2022 Air Quality Annual Status Report (ASR)

In fulfilment of Part IV of the Environment Act 1995

Local Air Quality Management

Date: June, 2022

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Executive Summary: Air quality in our area

Since 2018 air quality in Brighton & Hove had become cleaner for noxious pollutants, especially for the city centre, around bus and railway station hubs and the main hospital.

2020 included the strictest travel restrictions associated with Covid-19 and as expected, since that time the rate of pollution improvement has slowed. The first quarter of 2020 predated these changes, whilst 2021 continued with lower levels of commuting. The city has become more dependent on vehicle trips for servicing and online delivery. That said, the last 24-month period (2020-2021) was much cleaner than the long-term 'normal' that predated it.

2021 monitoring at Preston Park indicated the second lowest year for outdoor Nitrogen Dioxide (NO_2) since 2012. A slight increase was recorded at the site compared to 2020. This differs to the majority of Portslade, Hove, Central Brighton and Rottingdean where the lowest annual NO_2 to date was recorded in 2021. Detailed trends in local pollution levels are presented in this report.

Monitoring of fine particles in air, that is outdoor $PM_{2.5}$ across the city, indicated an increase for 2021 compared to 2020. It is not clear if this change was regional or localised. Further monitoring is required to determine the contribution to fine airborne particles from domestic burning, outdoor fires, fireworks, haulage, construction, and shipping. Airborne particles measured by regional monitoring networks can be affected by agriculture, weather patterns and climate change. The impact on particulate pollution from vehicle exhausts has diminished. This decade noxious exhaust emissions (gases) from legacy diesels are likely to continue to be a significant contribution to outdoor particles. There is now a very small contribution of sooty particles directly from vehicle exhausts. Where vehicles (especially heavy ones) accelerate and reduce speed rapidly tyre, brake and road wear, release particles to soil, water, and air.

Air Quality in Brighton & Hove City Council

Air pollution is associated with related adverse health impacts. It is recognised as a contributing factor in the onset of heart disease and cancer. Air pollution affects the most vulnerable in society: children, the elderly, and those with existing heart and lung conditions. There is also often a strong correlation with equalities issues because areas with poor air quality are also often less affluent areas[1,2]. That said, Brighton has a cosmopolitan centre with relatively high pollution levels, compared with less affluent outer areas (such as Whitehawk) with well-ventilated cleaner air. During the life course, to varying degrees inhalation of smoke and gases can affect everyone's health.

The mortality burden of air pollution within the UK is equivalent to 28,000 to 36,000 deaths at typical ages[3], with a total estimated healthcare cost to the NHS and social care of £157 million in 2017[4].

The most plentiful pollutant close to roadside environments is NO_2. Concentrations at roadside have improved with 2020 and 2021 being the cleanest years in a long-term

[1] Public Health England. Air Quality: A Briefing for Directors of Public Health, 2017

[2] Defra. Air quality and social deprivation in the UK: an environmental inequalities analysis, 2006

[3] Defra. Air quality appraisal: damage cost guidance, July 2021

[4] Public Health England. Estimation of costs to the NHS and social care due to the health impacts of air pollution: summary report, May 2018

sequence since 2005 and 2010. That said monitoring at Preston Park (remote from roads) suggests a small increase in NO_2 since 2020. Smaller parts of Brighton & Hove's AQMAs last amended in 2020 continue to exceed national standards for NO_2. Parts of the urban fringe and South Downs National Park are close to meeting stricter World Health Organisation guidelines for NO_2 and particles and are effectively a 'green lung or fresh air space' for respite and activity. Gaseous emissions of oxides of nitrogen from road traffic and gas boilers are a factor in the formation of nitrate particles and a precursor to regional ozone pollution.

Ozone and particles occur as spring or summer episodes (hours or days) across the South-East region. Oxides of nitrogen is emitted from low temperature diesel exhausts and gas boilers during the winter. Smoke arises from outdoor fires (usually summer and autumn) and domestic building chimneys during the heating season. The highest particulate days in a year can happen on any date, for example warm still, conditions during August. The highest $PM_{2.5}$ day (24-hour average) in a calendar year is often, but not always the 5th of November. Monitoring in Brighton & Hove during 2021 indicated everyday had a $PM_{2.5}$ 24-hour average of less than 25 µg/m^3. A new target recommendation is to reduce the number of days in the year that are more than 15 µg/m^3 $PM_{2.5}$ in-line with the most up to date World Health Organisation guidelines. This is consistent with working towards an annual average of 5 µg/m^3 for $PM_{2.5}$ and the feedback Brighton and Hove have given to the national consultation on air quality standards.

The council will continue to monitor local air quality and pollution levels in the city.

Through much of the calendar year pollution levels tend to be highest in declared Air Quality Management Areas that can be viewed by selecting AQMA boundaries AQMAs interactive map (defra.gov.uk) and zooming into the local details. Whilst Brighton & Hove AQMAs are small compared to London and Birmingham, population density and visitor numbers are very high, so thousands of people are affected, by air quality in these areas. The last declaration can be found at: Brighton & Hove AQMA Orders 2020.

How Brighton & Hove manages air quality is complimented with joint working with Sussex-Air Promoting better Air Quality in Sussex. In particular we welcome ties with local bus operators, The NHS, asthma care, The Director of Public Health, Universities, DfT, Home - Defra, UK, The Office for Zero Emission Vehicles - GOV.UK (www.gov.uk), The Environment Agency, and Highways England.

Actions to Improve air quality

Whilst air quality has improved significantly in recent decades and national policy decisions, will help to continue long term trends, there are some areas where local action is needed to add value and improve air quality further. We monitor substantial pollution improvement around bus hubs, the main railway station and hospital (a construction site for several years to date).

Since Covid-19 was most prevalent, transport, motorway-use and tourism have shown strong recovery. We are aware that the vehicle fleet is becoming older, and it is now challenging for households and smaller businesses to buy nearly new vehicles with lower emission rates. There is a potential risk for local air quality, road space and parking as larger cars and vans become more popular.

The 2019 Clean Air Strategy[5] sets out the case for action, with goals to reduce exposure to harmful pollutants. The Road to Zero[6] sets out the approach to reduce exhaust emissions from road transport through a series of mechanisms; this is extremely important given that the majority of Air Quality Management Areas (AQMAs) are designated due to elevated outdoor concentrations of NO_2, heavily influenced by transport emissions.

Over the last year local bus operators and the city council have continued to reduce bus emissions with procurement of cleaner hybrid buses and exhaust upgrades of older double decker buses. Supported by the DEFRA air quality grant and local bus operator the project to upgrade bus exhausts continues during 2022. Our target is that all frequent buses in Brighton & Hove and across Sussex will meet the Ultralow Emissions Standard. The project is continuing to make significant contribution to the substantial reduction in roadside NO_2, especially where several bus routes use the same street.

During the past year Brighton & Hove has made further progress with, fast bus ticketing contactless and the Brighton & Hove Bus Service Improvement Plan (BSIP) (brighton-hove.gov.uk). Public consultations have been processed on the Local Transport Plan (brighton-hove.gov.uk) and the Local Cycling and Walking Infrastructure Plan (brighton-hove.gov.uk). One significant finding of the city council's 2021 consultations so far, is that

[5] Defra. Clean Air Strategy, 2019

[6] DfT. The Road to Zero: Next steps towards cleaner road transport and delivering our Industrial Strategy, July 2018

three-quarters of respondents (mostly local residence) ranked reducing pollution and improving air quality as one of their highest priorities.

There is interest in allocating more space for active travel and buses, expanding Ultralow Emission options, and increasing the proportion of vehicles that are zero exhaust capable. A pilot project will consult the public on liveable city centre plans for reducing traffic and emissions.

Considerable progress has been made in the last year in securing funding for air quality investigations including outdoor monitoring of pollutants. This will help to progress community engagement and awareness raising, with regard to the health risks of emissions and the benefits of active travel.

Conclusions and priorities

Following reductions in recent years, the rate of pollution improvement has slowed 2021. That said monitoring around the main railway and busy bus areas suggests pollution has reduced substantially up to 2021. Most of the suburbs have low levels of pollution. Further improvements in these areas are likely to be relatively small or strongly influenced by the regional situation, national and international policy.

A few roadside hotspots within designated AQMAs continue to show evidence of exceeding established national standards for Nitrogen Dioxide, these areas are smaller than at any time since monitoring began nearly thirty years ago. The highest levels of local pollution are found in AQMA1:

- Lewes Road A270 north-east of Elm Grove and approaching Vogue Gyratory onto Hollingdean Road
- London Road between Cheapside, Brunswick Row and Oxford Street
- North Street east of the Clock Tower continues to improve
- New England Road A270 including close to the railway bridge and the eastern end of Old Shoreham Road
- Viaduct Terrace and Grand Parade A23, south of Richmond Parade

In need of continued improvement in emission and outdoor pollution levels:

- AQMA5 The Drove (west of the railway) connected to South Street
- AQMA3 Wellington Road and Trafalgar Road, South Portslade

- AQMA2 Rottingdean High Street, especially adjacent to the A259 and at ground floor level
- AQMA1 Frederick Place, North Laine

The AQMAs reviewed in 2020 will be retained. Priority during 2022 will be to:

- Analyse responses received from the public consultation on the AQAP
- Equalities Impact Assessment and AQAP report for consideration of the City Council's Environment Transport and Sustainability (ETS) committee
- Further air quality investigation including model updates and continued monitoring
- Confirm, AQMA4 and AQMA6 are compliant with all national air quality standards and local objectives 2022 and 2023.
- Emission reduction and traffic monitoring around AQMA1, AQMA2, AQMA3 and AQMA5

Our monitoring strategy will need to prioritise AQMAs, the Royal Sussex Hospital, the liveable city centre, GP surgeries, portside haulage routes, long-term construction sites and select school sites. Fortunately, most local schools with playing fields and are set back from busy roads and have relatively clean air. Children spend about 15% of the year at school. Useful information can be gained from assessing different settings and environments.

It will be important to ensure that proposed Low Traffic Neighbourhoods (LTNs) that have low pollution levels to start with, do not divert road traffic emission into AQMA roads with relatively high pollution. The city has residential use adjacent with main roads (within 9 metres of constant road traffic emissions), including business use with accommodation. It is common for retail premises at roadside to change their planning use to ground and first floor residential and for student accommodation developments at roadside. Common mitigation includes a ventilation strategy to draw fresher air from the backs at tops of roadside buildings.

Local engagement and how to get involved

The public Air Quality Action Plan has been open for eight weeks. Invitation to comment in this period has been sent to many community groups, local and national organisations.

Everyone can do a little bit to help improve local air quality in the city or their neighbourhood. For example, the travel and heating choices we all make have an adverse or beneficial impact on the air everyone breathes:

Healthy Travel Choice Hierarchy

1. Active Travel – walking, cycling and roller booting
2. Battery assisted bicycles
3. Public Transport
4. Electric car or van
5. Battery vehicle with a range extender
6. Petrol-electric hybrid vehicle
7. Small petrol engine
8. Diesel hybrid vehicle
9. Small diesel with effective exhaust mitigation
10. Large diesel without exhaust mitigation

Healthy Heating and Cooling Hierarchy

1. Renewably generated electricity without combustion with passive house and grid balancing energy storage
2. Electric grid or local microgeneration without emissions to air
3. Biogas fired boilers (Ultralow NOx)
4. Natural gas fired boilers (Ultralow NOx) piped not including chilled LNG
5. Combined Heat and Power (CHP) gas combustion (emits NOx and CO_2)
6. LNG with high transportation and energy costs CO_2 emissions
7. Pellet Stoves particles when burn starts
8. Log burning in an open fireplace with risk of smoke
9. Domestic waste-wood burning is resourceful, but can proudce various emissions
10. Diesel generators that emit smoke
11. Heavy fuel oil with various emissions
12. Coal burning with sulphurous emissions

Local responsibilities and commitment

This ASR was prepared by the Transport Department of Brighton & Hove Council with the support of the following officers and departments:

Parking Strategy, Public Transport, Environmental Health, Public Health, City Clean and City Parks, Tourism, Planning, Fleet Management, Taxi Licencing, Trading Standards, Equalities, Performance and Communications.

Following the 2022 AQAP our schedule is to approve 2023 appraised ASR by:

Director of City Transport and the Director of Public Health who from time-to-time chair the City Council's Air Quality Programme Board (AQPB).

If you have any comments on this ASR please send them to:
Transport.Projects@brighton-hove.gov.uk

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1 Local Air Quality Management

This report provides an overview of air quality in Brighton and Hove during and up to 2021. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995) and the relevant Policy and Technical Guidance documents.

The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether the air quality objectives are likely to be achieved. This year there is a national consultation on whether UK air quality targets should be more stringent. Where an exceedance of established national standards is considered likely the local authority must declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the standards. This Annual Status Report (ASR) is an annual requirement showing the strategies employed by Brighton and Hove to improve air quality and any progress that has been made.

The statutory air quality objectives applicable to LAQM in England are presented in Table E.1.

2 Actions to improve air quality

Air Quality Management Areas

Air Quality Management Areas (AQMAs) are declared when there is an exceedance or likely exceedance of an air quality standard. After declaration, the authority should prepare an Air Quality Action Plan (AQAP) setting out measures it intends to put in place in pursuit of compliance with all objectives.

A summary of AQMAs declared by Brighton and Hove can be found in Table 2.1. The table presents a description of six AQMA(s) that are currently designated within Brighton and Hove. Appendix D: Map(s) of Monitoring Locations and AQMAs provides maps of AQMA(s) and also the air quality monitoring locations in relation to the AQMA(s). The air quality objectives pertinent to the current AQMA designation(s) are as follows:

- NO_2 annual mean for all areas
- NO_2 hourly mean for AQMA1 and AQMA6

There are plans to review the AQMAs. last amended in 2020.

Table 2.1 – 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 National Highways?	Level of Exceedance: Declaration µg/m^3	Level Current Year To be confirmed Next Year	Name and Date of AQAP Publication	Web Link to AQAP
Brighton & Hove AQMA1	2013 Amended November 2020	NO2 Annual Mean	Includes four main arterial routes connecting Brighton & Hove City Centre, that is: B2066-ULEZ and part of the A23, A270, A2010 and adjacent land use.	YES	84.6	45.8	Public Consultation Live	
Brighton & Hove AQMA1	2013, Amended November 2020	NO2 1 Hour Mean	Includes four main arterial routes connecting Brighton & Hove City Centre, that is: B2066 ULEZ and part of the A23, A270, A2010 and adjacent land use.	YES	114.8	47.6		To follow public consultation and analysis, Equalities Impact Assessment, and committee report
Brighton & Hove AQMA2	2013 Amended November 2020	NO2 Annual Mean	Rottingdean High Street (B2123) from the A259 junction to the T-junction with Vicarage Lane.	YES	47	28.8		

AQMA Name	Date of Declaration	Pollutants and Air Quality Objectives	One Line Description	Is air quality in the AQMA influenced by roads controlled by National Highways?	Level of Exceedance: Declaration µg/m^3	Level Current Year To be confirmed Next Year	Name and Date of AQAP Publication	Web Link to AQAP
Brighton & Hove AQMA3	Nov-20	NO2 Annual Mean	Southwest Portslade including housing surrounding the A259 and A293 haulage route from Shoreham Port Inland. NOx contributions from general traffic, buses, HGV and wharf side industry.	YES	51.1	34.2	Public Consultation Live	As above
Brighton & Hove AQMA4	Nov-20	NO2 Annual Mean	Premises adjacent with the Old Shoreham Road (A270) and Sackville Road (A2033) Junction.	YES	47.7	28.3		
Brighton & Hove AQMA5	Nov-20	NO2 Annual Mean	Part of the Drove, South Road Preston Road part of the A23 and adjoining properties.	YES	50.7	34.4		
Brighton & Hove AQMA6	Nov-20	NO2 Annual Mean	Eastern Road outside of the Royal Sussex County Hospital. Mixed road traffic, gas combustion and long-term construction.	YES	42.2	23.6		

2.2 Progress and impact of measures to address air quality in Brighton and Hove

Defra's appraisal of last year's ASR summarised as follows:

- The recently amended and declared AQMAs
- The number of diffusion tube monitors compared with the previous year and how NO_2 had decreased at the highest (kerbside) monitoring site in the cities Ultralow Emission Zone
- The need for a new Air Quality Action Plan around the same time as a new Local Transport Plan and Local Cycling and Walking Infrastructure Plan (LCWIP) requiring public consultation and analysis of the responses

An acknowledgement of

- Quality assurance procedures included in the 2021 ASR
- Public Health Outcomes Framework indicating measures to reduce $PM_{2.5}$
- Impacts opportunities and challenges brought about by Covid-19
- The distinction of monitoring areas distinguished by AQMAs and roads

Following new AQMA declarations and the DERRA feedback received, monitoring has been reinstated in AQMA4 and AQMA6, so previous year results can be reported in this ASR. A map of all Brighton & Hove's AQMAs and each one in turn is provided in Appendix D. In their appraisal DEFRA supported the review of AQMAs, followed by public consultations related to the AQAP.

Brighton and Hove have taken forward a number of direct measures during the current reporting year of 2021 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.2. Where there have been, or continue to be, barriers restricting the implementation of the measure, these are also presented within Table 2.2. That said the plan will be changed and updated following feedback and analysis of extensive public consultation and elected members will have the chance to have their say at committee.

More detail on local initiatives can be found in their respective, Local Transport Plan, City Plan, Walking and Cycling Infrastructure Plan and Carbon Neutrality 2030. The AQAP consultation is scheduled to run until July 2022. At the time of writing there are

approaching 250 responses to the AQAP consultation which will take some weeks to analyse. The five main priorities are set out as:

- Active Travel
- Reducing Emission from vehicles
- Development Control and Planning
- Working with Partners
- Assessment (monitoring and mapping) awareness raising and public engagement

Brighton and Hove expect to manage monitoring and modelling over the next year with a target to spend allocated DEFRA-air quality and carbon neutral funds within two years.

Brighton and Hove worked to implement these measures in partnership with the following stakeholders during 2021:

- Sussex Air Quality Partnership
- Brighton & Hove Bus Company
- Bureau Veritas

The principal challenges and barriers to implementation that Brighton and Hove anticipate facing are time required for tendering and procurement. Permissions for further monitoring installations are expected to be agreed by the time of the next ASR.

Finalisation of a new AQAP report has been slower than expected due to twenty public consultations carried out by the Transport and Parking Department during 2021. That said several measures in the ongoing AQAP are completed or ongoing.

Brighton and Hove anticipate that the measures stated above and in Table 2.2 and broader trends will help achieve national compliance for a growing city and its AQMAs. The aim to surpass national standards and set new targets such as a local objective of 30 $\mu g/m^3$ NO_2 annual mean (WHO interim guide) by 2027. This level of ambition is timetabled before carbon neutrality schedules that are pledged by the city and region. Looking beyond ULEZ or Clean Air Zone policies (euro-VI emission standard), it is anticipated there will be progression with electrification of transport and buildings. Alternatives to fossil fuel combustion will be more commonplace for business and economic growth. For the second half of the new AQAP period (2022 to 2027) we would expect local air quality and climate policy agendas to become more closely aligned.

Whilst the measures stated above and in Table 2.2 will help to contribute towards compliance, Brighton and Hove anticipates that further additional measures not yet

prescribed will be required in subsequent years to achieve 2021 World Health Organisation guidelines for air quality.

Table 2.2 – Progress on funded measures to improve air quality (Following 2022 Action Plan Public Consultation)

Measure No.	Measure	Category	Classification AQAP Priority	Year Measure Introduced	Estimated / Actual Completion Year	Organisations Involved	Funding Source	Defra AQ Grant Funding	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
1a	Active travel access	Promoting travel alternatives	**Priority 1** **Increase active travel** **Support travel mode shift and reduce the need to travel** **Reduce energy demand and fuel burn** **Less commuting reduction in AM and PM peak traffic since 2020**	2018	2025	Local Transport Authority	DfT	Indirectly	£1 million - £10 million	Implementation	1 to 5 µg/m^3 NO_2 long term	Increased active travel for leisure and transport	Sea front bike lanes allocation of space	LCWIP to take forward
1b	Expanded bikeshare scheme and inclusion of e-bikes	Transport planning and infrastructure		2018	2023		Private	Sponsor	£1 million - £10 million	Implementation	1 to 3 µg/m^3 NO_2	Uptake in Bikeshare usage and new members	High patronage and trip numbers	Planned expansion to suburbs and to neighbouring authorities with e-bikes
1c	On street bike storage	Parking		2021	2025		DfT	LTP5	£100k - £500k	Ongoing	1 µg/m^3 NO_2	Increased bike use	Implemented on several streets	Not every request can be met
1d	Encourage / Facilitate home-working remote access to health, services, education	Promoting travel alternatives		2019	2025	All Departments and Companies	Various	NO	< £10k to £100K	Implementation	1 to 5 µg/m^3 NO_2	Less commuting traffic	Success since lockdowns	Working from home continues after 2020 travel restrictions
1e	Car share & car club	Alternatives to private vehicles and diesel		2017	2023	All Departments and Companies	Private	NO	£100k - £500k	Available and progress to zero	1 to 2 µg/m^3 NO_2	Viable car clubs with electric	Good uptake companies and households	Established
1f	Bus access improvements	Transport planning and infrastructure		2015	2027	Transport and Bus Company	DfT	DfT	> £10 million	Planning	1 to 2 µg/m^3 NO_2	Bus priority and accessibility	New phase to start	BSIP strategy
1g	Transport mode Interchanges			2018	2022	Local Transport Authority	DfT	LTP5	£1 million - £10 million	Completion	1 µg/m^3 NO_2	More sustainable travel	Work on main station delivered	Transport interchanges more accessible Declined rail use since 2020
1h	Develop Assessment Framework for Low Traffic Neighbourhoods (LTN)			2002	2023		Local Authority	NO	£100k - £500k	Consultation	1 to 2 µg/m^3 NO_2	Reduced traffic levels	Consultation	Insure no adverse impact on AQMAs
1i	School Travel Plans	Travel plans		2022	2027			NO		Constant	<1 µg/m^3 NO_2	Behavioural change	Annual travel survey results to look at travel modes	Permanent schemes
1j	Workplace travel planning			2022	2027			NO		Constant	< 1 µg/m^3 NO_2			Helped by reduced levels of commuting since 2018/19
1k	School Streets	Promoting travel alternatives		2022	2027			NO		Six schemes per year	< 1 µg/m^3 NO_2			Permanent schemes
1l	Continue higher cost for resident parking permits for additional vehicles	Parking		2022	2024	Parking		NO		Constant	Trace levels	Fewer car trips	Implemented	Popularity
1m	Explore Park and stride. Park and			2022	2027	Local Transport Authority		NO		Feasibility study completed	2 to 7 µg/m^3 NO_2	Vehicle trips saved through AQMAs	Options considered	Consensus required

Measure No.	Measure	Category	Classification AQAP Priority	Year Measure Introduced	Estimated / Actual Completion Year	Organisations Involved	Funding Source	Defra AQ Grant Funding	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
	ride, strategic mobility													
1n	Explore workplace parking levy	Travel Planning		2022	2025		Local Authority	NO	< £10k to £100K		1 to 2 µg/m^3 NO_2	Reduced car commuting		Consideration in LTP5 Example Nottingham
1o	Liveable City Centre	Urban realm		2022	2024			NO	£500k to £1 million	Officers exploring	1 to 5 µg/m^3 NO_2	Improved urban realm	Draft	Prioritised by Climate Assembly and part of LTP5
1m	20-minute neighbourhoods			2022	2024			NO	< £10k to £100K		Trace levels	Less road emissions	Part of LTP5	Proposed in LTP5
1n	Develop re-wilding and tree planting areas and parklets		**Priority 1** **Increase active travel**	2022	2025			NO	£100k - £500k	Improved urban realm	slight for particles	Improved urban realm and a safer more attractive environment for walking and cycling	Valley Gardens, Waterhall rewilding, Carden Hill tree planting, LTNs	Plants will benefit from cleaner air less likely to mitigate pollution
2a	Working towards a zero-exhaust council fleet	Promoting zero emission council fleet		2019	2027	Local Transport Authority .	Low Interest Loan	NO	£1 million - £10 million	Implementation	1 to 4 µg/m^3 NO_2	Zero Emission Council Fleet	Electric waste vehicle	Time to procure more
2b	Ultralow and zero emission zone for buses	Promoting Ultra-low emission public transport	**Priority 2** **Encourage and support uptake of ultra-low and zero exhaust vehicles**	2019	2027		DfT, DEFRA, private bus operators	YES	>£1 million - £10 million	Implementation	15 to 35 µg/m^3 NO_2 estimations	>90% bus ULEZ compliance. Less NO_2 next to roadside	Advance beyond 2015 LEZ. Meet and surpass bus emission standards set by the 2019 ULEZ	Officer time, requestion approvals, parts availability
2c	Exhaust retrofit on middle age buses (end of life for oldest)			2013	2023	Local Bus Operators and Air Quality	Defra, carbon reduction, local bus operators	YES	£1 million - £10 million	Implementation	5 to 20 µg/m^3 NO_2 estimations	Lower NO_2 kerbside and roadside	Implementation on-going	Fourth and final phase scheduled for winter 22/23
2d	Expanded ultralow bus zone			2022	2023	Local Transport Authority	Officer time	NO	£100k - £500k -	Planning	1 to 7 µg/m^3 NO_2	More widespread NO_2 improvement	Recommendation	For Quality Bus Partnership
2e	Better aligned wheel tracking			2021	2025	Brighton & Hove CC University of London	University	NO	£100k - £500k	Planning	1 to 3 µg/m^3 $PM_{2.5}$	Outcome of Discussions	Reduced road wear. Higher tyre pressure	Benefit for particles and CO_2
2f	Ultralow or zero zone for all vehicle types	Ultra-low emission all vehicles		2020	2024	Local Transport Authority .	DEFRA application	Bid for part of fund	>£1 million - £10 million	Planning	5 to 15 µg/m^3 NO_2	Fewer polluting vehicles	Bid to funding opportunities	Cost
2g	Promoting e-cargo bikes	Freight and delivery		2020	2023	All Departments and Companies	DfT	NO	£100k - £500k	Implementation	1 to 2 µg/m^3 NO_2	Increased cycle-use modal shift	Good examples of bike cargo	Officer Time
2h	Geo-referenced hybrid	Bus and taxi fleet fuel savings		2018	2022	Local bus and taxi operators	Bus Operators	NO	£100k - £500k	Completed	1 to 7 µg/m^3 NO_2	NO_2 Reduction	Second phase	Relevant to 54/350 regular buses
2i	Fast & rapid electromotive chargers for taxis and cars	Promoting zero emission cars and taxis		2019	2021	Parking	Office of zero emission vehicles	NO	£500k - £1 million	Implementation	1 to 3 µg/m^3 NO_2	On-Street facilities	More than 200 fast chargers out	Further charging facilities 2022/23
2j	Zero exhaust for last mile deliveries	Freight and delivery		2022	2025	Local Transport Authority	Local Authority	NO	£100k - £500k	Planning	1 to 6 µg/m^3 NO_2	Reduce emission from freight in AQMAs and LCC	E-bikes and e-vans	Space for transfer with national network
2k	Anti-Idling	Avoiding vehicle emissions		2017	2023	Air quality and communications	Sussex Air	NO	< £10k	Ongoing	1 µg/m^3 NO_2	Public awareness of offence caused	>70 signs out increase uptake of auto engine shut off and zero	Officer time suitable posts street clutter

Measure No.	Measure	Category	Classification AQAP Priority	Year Measure Introduced	Estimated / Actual Completion Year	Organisations Involved	Funding Source	Defra AQ Grant Funding	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
2l	Explore emission-based parking charges	Parking	**Priority 2** continued	2022	2023	Parking	Parking	NO	< £10k to £100K	Committee Report	1 to 2 µg/m^3 NO_2	Fewer diesels in the city	Consider Options	Based on ULEZ Standards & EV not CO_2
3a	Air quality monitoring and annual reports	Public information	**Priority 3** **Monitoring and Public Awareness**	2020	2027	Air quality and Sussex Air	Low carbon fund & DEFRA air quality grant	YES	£100k - £500k	Increase in automatic analysers	1 µg/m^3 NO_2	Annual report	Funding received 2022 to be spent by end of 2023/24 at the latest	Procurement of new equipment quality assurance
3b	Real-time			2021	2024	Air quality and communications			£50k - £100k	Real-time trials as technology improves	1 µg/m^3 NO_2 $PM_{2.5}$	Date from automatic analysers and sensors		
3c	Community Engagement Schools and Events			2019	2025				£100k - £500k	Implementation	1 µg/m^3 NO_2	Promote awareness active & zero emission travel	Interactive across Sussex	Air quality at Brighton & Hove schools relatively clean
3d	Communications on reducing domestic smoke			2019	2027	Communications and air quality	Local Authority	NO	£50k - £100k	Press releases and web updates	1 to 2 µg/m^3 $PM_{2.5}$	Public information on cleaner home heating	Spring and autumn statements	Cost of living could increase solid fuel burning reduce
3e	Public Information campaign on air quality and health			2022	2027	Public Health and air quality			< £10k		1 to 2 µg/m^3 NO_2 and $PM_{2.5}$	Increased percentage of residents informed	Air quality at health and wellbeing board	Tied in with clinical health, GPs, NHS and Director of Public Health
3f	Promote air alert			2022	2027	Sussex Air	Sussex Air	NO	< £10k	Established	Pollution episodes	Sign-ups for app	Information Online	Un-subscribers
3g	Move for change campaign			2022	2027	Travel Team	Local Authority	NO	10k - £50k	Ongoing	< 1 µg/m^3 NO_2			N/A
4a	Ensure development has positive influence on air quality	Planning	**Priority 4** **Reduce emissions from buildings new developments energy production and construction sites**	2022	2027	Planning	Development	NO	£10k to £10 million	Ongoing	1 to 7 µg/m^3 NO_2	Develop design and avoidance of emission to build back better	Case study examples of low vehicle electric developments	Build back better aims to improve the environment compared to historical planning permissions
4b	Improve urban street ventilation by avoiding enclosure	Planning		2022	2027	Planning	Planning	NO	£10k to £10 million	Ongoing	1 to 5 µg/m^3 NO_2	Avoid creating or reinstating street canyons by designing gaps and setbacks	Case examples	Buildings set back from roads and gaps between structures. Public amenity space including room for pedestrians, cyclists and open space eg parklets
4c	Construction Environment Management Plans Euro-VI HGV's with route plans	Freight and delivery management		2021	2027	Planning and developers, air quality consultee	Developers	NO	£50k - £100k	Implementation	1 to 2 µg/m3 PM2.5 and NO2	Reduction of HGV emissions in the AQMA	Implemented on several major plans	Euro--VI HGV reduced emissions in AQMAs
4d	Improved Emission Standards for Non-Road Mobile Machinery	Planning				Planning and air quality	Developers		£100k - £500k	Phase in more stringent standards	1 to 4 µg/m3 PM2.5 and NO2	Applies to bulldozers and cranes and other machinery working on construction sites	Conditions on major planning applications. Better UK controls	Funding required to enforce more stringent standards

Measure No.	Measure	Category	Classification AQAP Priority	Year Measure Introduced	Estimated / Actual Completion Year	Organisations Involved	Funding Source	Defra AQ Grant Funding	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
4e	Planning Policy	Policy guidance and development Control	**Priority 4** **Reduce emissions from buildings new developments energy production and construction sites**	2016	2022	Planning and Transport	Planning	NO	£50k - £100k	Completed	1 to 5 µg/m^3 NO_2	City Plan 2 and planning polices	Supporting Policies	Established
4f	Development facilitates active and zero exhaust travel			2022	2027	Planning	Planning	NO	£100k - £500k	Part of planning process	1 to 2 µg/m^3 NO_2	Fewer diesel private car trips	High proportion for City Centre	Cycle parking on site
4g	Ensure commercial developments produce a workplace travel plan			2022	2027			NO	£100k - £500k		1 µg/m^3 NO_2		Standard	Less commuting helps
4h	Ensure development meet Part S of the building regulation for electromotive charging points			2022	2027			NO	£50k - £500k		1 to 2 µg/m^3 NO_2		Conditions on recent planning applications	New legislation
4i	Ensure that major developments avoid emissions in accordance with energy hierarchy for net carbon and avoid oxides of nitrogen emissions in and around AQMAs.			2022	2027			NO	£50k - £500k		1 to 2 µg/m^3 NO_2		Improvement on recent planning applications compared to historic	Phase out emissions in AQMAs and Liveable City Centre
4j	Smoke Control and Cleaner Home Heating	Smoke Control		2020	2023	Air Quality, Legal, Communication, Trading Standards, Environmental Health	BHCC	NO	£100k - £500k	Implementation	1 to 4 µg/m^3 PM_{10}	New Smoke Control	Discussions with DEFRA and legal retailer awareness, response to complaints and enforcement	Cost of living could increase solid fuel burning. New legislation
4k	Training and revenue for officers to enforce domestic smoke control			2022	2023			Bid to DEFRA grant	£50k - £100k					Revenue required
4l	Construction Environment Management Plans	None-Road Mobile Machinery		2015	2027	Developers	Developers	NO	£50k - £100k	Implementation	1 µg/m^3 NO_2 1 to 2 µg/m^3 $PM_{2.5}$ and	Lower emissions from NRMM	Progress with long term construction	Lower emissions from None-Road Mobile Machinery
4m	Alternatives to combustion or ultralow NOx gas boilers with flue height	Promoting alternatives to combustion at development sites in the city		2018	2027	Planning and Air Quality	Developers	NO	£50k - £100k	Implementation	1 to 2 µg/m^3 NO_2	Ultralow emission boilers zero alternatives	Good progress	Avoidance of gas biomass, oil, diesel, coal combustion in and around urban AQMAs
4n	Shoreham Power Station Permit	Environmental Permits		2010	2027	Environment Agency	Scottish Southern	NO	£50k - £100k	Constant	1 to 3 µg/m^3 NO_2	Low emission contribution	Established	Permit condition for ultralow NOx.
4o	Crematorium Permit	Environmental Permits		2010	2027	Environmental Health	Crematorium	NO	< £10k	Constant	1 to 2 µg/m^3 NO_2	Mitigated mercury emissions	Established	Assess contribution
5a	Partnership Working Internal	Stakeholder Engagement		2015	2027	Air Quality, Transport, Communications, Education Regulatory	City Council	NO	£10K to £50K	Continuous	N/A	Partnerships and shared knowledge	Established	Officer Time

Measure No.	Measure	Category	Classification AQAP Priority	Year Measure Introduced	Estimated / Actual Completion Year	Organisations Involved	Funding Source	Defra AQ Grant Funding	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
						Services, Public Health								
5b	Partnership Working External		**Priority 5** **Partnership working**	2015	2027	Air Quality, Sussex Air, Environment Agency DEFRA, DfT, National Highways, NHS		NO	£10K to £50K	Continuous		Partnerships and shared knowledge share funding applications	Established	Revenue Limitations
5c	Continue to lobby government to bring forward WHO guidelines for $PM_{2.5}$ and NO_2	Government Engagement		2022	2023	Multiple Departments	Various	NO	< £10k	Improved health and environment protections		Firmer policies for business	Letters and consultation responses	Announcement scheduled late 2022

$PM_{2.5}$ – Local authority approach to reducing emissions and or concentrations

As detailed in Policy Guidance LAQM.PG16 (Chapter 7), local authorities are expected to work towards reducing emissions and/or concentrations of $PM_{2.5}$ (particulate matter with an aerodynamic diameter of 2.5µm or less). There is clear evidence that $PM_{2.5}$ has a significant impact on human health, including premature mortality, allergic reactions, and cardiovascular diseases.

Whilst the tiny airborne particles are not defined by composition or toxicology, when inhaled they can be drawn deep into the respiratory tract, crossing over into the blood stream. $PM_{2.5}$ is reffered to in section 6.49 of the Joint Strategic Needs Assessment (JSNA)[i] and is linked with the Public Health Outcomes Framework (PHOF)[ii]. PHOF sets out a vison for public health "to protect the nations health and improve the health of the poorest fastest".

Brighton & Hove is taking the following measures to address $PM_{2.5}$:

- The phasing out of pre-euro-V emission buses (registered before October 2008) reduces particulate emissions from the frequent bus fleet. Older buses remain for rail replacement services, driver training or heritage days. City council, taxi and haulage fleets have also made progress in phasing our pre-euro 5 vehicles
- Scheduled for 2022 >90% of regular bus services will surpass the ULEZ, euro-VI emission standards this will further reduce oxides of nitrogen that are precursors to the formation of nitrate particles in the atmosphere, and also help reduce N2O a potent greenhouse gas
- The Council is in talks with University of London regarding improving true wheel alignment and tyre pressure to reduce tyre and road wear and particulate releases to air
- Construction Environment Management Plans have progressively more stringent emissions standards for Non-Road Mobile Machinery that includes bulldozers, dumpers, and cranes, it recommended going forwards these standards are enforced especially on major projects, development areas, in or near AQMAs
- Static diesel generators are discouraged for building and road work events, especially those in the city centre that are likely to last more than a few days

- Members have requested that officers consider declaration of a citywide Smoke Control Area (SCA). Parliament approved amendments to the Environment Act (2021) sets out stronger powers for Local Authorities
- In the interests of communal health, the council issued a series of public statements discouraging indoor and outdoor domestic burning during the Covid-19 pandemic[iii].
- Further press releases on reducing seasonal burning and a new pamphlet outlining the risks of air pollutants due to bonfires in the city
- To complement Defra's automatic urban rural monitoring network (site at Preston Park) the City Council has for several years monitored $PM_{2.5}$ adjacent to Lewes Road and North Street
- Brighton & Hove has secured funds for further $PM_{2.5}$ monitorng in the city (and accorss Sussex) with a view to delivering a reliable network
- Further guidance is available under the $PM_{2.5}$ and Action Planning section of Technical Guidance LAQM.TG16 (Chapter 2).

There were no 24-hour periods during 2021 with moderate levels of $PM_{2.5}$ or concentrations more than the 2005 WHO daily recommended level. Further details are given in Table A8. 2021 WHO recommendations have been published since the writing of the 2020 ASR and it suggested the council adopt interim targets based on the most ambitious guidelines.

3 Air quality monitoring data and comparison with air quality objectives and national compliance

This section sets out the monitoring undertaken within 2021 by Brighton and Hove and how it compares with the relevant air quality objectives. In addition, monitoring results are summarised in tabular form for the five-year period between 2017 and 2021, to allow monitoring trends to be identified and discussed.

Summary of monitoring undertaken

3.1.1 Automatic Monitoring Sites

Brighton and Hove undertook automatic (continuous) monitoring at two sites during 2021. In addition, the park monitor in Preston Park is run by DEFRA as part of the UK Automatic Urban Rural Network (AURN). Monitoring is available from the University of Brighton You can now check air quality - online (brighton.ac.uk) at their Falmer campus south of the A27 trunk road and the Brighton to Lewes railway. Table A.1 in Appendix A shows the details of the automatic monitoring sites. NB. Local authorities do not have to report annually on the following pollutants: 1,3 butadiene, benzene, carbon monoxide and lead. The Sussex Air Network page presents automatic monitoring results for Brighton and Hove and across the county with Preston Park and other AURN results also available through Data Archive - Defra, UK.

Maps showing the location of the monitoring sites in Brighton & Hove are provided in Appendix D. Further details on how the monitors are calibrated and how the data has been adjusted are included in Appendix C. Sussex have won funds for additional regulatory standard monitors, with scheduled installation starting during the next year.

3.1.2 Non-Automatic Monitoring Sites

Brighton and Hove undertook non- automatic (i.e. passive) monitoring of NO_2 at 54 sites during 2021. Table A.2 in Appendix A presents the details of the non-automatic sites.

Maps showing the location of the monitoring sites are provided in Appendix D. Further details on Quality Assurance/Quality Control (QA/QC) for the diffusion tubes, including

bias adjustments and any other adjustments applied (e.g. annualisation and/or distance correction), are included in Appendix C.

Individual Pollutants

The air quality monitoring results presented in this section are, where relevant, adjusted for bias, annualisation (where the annual mean data capture is below 75% and greater than 25%), and distance correction. Further details on adjustments are provided in Appendix C.

3.1.3 Nitrogen Dioxide (NO_2)

Table A.3 and Table A.4 in Appendix A compare the ratified and adjusted monitored NO_2 annual mean concentrations for the past five years with the air quality objective of 40µg/m^3. Note that the concentration data presented represents the concentration at the location of the monitoring site, following the application of bias adjustment and annualisation, as required.

For diffusion tubes, the full 2021 dataset of monthly mean values is provided in Appendix B.

Table A.6 in Appendix A compares the ratified continuous monitored NO_2 hourly mean concentrations for the past five years with the air quality objective of 200µg/m^3, not to be exceeded more than 18 times per year.

Annual mean NO_2 greater than 60µg/m^3, indicates that an exceedance of the 1-hour mean objective where that is monitored. During 2021 monitoring suggests that no part of Brighton & Hove exceeded the hourly standard for NO_2. That said road traffic, combined heat and power and gas boilers contribute to short-term oxides of nitrogen.

The relatively stringent annual average standard 40µg/m^3 continues to be exceeded next to parts of Lewes Road with monitoring detecting NO_2 (within 10%) of the UK standard next to, London Road, Grand Parade, New England Road, Viaduct Terrace and part of North Street (roadside at the building-line frontage).

In recent years substantial improvements have been detected around the bus ULEZ, the main railway station and the Royal County Hospital. Recent demolition on Holligdean Road has opened part of the street and construction may have diverted traffic elsewhere.

As the NO_2 AQMA were amended in 2020 that are no plans to reiview them in the next year before the next ASR.

3.1.4 Particulate Matter (PM_{10})

Since 2015 Brighton & Hove has monitored $PM_{2.5}$ instead of PM_{10} and the relatively course fraction of airborne particulate complies with national standards. As funding is now available the council is scheduled to monitor for both PM_{10} and $PM_{2.5}$. Particles do not vary geographically as much NO2. A number of monitors across the city in combination with others across Sussex will be insightful to help see where local and regional emissions are influence outdoor concentrations.

3.1.5 Particulate Matter ($PM_{2.5}$)

Table A.7 in Appendix A presents the ratified and adjusted monitored $PM_{2.5}$ annual mean concentrations for the past five years. Further improvement is required to certainly surpass 2010 WHO guidelines and work towards 2021 WHO guidelines for annual and daily averages.

3.1.6 Sulphur Dioxide (SO_2)

Sulphur Dioxide levels have been found to comply with national standards and world health guidelines across the Greater Brighton area. Reduced coal burning, ultralow sulphur petrol and diesel (2007) and fewer diesel trains have helped bring down levels of sulphurous gas and particles. The University of Brighton received £250K research fund for monitoring. Results for SO_2 and other pollutants can be found at: Air Quality - last 24 hours (brighton.ac.uk).

The monitoring station is in a field at Falmer (south of the A27 and Brighton to Lewes railway) and included in the summary appendix of Brighton & Hove automatic analysers.

Appendix A: Monitoring Results

Table A.1 – Details of Automatic Monitoring Sites

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)
BH6	Lewes Road South of Vogue Gyratory	Roadside	532082	105694	NO_2, $PM_{2.5}$	YES	API Chemiluminescent, TEOM	1	1.5	3
BH10	North Street near Ship Street	Roadside	530995	104271	NO_2, $PM_{2.5}$	YES	API Chemiluminescent	0	6	3.5
BH0	Preston Park AURN	Urban Background	530526	106218	NO_2, $PM_{2.5}$, O_3	NO	API Chemiluminescent, Partisol	>100	200	5
UB	University of Brighton	Suburban	534647	108503	NO_2, PM_1,$PM_{2.5}$, PM_{10}, SO_2, nitrous acid, formaldehyde	NO	Differential Optical Absorption Spectroscopy	>100	~150	3.5

Notes:

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

Table A.2 – Details of Non-Automatic Monitoring Site Nitrogen Dioxide (Sorted by AQMAs and Road Numbers)

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	In AQMA? Which AQMA?	Distance to kerb of nearest road (m) (2)	Tube Height (m)
C12-2010	Queens Road South of Church St	Roadside	530900	104451	AQMA1 A2010	4.2	2.5
W1-2005	Queens Road North		530969	104785		4.2	3.1
W3-2006	Terminus Road Terrace and Hill		530963	104994		3.5	2.6
C28-2010	Frederick Place, North Laine		531032	104843	AQMA1 (A2010)	2.8	2.5
C04-2010	Castle Square	Roadside	531228	104088	AQMA1 ULEZ	2.7	5.7
C10-2012	North Street near Ship Street		530995	104271		2.5	6.1
C11-2007	North Street Central		530947	104284		2.5	6.5
C11-2012	North Street East of Clock Tower	Kerbside	530890	104302		3	2.2
C13-2014	Lower Dyke Road	Roadside	530770	104363		3.2	4.5
W11-2020	Western Road		530154	104444	AQMA1 ULEZ west	2.6	4
W10-2006	Western Road near Sillwood Road		530302	104415		2.9	4.5
C09-2005	Marlborough Place	Roadside	531302	104392	AQMA1 A23	2.7	4.3
C15-2005	Gloucester Place		531401	104669		3	8.4
C16-2005	York Place		531400	104844		2.8	4.9
C18-2005	London Road Brunswick Row		531369	105042		2.5	3
C19-2005	Oxford Street Ditchling Road		531472	105161		2.6	3.3
C20-2005	Ditchling Road Viaduct Terrace		531496	105315		2.2	4.7
C21-2005	Viaduct Terrace		531451	105356		3.1	3.6
C23-2005	London Road Rose Hill Terrace		531189	105375		3	5.4
E1-2016	Preston Road near Preston Circus		531101	105498		2.8	2.5
E6-2020	Beaconsfield Road	Roadside	531107	105595	AQMA1 A23	2.6	3.8
E16-1996	Grand Parade North		531465	104629		2.6	4.4
E16-2015	Grand Parade Middle		531426	104514		2.5	3.6
E17-2003	Grand Parade South		531394	104338		2.8	5
C17-2012	Cheapside	Roadside	531364	104982	AQMA1 (A23)	2.4	3.4
C18-2010	Oxford Street London Road		531373	105136		2.8	3
E17-2018	Eastern Road near Pavilion Parade		531408	104233		2.5	1.6
C24-2015	New England Road Elder Place	Roadside	531101	105443	AQMA1 A270	2.7	3.6
C25-2010	New England West of Argyle Road		530985	105419		2.7	3.5
E07-2019	Lewes Road north of Elm Grove		531838	105349		2.5	2.9
E08-1996	Lewes Road near Inverness Road		532090	105752		2.6	4.4
E10-2015	Vogue Gyratory Island		532126	105838		2.7	3
E14-2019	Lewes Road on Pelham Terrace		532377	106314		2.9	3.4

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	In AQMA? Which AQMA?	Distance to kerb of nearest road (m) (2)	Tube Height (m)
E15-2012	Lewes Road on Coombe Terrace		532300	106159		2.6	3.7
W05-2006	Old Shoreham Road Hill		530778	105362		2.7	3.6
E12-2002	Hollingdean Road	Roadside	532021	105946	AQMA1 (A270)	2.7	4.9
W04-2006	Chatham Place		530808	105340		2.7	3.4
E22-2009	Rottingdean High Street East	Roadside	536970	102280	AQAM2 B2123	2.6	0.2
E23-2010	Rottingdean High Street West	Kerbside	536966	102273		2.6	0.2
E30-2020	Rottingdean High Street Mid	Roadside	536947	102341		2.4	1.8
E31-2020	Rottingdean Vicarage Lane	Roadside	536932	102454	AQAM2 (B2123)	2.5	1.5
E25-2018	Rottingdean Marine Drive	Roadside	537014	102238	AQAM2 A259	2.8	2.7
W16-2020	Wellington Road East	Roadside	526233	104860	AQMA3 A259	2.7	3
W17-2009	Wellington Road Church Road		525931	104961		2.7	3
W19-2009	Trafalgar Road Portslade		525658	105695	AQMA3 A293	2.8	3.9
W21-2010	Sackville Road Hove Park Tavern	Roadside	528388	105936	AQMA4 A2023	2.8	3.4
E02-2012	The Drove linked with South Street	Roadside	530063	106368	AQMA5	2.5	2.6
E02-2009	Preston Road near Preston Drove		530233	106515	AQMA5 A23	2.7	4
E18-2021	Eastern Road near Sudley Place	Roadside	532759	103810	AQMA6 C5600	2.6	2.4
C01-2020	Old Steine St James Street Corner	Roadside	531361	104040	Outside AQMAs	4.2	8
C05-2012	Pavilion Park	Background	531230	104260		2.8	102
E32-2020	Rottingdean Sea Front	Background	537011	102099		2.5	112
W14-2021	Old Shoreham Road, Margery	Roadside	526761	105809		2.5	4.4
W18-2010	Vale Park	Background	525970	105230		2.8	97

Notes: All tubes are at a relevant receptor location (apart from those at background). All tubes are singular, except C10-12 triplicate average, co-located with analyser BH10. This list starts at the main railway station.

Where “Main road” names for example (A23) are in brackets the tube sample is adjacent to an unclassified road, adjoining the AQMA-main road cited.

At the time of writing the bus-ULEZ (LEZ since 2015) follows the B2066 road for 1.8 km, which is mostly used by buses, taxis and service delivery.

Diffusion Tube IDs relate to changing order: W = West, C = Central and E = East. The second number is the year sampling started at the site. 2021 are new for this ASR, all other tubes are ‘existing’ or continued from 2020. Long-term tubes (and some that have discontinued due to compliance status) are included in the trend graphs.

Table A.3 – Annual Mean NO_2 Monitoring Results: Automatic Monitoring (µg/m^3)

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
BH6	532082	105694	Roadside	96.6	96.6	**51.1**	37.8	26.9	18.9	18.3
BH10	530995	104271	Roadside	99.3	99.3	**50.3**	**49.5**	**45.7**	32.6	29.3
BH0	530526	106218	Urban Background	98.6	98.6	16.9	16.3	15.2	10.9	12.3

☒ **Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG16**

☒ **Reported concentrations are those at the location of the monitoring site (annualised, as required), i.e. prior to any fall-off with distance correction**

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**.

All means have been "annualised" as per LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

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

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) 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%).

Table A.4 – 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	AQMA	Valid Data Capture 2021 (%) [2]	2017	2018	2019	2020	2021
C01-2020	531361	104040	Roadside	Outside AQMA	90.9				25.1	26
C05-2012	531230	104260	Urban Background	Outside AQMA	100	23.6	22.0	21.0	16.9	16.3
C09-2005	531302	104392	Roadside	AQMA1 A23	100	**47.4**	**47.2**	**41.1**	27.5	28.1
C15-2005	531401	104669	Roadside	AQMA1 A23	100.0	35.2	37.1	38.0	29.4	27.6
C16-2005	531400	104844	Roadside	AQMA1 A23	90.9	**44.6**	38.9	37.7	26.6	28.5
C17-2012	531364	104982	Roadside	AQMA1 (A23)	90.9	**44.5**	**53.9**	**49.0**	37.5	35
C18-2019	531369	105042	Kerbside	AQMA1 A23	63.6			**61.8**	**44.8**	**39.1**
C18-2010	531373	105136	Roadside	AQMA1 A23	100.0	**58.1**	**54.7**	**52.6**	39.7	**36.6**
C19-2009	531472	105161	Roadside	AQMA1 A23	100.0	**44.9**	39.2	36.5	29.0	31.2
C20-2005	531496	105315	Roadside	AQMA1 A23	90.9	**40.5**	**40.7**	36.8	31.0	29.9
C21-2005	531451	105356	Roadside	AQMA1 A23	100.0	**49.7**	**45.8**	**44.6**	36.5	**36.3**
C23-2005	531189	105375	Roadside	AQMA1 A23	90.9	**47.0**	**43.1**	39.5	30.6	28.3
E01-2016	531101	105498	Roadside	AQMA1 A23	100.0	39.9	**41.9**	34.3	30.2	28.9
E06-2020	531107	105595	Roadside	AQMA1 A23	90.9				27.5	27
E16-1996	531465	104629	Roadside	AQMA1 A23	90.9	39.4	**41.4**	**42.3**	37.4	35.3
E16-2015	531426	104514	Roadside	AQMA1 A23	90.9	**51.1**	**44.8**	**42.3**	**41.4**	**38.3**
E17-2003	531394	104338	Roadside	AQMA1 A23	100.0	**44.2**	**46.8**	**43.8**	34.0	33.2
E17-2018	531408	104233	Roadside	AQMA1 (A23)	90.9		**40.4**		36.2	33.8
C04-2010	531228	104088	Roadside	AQMA1 ULEZ	90.9	**43.8**	**48.2**	**43.5**	33.6	30.6
C10-2012	530995	104271	Roadside	AQMA1 ULEZ	100.0	**45.2**	**45.5**	**41.3**	32.3	29.9
C11-2007	530947	104284	Roadside	AQMA1 ULEZ	100.0	**57.3**	**54.6**	**48.5**	35.0	**35.8**
C11-2012	530890	104302	Kerbside	AQMA1 ULEZ	90.9		**90.8**	**77.4**	**51.2**	**47.6**
C13-2014	530770	104363	Roadside	AQMA1 ULEZ	72.7	**41.6**	**40.5**	36.6	31.2	29.1
W10-2006	530302	104415	Roadside	AQMA1 ULEZ	90.9	**40.9**	**41.4**	38.0	28.0	24.5
W11-2020	530154	104444	Roadside	AQMA1 ULEZ	100.0				26.7	26.6
C12-2010	530900	104451	Roadside	AQMA1 A2010	90.9	**43.1**	**45.3**		30.4	29.1
W01-2005	530969	104785	Roadside	AQMA1 A2010	100.0	**43.1**	**41.1**	34.0	25.8	28.3
W03-2006	530963	104994	Roadside	AQMA1 A2010	90.9	**42.6**	**40.4**	37.5	31.4	31.7
C28-2010	531032	104843	Roadside	AQMA1 (A2010)	100	**46.0**	**42.9**	37.7	33.5	33.1
C24-2005	531101	105443	Roadside	AQMA1 A270	63.6	**54.8**	**51.1**	**44.0**	38.3	**37.5**
C25-2010	530985	105419	Roadside	AQMA1 A270	90.9	**47.8**	**44.3**	**42.7**	38.6	**37.5**
W04-2006	530808	105340	Roadside	AQMA1 (A270)	90.9	**41.0**	39.9	39.0	31.8	28.6
W05-2006	530778	105362	Roadside	AQMA1 A270	100	**44.9**	**44.5**	38.1	34	34
E07-2019	531838	105349	Roadside	AQMA1 A270	81.8			**58.0**	**46.5**	**45.8**
E08-1996	532090	105752	Roadside	AQMA1 A270	100	**55.7**	**52.6**	**48.7**	**42.5**	**41.1**
E10-2015	532126	105838	Roadside	AQMA1 A270	100	**43.0**	**40.8**	38.0	33.5	31.3
E12-2002	532021	105946	Roadside	AQMA1 (A270)	100	**46.2**	**45.3**	**41.1**	37.6	28.6
E14-2019	532377	106314	Roadside	AQMA1 A270	100	37.2	39.3	35.0	31.7	28.6
E15-2012	532300	106159	Roadside	AQMA1 A270	81.8	38.6	**40.7**	37.4	34.0	29.2
E22-2009	536970	102280	Roadside	AQMA2 B2123	100	**41.4**	36.2	32.7	28.4	26.6
E23-2010	536966	102273	Kerbside	AQMA2 B2123	100	35.3	37.2	35.2	31.7	27.8
E25-2018	537014	102238	Roadside	AQMA2 A259	90.9		35.5	31.7	27.2	27.5
E30-2020	536947	102341	Roadside	AQMA2 B2123	100				26.0	25.8
E31-2020	536932	102454	Roadside	AQMA2 (B2123)	100				16.5	15.0
E32-2020	537011	102099	Background	Outside AQMA	72.7				13.5	12.2
W14-2021	526761	105809	Roadside	Outside AQMA	90.9					16.1
W16-2020	526233	104860	Roadside	AQMA3 A259	100				35.9	30.6
W17-2009	525931	104961	Roadside	AQMA3 A259	81.8	**44.4**	**42.0**	39.2	38.1	34.2
W18-2010	525970	105230	Urban Background	Outside AQMA	90.9	22.3	20.2	18.4	17.0	15.0
W19-2009	525658	105695	Roadside	AQMA3 A293	81.8	38.1	**41.7**	39.9	34.4	31.7
W21-2010	528388	105936	Roadside	AQMA4 A2023	100	39.4	36.6	34.6		28.3

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	AQMA	Valid Data Capture 2021 (%) [2]	2017	2018	2019	2020	2021
E02-2009	530233	106515	Roadside	AQMA5 A23	90.9	**40.3**	**41.1**	34.7	31.4	28.3
E02-2012	530063	106368	Roadside	AQMA5	90.9	**44.4**	**42.0**	39.2	35.7	34.4
E18-2021	532759	103810	Roadside	AQMA6	90.9	**42.2**	35	28.8		23.6

☒ **Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG16**

☒ **Diffusion tube data has been bias adjusted**

☒ **Reported concentrations are those at the location of the monitoring site (bias adjusted and annualised, as required), i.e. prior to any fall-off with distance correction**

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**.

Means for diffusion tubes have been corrected for bias. All means have been “annualised” as per LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

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

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) 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 A.1 – Trends in Annual Mean NO_2 Concentrations

A series of graphs showing long term trends in nitrogen dioxide at roadside compared with background (not near a road) declining since 2010/11. The summary below indicates how the rate of improvement differs between areas. Percentage improvements ranked over ten and five years:

Table A.5 – B + C Improvement in AQMA and Background NO_2 over Ten and Five years

Area	Ten Year NO2 Improvement %
AQMA1 ULEZ kerbside pavement B2066	60
AQMA1 ULEZ at the façade B2066	55
AQMA1 Valley Gardens II + III Westside A23	50
AQMA6 Eastern Road opposite Hospital Campus C-Link	50
AQMA1 Queens Road A2010	49
AQMA1 Cheapside - London Road A23	46
AQMA1 Southbound through Preston Circus A23	43
AQAM1 Lewes Road North of Vogue Gyratory A270	43
AQMA2 Rottingdean High Street B2123	42
AQMA1 Terminus Road A2010	41
AQMA1 New England Road Area A270	41
AQMA4 Sackville Road A2023	40
AQAM1 Hollingdean Road C-Link	39
AQMA3 Trafalgar Road A293	38
AQAM1 Lewes Road South of Vogue Gyratory A270	37
AQMA1 Frederick Place North Laine B2199	34
Background Sites	34
AQMA1 Valley Gardens II + III Eastside A23	32
AQMA3 Welllington Road A259	29
AQMA5 South Street- The Drove west of the railway C-Link	27

Area	Five Year NO2 Improvement %
AQMA1 ULEZ kerbside pavement B2066	51
AQMA6 Eastern Road opposite Hospital Campus C-Link	44
AQAM1 Hollingdean Road C-Link	38
AQMA1 ULEZ at the façade B2066	35
AQMA1 Cheapside - London Road A23	33
AQMA1 Queens Road A2010	33
AQMA1 Valley Gardens II + III Westside A23	33
Background Sites	31
AQMA2 Rottingdean High Street B2123	29
AQMA1 New England Road Area A270	28
AQMA1 Frederick Place North Laine B2199	28
AQMA4 Sackville Road A2023	28
AQAM1 Lewes Road South of Vogue Gyratory A270	26
AQAM1 Lewes Road North of Vogue Gyratory A270	24
AQMA3 Welllington Road A259	23
AQMA5 South Street- The Drove west of the railway C-Link	23
AQMA1 A23 Southbound through Preston Circus A23	22
AQMA1 Terminus Road A2010	21
AQMA1 Valley Gardens II + III Eastside A23	21
AQMA3 Trafalgar Road A293	20

Figure A.2AQMA1 A23 Valley Gardens II and III

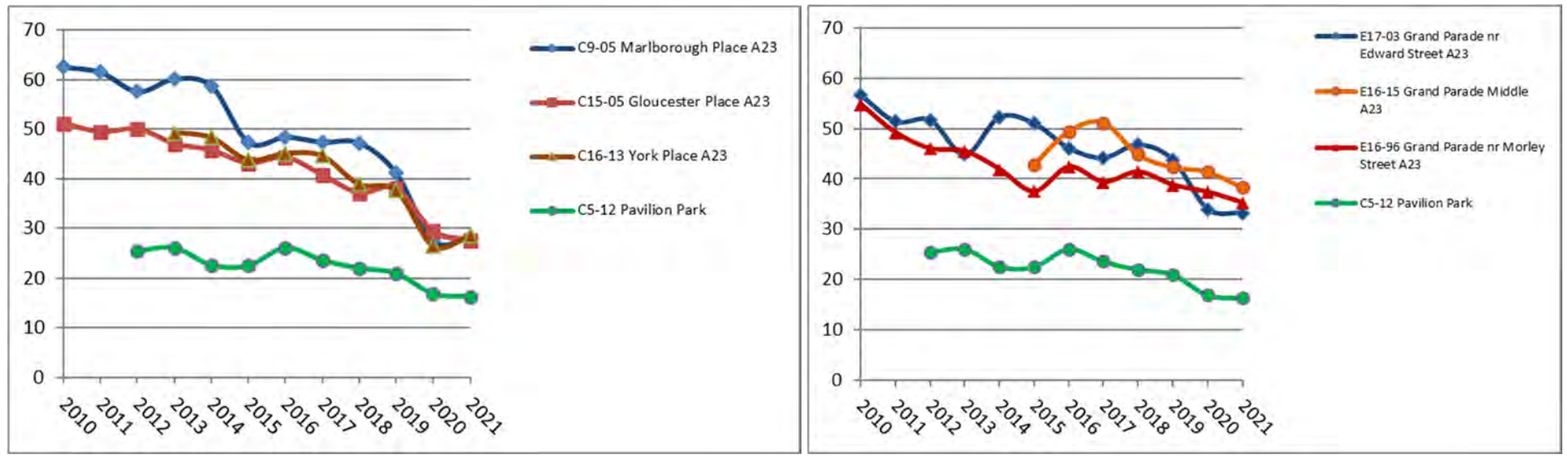


Figure A.3AQMA1 A23 Preston Circus Area

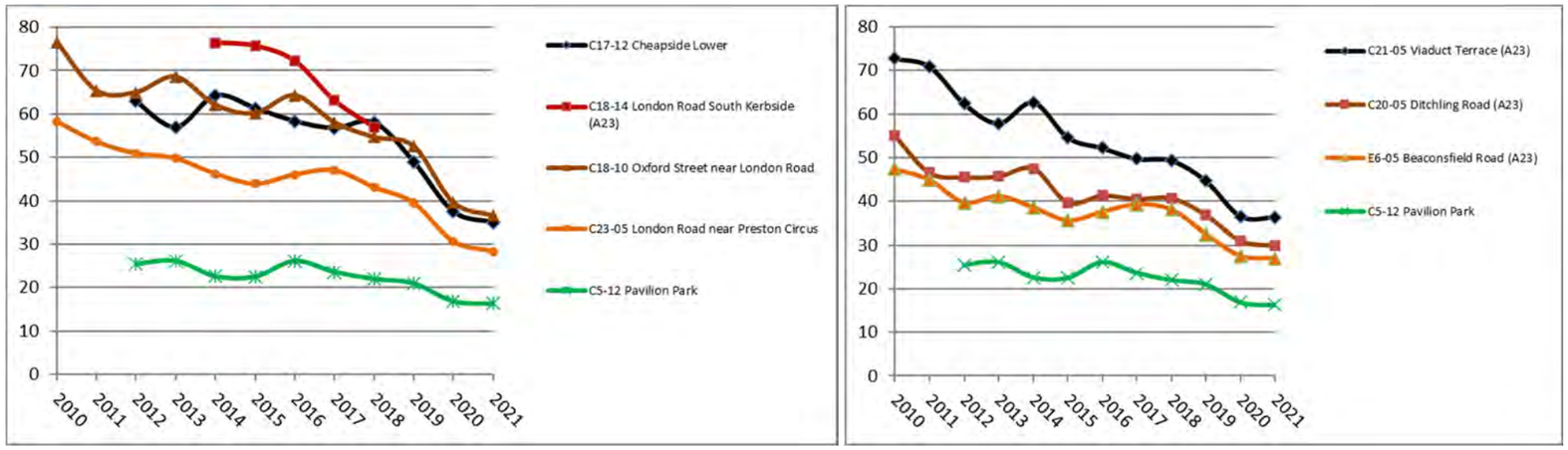


Figure A.4AQMA1 ULEZ Kerbside (above pedestrian pavement)

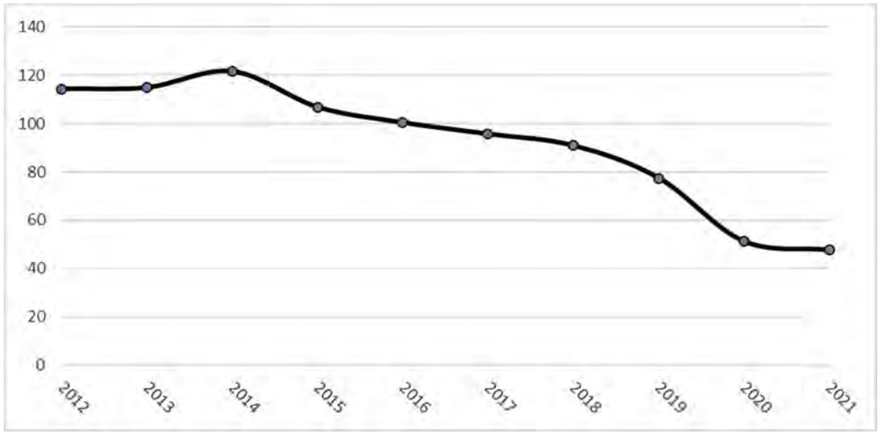


Figure A.5AQMA1 ULEZ Façade (roadside building-line compared with central background)

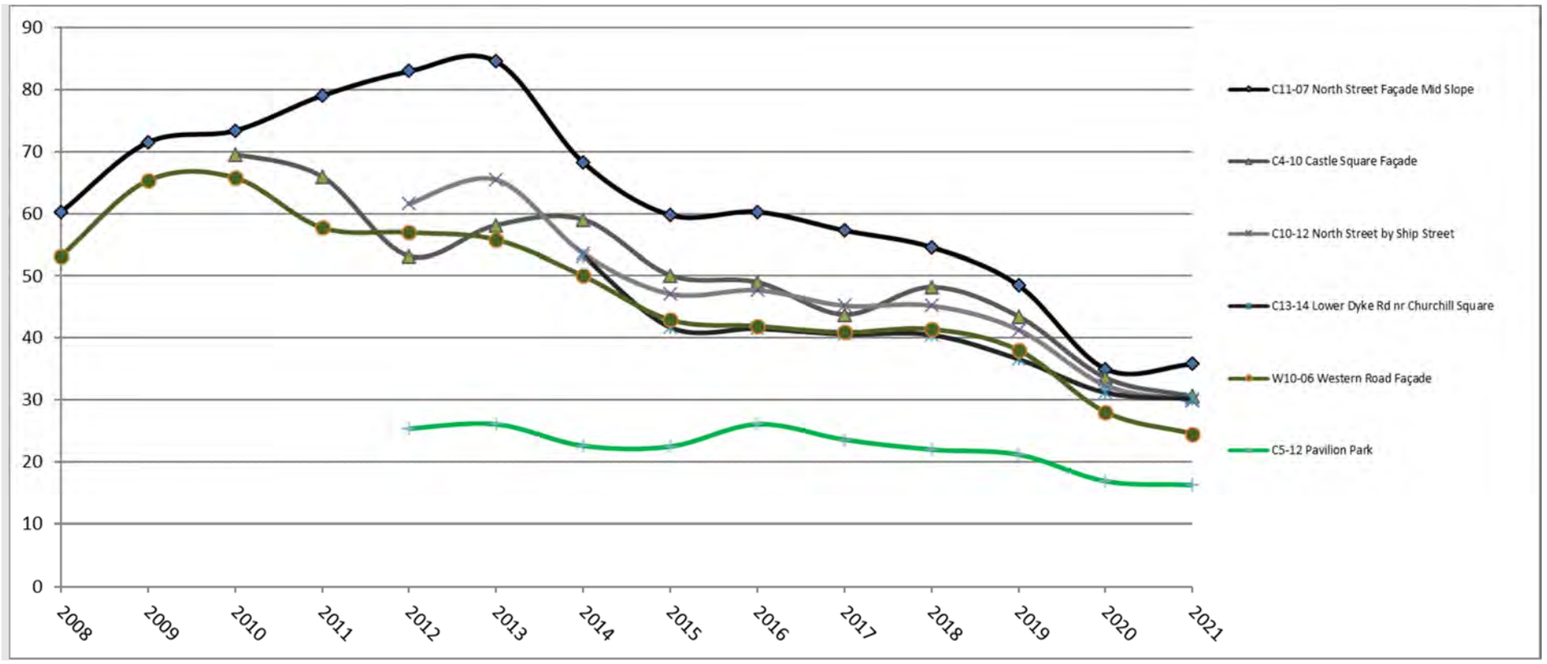
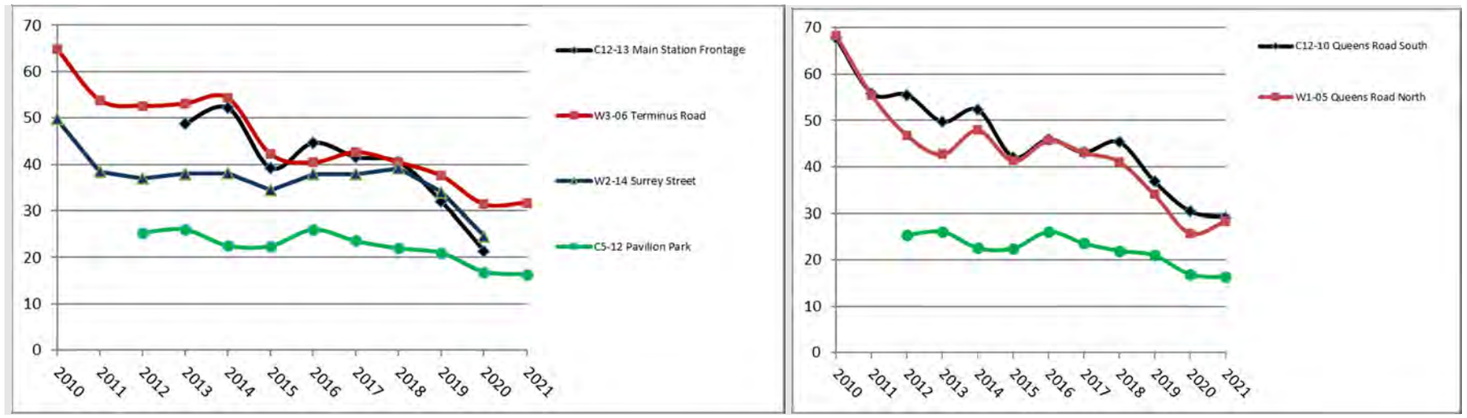


Figure A.6AQMA1 A2010 Brighton Railway Station Approaches



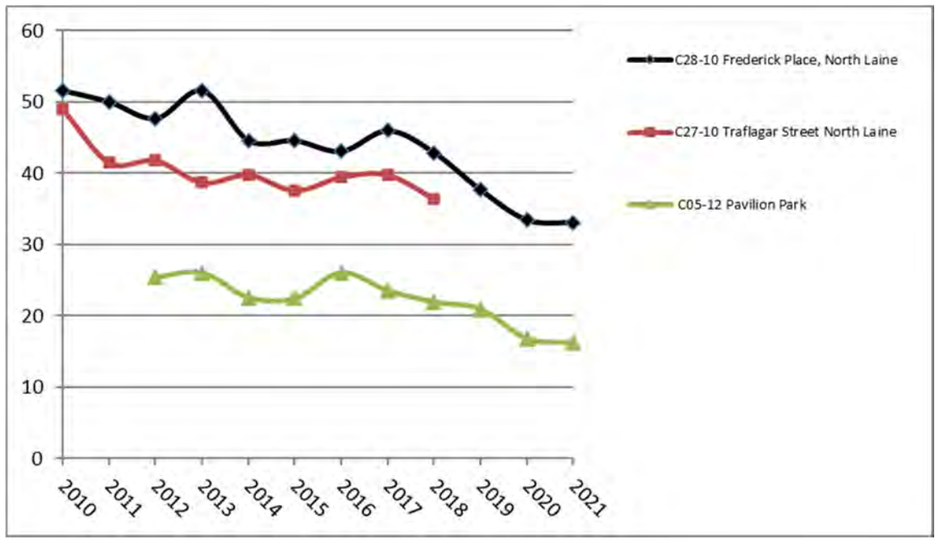
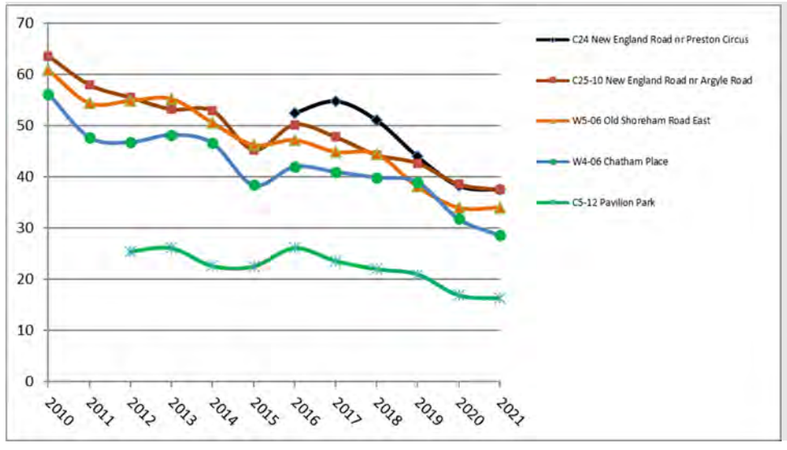
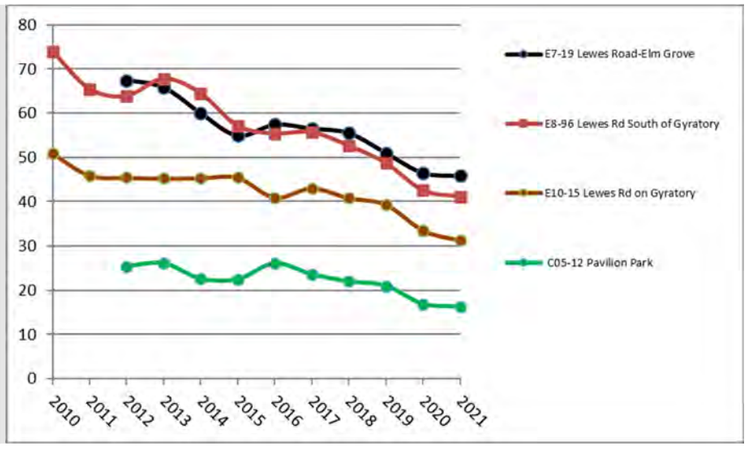


Figure A.7AQMA1 A270





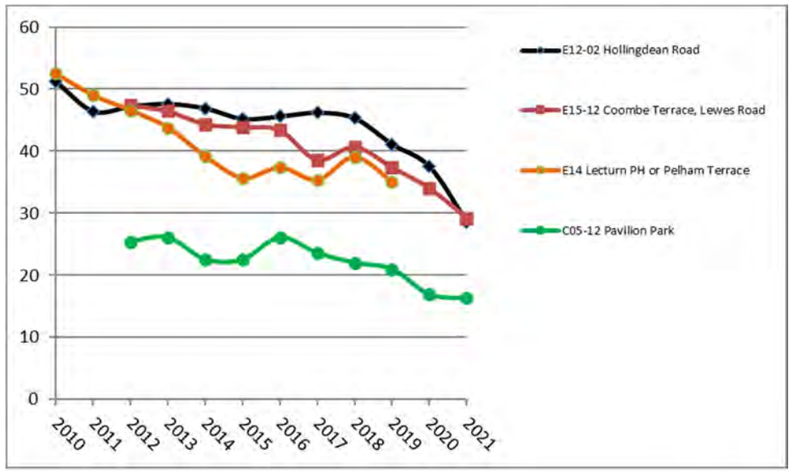


Figure A.8AQMA2 Rottingdean Roadside (2021 Local Background monitored at 12 µg/m^3)

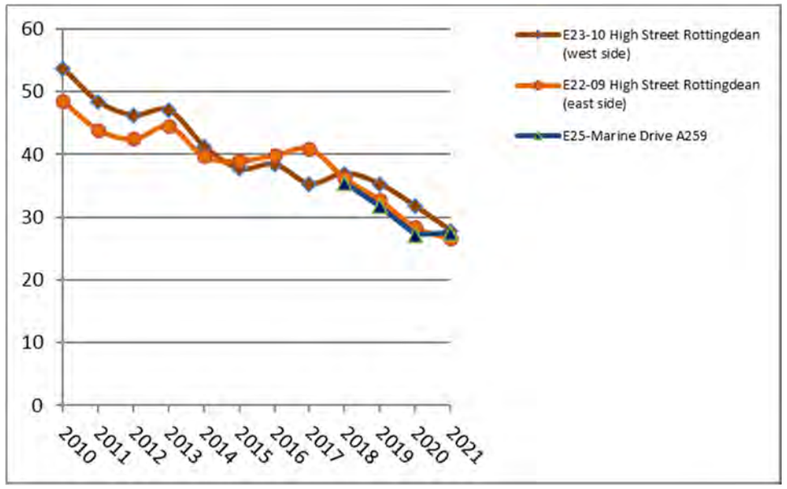
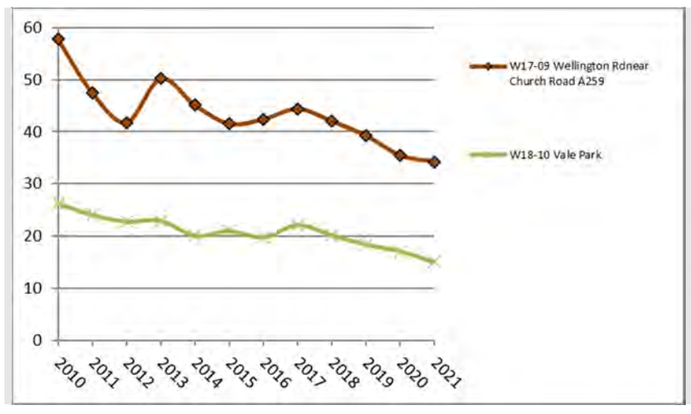


Figure A.9AQMA3 South Portslade



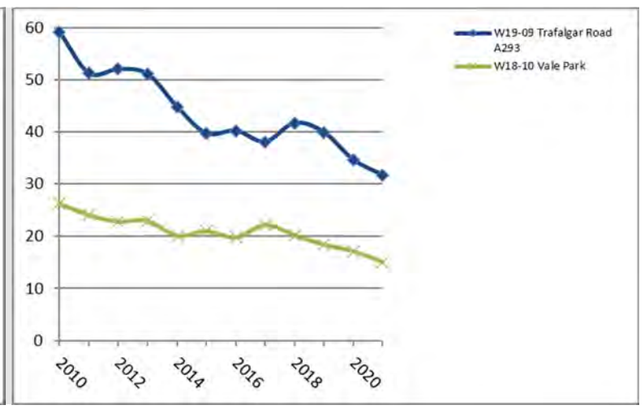


Figure A.10AQMA4 and Hove

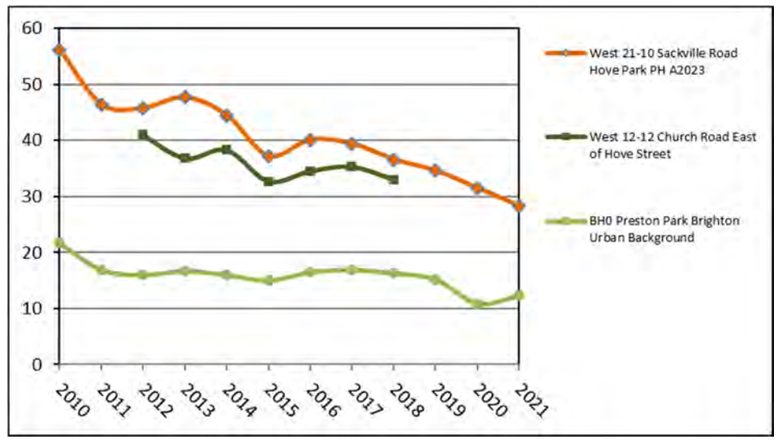


Figure A.11AQMA5 Preston Road South Street-The Drove (west of the railway)

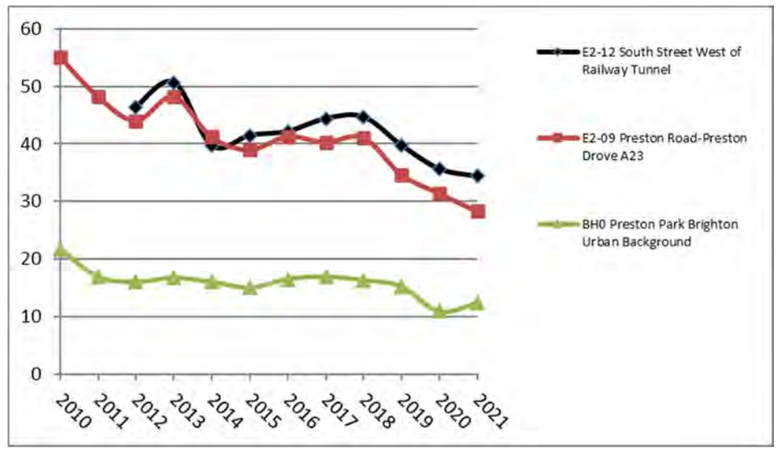


Figure A.12AQMA6 south of the Royal County Hospital

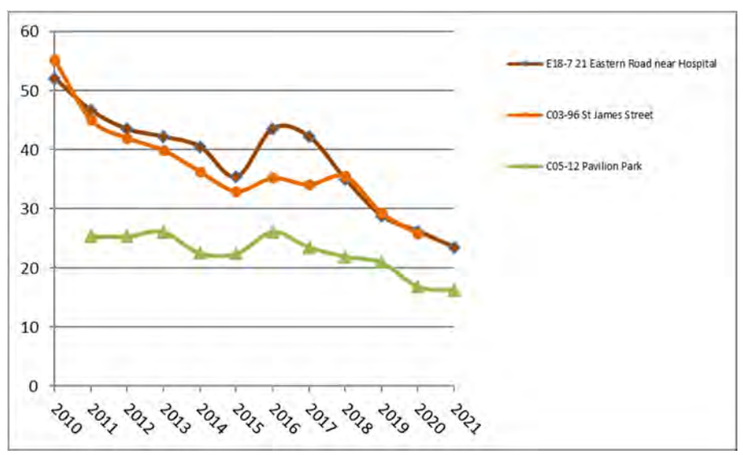


Table A.6 – 1-Hour Mean NO_2 Monitoring Results, Number of 1-Hour Means > 200µg/m^3

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
BH6	532082	105694	Roadside	96.6	96.6	**69**	16	0	0	0
BH10	530995	104271	Roadside	99.3	99.3	0	3	0	0	0

Notes:

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

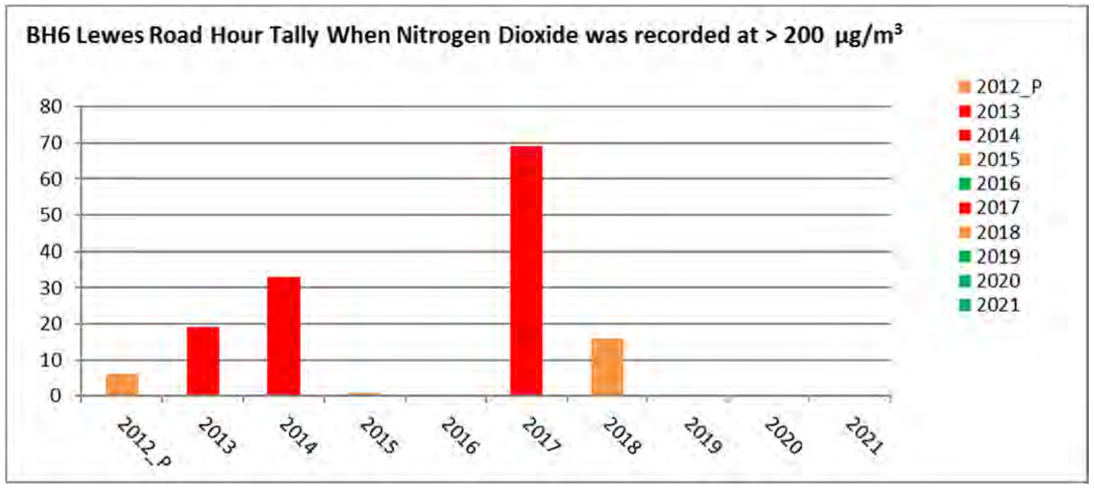
Exceedances of the NO_2 1-hour mean objective (200µg/m^3 not to be exceeded more than 18 times/year) are shown in **bold**.

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

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) 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 A.13 – Trends in Number of NO_2 1-Hour Means > 200µg/m³



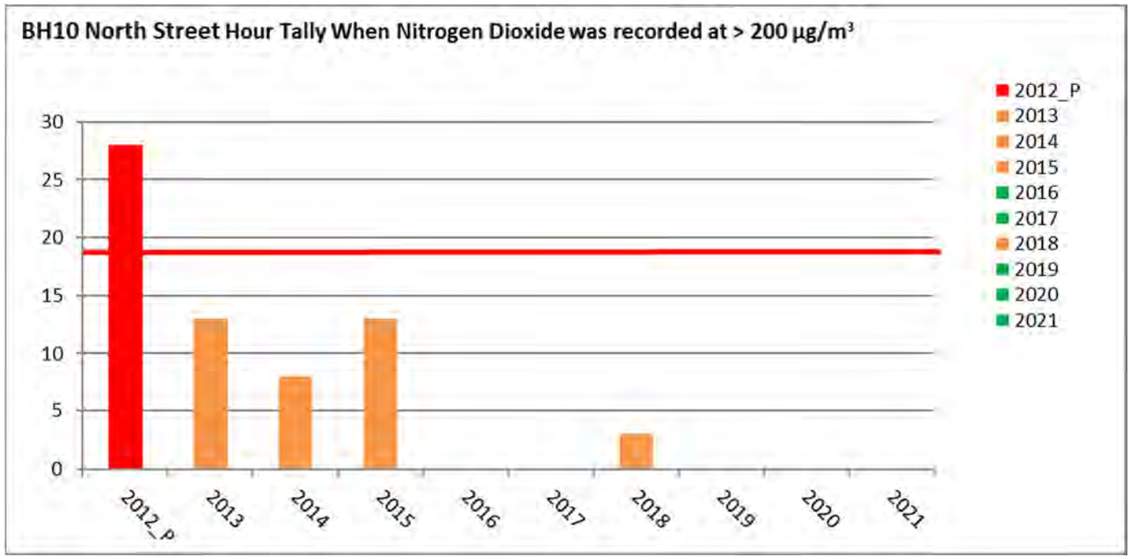


Table A.7 – Annual Mean $PM_{2.5}$ Monitoring Results (µg/m^3)

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
BH6 TEOM	532082	105694	Roadside	96.5	96.5	6.4	5.8	5.7	5.5	5.7
BH10 TEOM	530995	104271	Roadside	89.2	89.2	10.6	10.3	9.8	8.4	10.2
BH0 AURN Partisol	530526	106218	Urban Background	100	Ceased 29th May 2019	8.9	8.9	9.2	Method change	
BH0 AURN BAM from 2020	530526	106218	Urban Background	63.6	63.6			Started 2020	9.6	9.9

☒ **Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG16**

Notes:

The annual mean concentrations are presented as µg/m^3.

All means have been “annualised” as per LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) 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 A.14 – Trends in Annual Mean $PM_{2.5}$ Concentrations

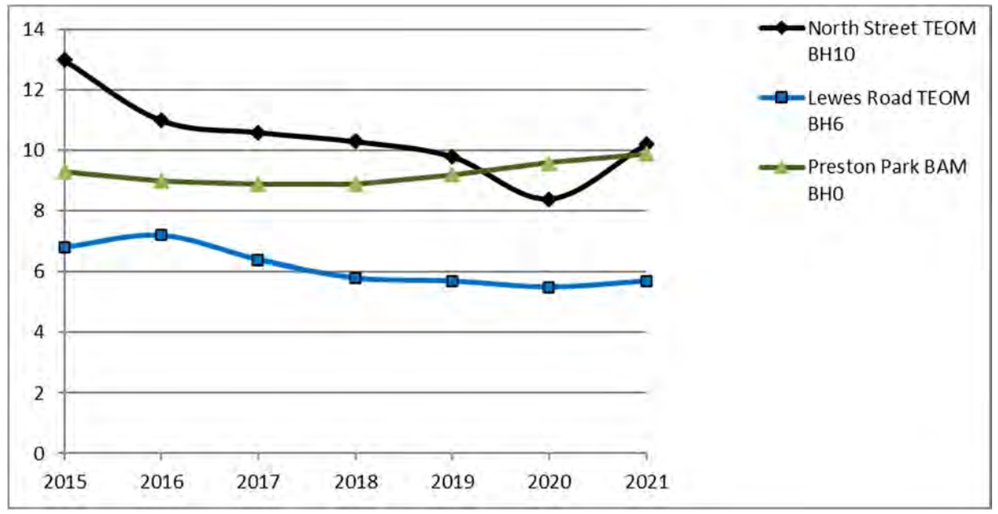
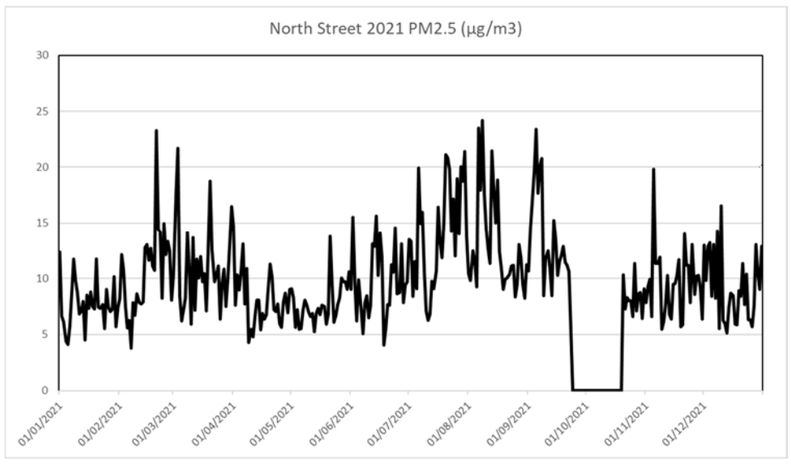
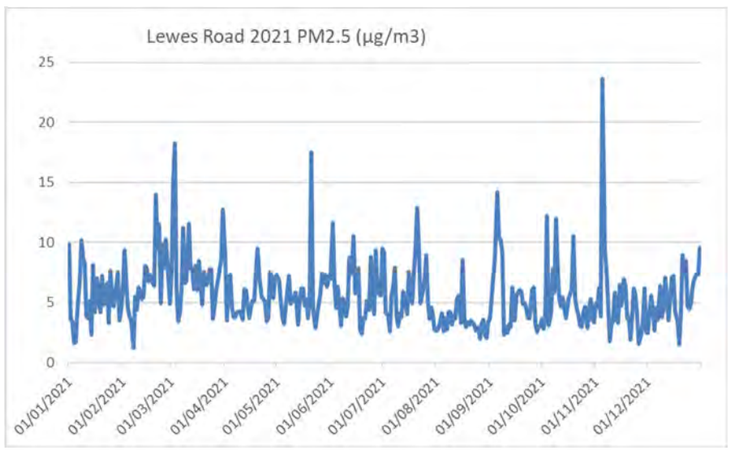


Figure A.15 –$PM_{2.5}$ Daily (24-hour) 2021





Notes: 0 µg/m^3 = zero data capture. Highest days for particulates in the North Street area were March, late July to early September. Lewes Road: Spring and 5th November.

Appendix B: Full monthly diffusion tube results for 2021

Table B.1 – NO_2 2021 Diffusion Tube Results (µg/m^3)

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted (0.84)	Comment
C01-2020	531361	104040	31.7		40.8		25.5	29.3	29.4	24.6	31.3	31.3	36.3	29.7	31.0	26.0	Prior to Valley Gardens III Project
C04-2010	531228	104088	33.2	32.8	32.2		32.5	41.7		33	38.9	43.7	40.8	35.5	36.4	30.6	Less NO_2 in ULEZ than before
C05-2012	531230	104260	20.7	20	20.1		17.2	18.2	13.4	17.9	18	21	25.1	21.3	19.4	16.3	City Centre public garden
C10-2012	530995	104271	33.1	31.4	33.2		33	39.8	32.3	39.2	39.4	37.8	40.6	31.4	35.6	29.9	Triplicate Co-location with BH6
C11-2007	530947	104284	41.1	38.9	39.4		40.6	49.1	38.8	43.1	45.6	47.3	46	38.9	42.6	**35.8**	ULEZ location where people live or work
C11-2012	530890	104302	50.3	49.2	49.4		48.1	58.9	54.9	61.5	62.5	67.9	64.5		56.7	47.6	ULEZ location where people pass by
C12-2010	530900	104451	31.1	36.7	33.3		31.9	41.9		29.9	34.6	38	36.3	32.6	34.6	29.1	Approach to Railway Station
W01-2005	530969	104785	32.8	29.5	30.9		29.3	39.8			33.2	35.9	39.2	33	33.7	28.3	Approach to Railway Station
C13-2014	530770	104363	36.7	32.3	33.6			41.3	34.1	32.7	35.4	38.1			35.5	30.2	Bus Layby
C09-2005	531302	104392	32.3	29.3	30.5		29.7	33.4	29.8	33.1	38.2	42.7	43.6	25.4	33.5	28.1	General traffic taken away 2019
C15-2005	531401	104669	31.1	30.6	29.7		30.9	33.6	20.9	29.6	35.8	41.5	43.9	33.9	32.9	27.6	General traffic taken away 2019
C16-2005	531400	104844	33.1	31.9	31		29.9		27.7	30.9	35.8	40.7	43.3	34.8	33.9	28.5	General traffic taken away 2019
C17-2012	531364	104982	47.4	41.3	38.8		38.8	42.5		46.3	43.4	41.2	39.7	37.6	41.7	35.0	Street canyon street adjoining A23
C18-2019	531369	105042	45.5	42.7	41.5		45.4	46.8	47.7		48	54.5	53	40.5	46.6	**39.1**	A23 in confined space
C18-2010	531373	105136	35.7	40.2	43		39.4					51.5	54.5	28.6	41.8	**36.6**	Bus route adjoining A23
C19-2021	531472	105161		35.1	33.9		31.1	38.5			39.6	42.3	46.6		38.2	31.2	Vehicles turn on corner
C20-2005	531496	105315	36.7	35.4	32.1		34.1	37.8	31.2	33.9	38.3	39.3	40.8	32.6	35.7	29.9	Incoming traffic towards the city centre
C21-2005	531451	105356	36	40.3	40.2		43.3	50.1	49	35.8	46.3	50.1	42.2	41.5	43.2	**36.3**	General traffic towards the city centre
C23-2005	531189	105375	35.6	33.7	32		31.9	32.3	32.2	27.1	35	41.1		35.6	33.7	28.3	A23 Approach to Preston Circus
C24-2015	531101	105443	39.4				40	49.9	38.1	39.7	46.8		52.8		43.8	**37.5**	Prone to congestion and vehicle launch
C25-2010	530985	105419	40.9	40.9	43.4		37.8	44.5	43.7	41.3		53	55	45.7	44.6	**37.5**	Prone to congestion and vehicle launch

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted (0.84)	Comment
C28-2010	531032	104843	39.2	37.9	37.4		34	41	36.8	42.1	40.4	44.1	45.8	35.2	39.4	33.1	Delivery route for North Laine
E01-2016	531101	105498	35.1	36.1	30		32.6	36.7	27.8	34.5	36.3	35.6	41.7	31.5	34.4	28.9	North of Preston Circus
E02-2009	530233	106515	32.3	33	29.8		29.2	32.6	34.5	29.7	37.5	36.8	42		33.7	28.3	A23
E02-2012	530063	106368	43.4	44.3	37.9		37.5	38.5	43.4	35.3	44.7	43.1	41.7	41.3	41.0	34.4	Hill climb around a corner
E06-2020	531107	105595	32.4	30.8			29.5	31.8	30.1	25.1	34.1	35.6	40.1	31.9	32.1	27.0	Traffic flowing towards city centre
E07-2019	531838	105349	47.4	47	45		48.2	49.8		53.4		70.7	76.9	52	54.5	**45.8**	Vehicle launch parallel with facade
E08-1996	532090	105752	46.7	44.3	44.6		38.1	49.2	44.1	49.1	52.6	67	59	43.3	48.9	**41.1**	Vehicles waiting to access gyratory
E10-2015	532126	105838	38.1	37	31.9		31.6	42.4	34.4	34.8	41.8	42.2	42.8	32.5	37.2	31.3	Dwellings on gyratory
E12-2002	532021	105946	38.2	42.6	32.2		31.5	35.2	31.5	25.6	33.9	34.3	36		34.1	28.6	Demolition widen the street
E14-2019	532377	106314	26.3	46.1	33.4		30.4	38.3	34.1	27.6	37.5	37.3	33.5	30.3	34.1	28.6	Terrace on one side of dual carriageway
E15-2012	532300	106159	35.7	35.1	32.2		30.6	41.4	33.7	31.1	38.1	39	34.1	31.4	34.8	29.2	Terrace on one side of dual carriageway
E16-1996	531465	104629	39.5	30.8			40.7	49.8	46.1	39.9	48.6	44.4	41.3	39.7	42.1	35.3	Northbound general traffic added 2019
E16-2015	531426	104514		41.7	38.3		45.3	50.1	47.1	44	52.2	49.5	45.2	42.1	45.6	**38.3**	Northbound general traffic added 2019
E17-2003	531394	104338	31.5	36	36.1		41.2	46.3	43.6	36.8	41.3	42.8	41.7	37.3	39.5	33.2	Northbound general traffic added 2019
E17-2018	531408	104233	37	40.5	35.6		40.3	43.7	42.9	33.9	40.3	39	48.9		40.2	33.8	Traffic queuing wating to access A23
E18-2021	532759	103810		31.1	24.1		25.1	30.6	24.8	22.4	26.9	29.2	39.7	27.2	28.1	23.6	AQMA6 opposite Main Hospital
E22-2009	536970	102280	31.4	32.7	30.6		30.6	33	29.6	30.9	32.2	29.7	37.4	30.7	31.7	26.6	AQMA2 traffic in historic village
E23-2010	536966	102273	35.2	31.3	34.3		34	34.4	37	30.1	29.5	33.3	35.7	28.8	33.1	27.8	AQMA2 traffic in historic village
E25-2018	537014	102238	28.4	33.8			30.4	35.4	28.9	34.9	32.8	31.3	41.8	29.4	32.7	27.5	AQMA2 Boundary A259
E30-2020	536947	102341	29.2	28	32.4		29.6	34.2	29.9	29.1	32.4	28.9	37.2	27.2	30.7	25.8	AQMA2 Middle High Street
E31-2020	536932	102454	20.3	19.8	16.8		17.2	19	17.6	11.5	17	16.8	20.7	19.5	17.8	15.0	AQMA2 Boundary Vicarage Lane
E32-2020	537011	102099		19.4	15.6		12.5	15.7			13.6	15.4	20	15.2	15.9	12.2	Rottingdean Background
W03-2006	530963	104994	38.2	30.1			37.8	36.9	38.3	32.4	37.9	42.2	44.9	38.9	37.8	31.7	Hill climb and queuing next to housing
W04-2006	530808	105340	36.1	19.7	30.9		33.2	34.6	32	33.8		42.1	50	27.5	34.0	28.6	Queuing Traffic near traffic lights

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted (0.84)	Comment
W05-2006	530778	105362	38.5	41	35.2		40.1	39.7	39.3	39.2	41.8	40.8	48.6	40.8	40.5	34.0	Hill climb and queuing next to housing
W10-2006	530302	104415	30.4	30.3	22.9		29	27.7	31.9	23.6	30.5	30.3	33.3	30.5	29.1	24.5	ULEZ west
W11-2020	530154	104444	29.9	31.4	30.1		31.2	32.3	31.5		32.7	32.5	34.6	30.3	31.7	26.6	ULEZ west
W14-2021	526761	105809		31.1	19.5		17.4	18.6	17.4	13.2	10.8	24	25.8	13.8	19.2	16.1	DfT temporary cycle Lane taken away
W16-2020	526233	104860	32.7	36.9	32.1		34.5	34.8	37.7	29.9	38.8	37	48.6	37.3	36.4	30.6	Main road along South Coast
W17-2009	525931	104961	36.8		36.2		40.5	38.4	37.6	41.6	42.1		52.4	40.3	40.7	34.2	Main road along South Coast
W18-2010	525970	105230	20.5	24.1	16.9		15.2	16.9	15.6	12	17.2		19.2	20.8	17.8	15.0	Portslade Background
W19-2009	525658	105695	37.8	36.8	32.2			35.4	35.8	32.6	37.3	44.1	49.7	36.1	37.8	31.7	HGV haulage route to and from Port
W21-2010	528388	105936			27.7		30.1	31.9	34	28.1	36.8	38.1	43.4	32.8	33.7	28.3	Queuing Traffic near traffic lights in AQMA4

☒ **All erroneous data has been removed from the NO_2 diffusion tube dataset presented in Table B.1.**

☒ **Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG16**

☐ **Local bias adjustment factor used**

☒ **National bias adjustment factor used**

☒ **Where applicable, data has been distance corrected for relevant exposure in the final column (not relevant so removed)**

☒ **Brighton & Hove City Council confirm that all 2021 diffusion tube data has been uploaded to the Diffusion Tube Data Entry System**

Notes:

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

NO_2 annual means exceeding 60µg/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: Supporting technical information / air quality monitoring Data QA/QC

New or changed sources identified within Brighton and Hove During 2021

Since Covid-19 a higher proportion of traffic movement are thought to be associated with servicing and delivery. Vehicle trips associated with tourism have recovered more quickly than those due to commuting or retail. Construction traffic servicing the hospital (AQMA6) and Preston Barrack development (A270 on Lewes Road) has diminished. During 2021, there is less roadworks around AQMA1 for example Lewes Road and Valley Gardens (A23). DfT temporary cycle Lanes along the sea front have been retained, whilst others like the one on Old Shoreham Road have been removed. It is possible that space allocation for active travel and an improved urban realm could cause road traffic congestion in another place. That said higher engine revs, fuel burn, CO_2, NOx and PM emissions happen where diesel (and to a lesser extent petrol) vehicles accelerate into available carriageway space. In 2021 a higher proportion (over 70%) of the local bus fleet meets the ULEZ euro-VI emission standard.

Additional air quality works undertaken by Brighton and Hove during 2021

During 2021 twenty-five additional double decker buses have been exhaust upgraded. Various Transport and Parking consultation have been carried out. A new Air Quality Action Plan has been prepared for public consultation.

QA/QC of diffusion tube monitoring

- Gradko International diffusion tubes have been consistently used for many years by Sussex Local Authorities using the 20% TEA in water method
- 2021 diffusion tube monitoring covered eleven periods from December 2020 to January 2022. During the second half of the year exposure periods alternated between four- and five-week exposure periods.

- During the first half of the year due to a shortage of staff, some of the exposure periods were longer than five weeks.
- 49/54 tubes had data capture >75%
- Annualisation has been carried out for 5/54 tubes were data capture was between 25 and 75%
- Accreditation of the diffusion tube monitoring method like previous years is as follows:

(A division of Gradko International Ltd.)
St. Martins House, 77 Wales Street Winchester, Hampshire SO23 0RH
tel.: 01962 860331 fax: 01962 841339 email:diffusion@gradko.com

AIR PT Nitrogen Dioxide Proficiency Scheme Results 2021

Methods: GLM 7 – CARY 60 Spectrophotometer

AIR PT Proficiency Scheme - Nitrogen Dioxide 2021					
			Procedure GLM 7		
Date	Round	Assigned value	Measured concentration	z-Score	% Bias
Feb-21	AIR PT 42-1	1.71	1.13	-4.17	-33.9%
Feb-21	AIR PT 42-2	1.74	0.81	-6.29	-53.4%
Feb-21	AIR PT 42-3	1.40	0.83	-5.43	-40.7%
Feb-21	AIR PT 42-4	1.37	1.16	-1.91	-15.3%
Mar-21	AIR PT 42-1 Rpt	1.71	1.79	0.62	4.7%
Mar-21	AIR PT 42-2 Rpt	1.74	1.75	0.08	0.6%
Mar-21	AIR PT 42-3 Rpt	1.40	1.40	0	0.0%
Mar-21	AIR PT 42-4 Rpt	1.37	1.41	0.39	2.9%
May-21	AIR PT 43-1	1.19	1.23	0.35	3.4%
May-21	AIR PT 43-2	1.19	1.22	0.26	2.5%
May-21	AIR PT 43-3	2.00	1.97	-0.2	-1.5%
May-21	AIR PT 43-4	1.94	1.98	0.26	2.1%
Aug-21	AIR PT 45-1	1.58	1.58	0	0.0%
Aug-21	AIR PT 45-2	1.57	1.56	-0.08	-0.6%
Aug-21	AIR PT 45-3	2.43	2.41	-0.08	-0.8%
Aug-21	AIR PT 45-4	2.42	2.37	-0.28	-2.1%
Oct-21	AIR PT 46-1	2.7	2.77	0.33	2.6%
Oct-21	AIR PT 46-2	2.71	2.6	-0.49	-4.1%
Oct-21	AIR PT 46-3	2.17	2.06	-0.65	-5.1%
Oct-21	AIR PT 46-4	2.13	2.15	0.13	0.9%

Results from AIR-PT 42 showed a significant negative bias. An investigation was carried out and a repeat set of samples ordered (Mar-21) to confirm results.

Results from the investigation showed for AIR PT samples, extraction of nitrite was not complete and required further time on the shaker to extract all nitrite from the tubes. Successful extraction was demonstrated on the repeat Air PT samples in March 2021.

The investigation also showed that for laboratory standards and customer samples, extraction of nitrite from tubes was complete without further shaking, and there was no risk associated with results

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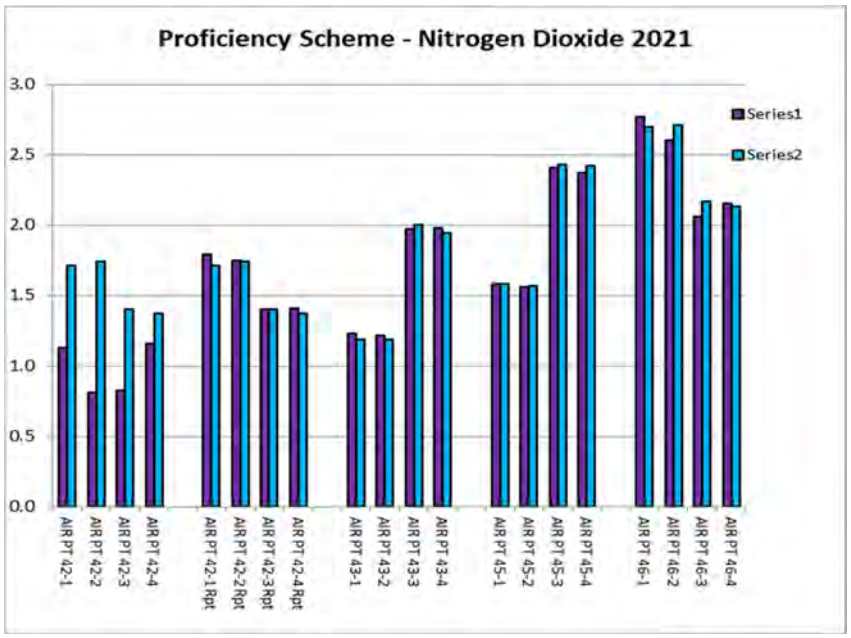


Diffusion Tube Annualisation

Annualisation is required for any monitoring site with data capture less than 75% but greater than 25%. For 2021 five diffusion tubes sites required annualisation these are detailed in Table C.2.

Diffusion Tube Bias Adjustment Factors

The diffusion tube data presented within the 2021 ASR have been corrected for bias using an adjustment factor. Bias represents the overall tendency of the diffusion tubes to under or over-read relative to the reference chemiluminescence analyser. LAQM.TG16 provides guidance with regard to the application of a bias adjustment factor to correct diffusion tube monitoring. Triplicate co-location studies can be used to determine a local bias factor based on the comparison of diffusion tube results with data taken from NO_x/NO_2 continuous analysers. Alternatively, the national database of diffusion tube co-location surveys provides bias factors for the relevant laboratory and preparation method.

For 2021 Brighton and Hove have applied a national bias adjustment factor of 0.84 to the monitoring data (version 3, 2022). A summary of bias adjustment factors used by Brighton and Hove over the past five years is presented in Table C.1. This bias is derived from national studies using the Gradko 20% TEA in water methodology found at National Bias Adjustment Factors | LAQM (defra.gov.uk).

For 2021 the local bias adjustment factor was not consistent with previous years, so the national option has been selected. For the beginning of the year diffusion tube exposure periods were more than the recommended five weeks. For choice justification, audit purposes the calculations are provided below:

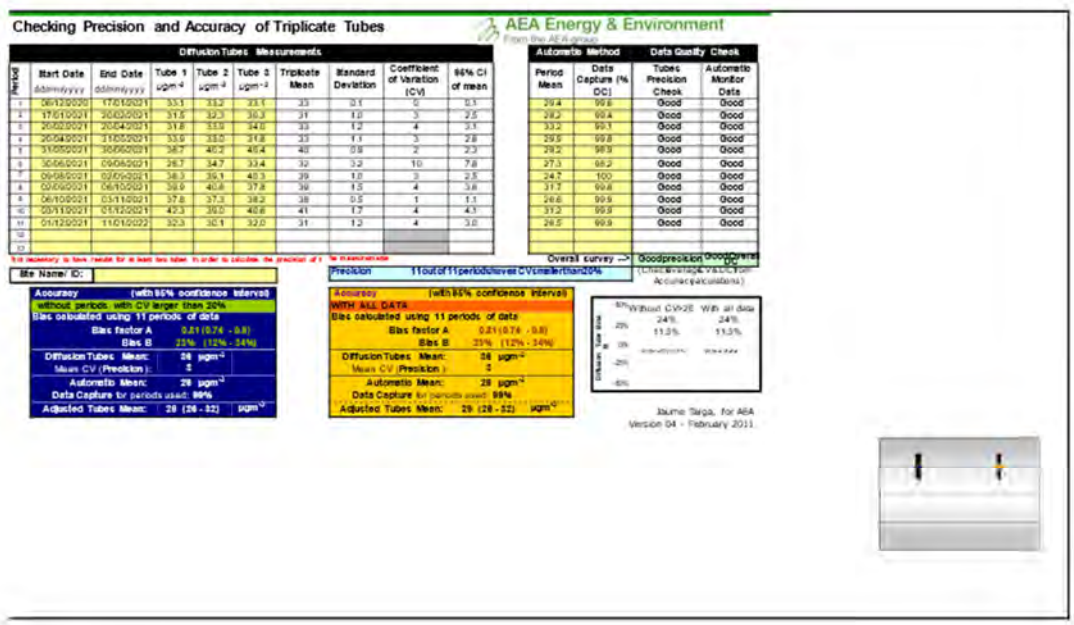


Table C.1 – Bias Adjustment Factor

Monitoring Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor
2021	National	03/21	**0.84**
2020	National	06/20	**0.92**
2019	National	06/19	**0.93**
2018	National	06/18	**0.93**
2017	National	06/17	**0.93**

QA/QC of automatic monitoring

Since 2012 the Transport Research Laboratory has carried Quality Assurance and Quality Control on behalf of Brighton & Hove Council for the monitoring stations BH6 and BH10 on Lewes Road and North Street.

Site operation

Routine instrument calibrations are conducted approximately once per fortnight, which involve zero and span checks, a written record of the gas analyser diagnostics and a general

visual inspection of all equipment is undertaken. There is a written operating procedure and a calibration record sheet is completed at every site visit.

Data retrieval and daily data checking

Data from the monitoring station is retrieved directly via a Siemens TC35i GSM modem at 8-hourly intervals. The data is then stored on Envista Arm software hosted at TRL. This was used to retrieve, check and archive data. TRL's internal QA/QC procedures require all data to be backed up on a secure server and all documentation associated with each site to be uniquely identified and securely stored to provide an audit trail. Daily data inspections are undertaken during office hours using the facilities of the Data Management System. Initial observations of the Management System indicate whether the site has been contacted during its nominated 'poll time' overnight. If this has not been successful a manual poll of the site may be required. If this is not successful further investigation of the communications integrity will be required to establish contact with the site modem and data logger. Three day plots of recorded data are viewed for the requested site, and these are inspected and assessed for continuity, validity, minimum and maximum values, date and time, power failures and general integrity. All anomalies are recorded on the Daily Check log, as required. Any anomalies or queries arising from daily inspection of data, or system operation, are brought to the attention of the Project Manager who will evaluate the situation, and initialise any necessary action. In the event that the PM is not available, contact will be made with the next available senior person within the monitoring team. Any issues identified with equipment operation will be referred to the client for attention within 24 hours (excluding weekends). On a weekly basis, data are examined using summary statistics and outlier analysis to establish data validity. If unusual data episodes are recorded, these would be routinely examined over longer data periods to establish their impact on trends but would also be cross referenced with data peaks and troughs recorded at other national monitoring stations. In addition, integrity and validity of data logger clock times are checked, and any significant errors recorded in the Data Management System logbook. All site data recorded through the Data Management System is archived on TRL's Network. The data is backed up daily, and the TRL IT Department maintains these data within their long-term and secure archives. This secures all data in the event of any system failure.

Data calibration and ratification

Data is ratified as per Automatic Urban Rural Network (AURN) recommended procedures. The calibration and ratification process for automatic gas analysers corrects the raw dataset

for any drift in the zero baseline and the upper range of the instrument. This is done using Evista-based calibration and ratification which incorporates the zero and span check information from the calibration visits. The zero-reading recorded during the calibration visits is used to adjust any offset of the baseline of the data. The difference between the span value obtained between one calibration visit and the next visit is used to calculate a factor. This change is assumed to occur at the same rate over the period between calibrations and as such the factor is used as a linear data scaler. This effectively results in the start of the period having no factor applied and the end of the period being scaled with the full factor with a sliding scale of the factor in-between. After applying the calibration factors, it is essential to screen the data, by visual examination, to see if they contain any unusual measurements or outliers. Errors in the data may occur because of equipment failure, human error, power failures, interference, or other disturbances. Data validation and ratification is an important step in the monitoring process. Ratification involves considerable knowledge of pollutant behaviour and dispersion, instrumentation characteristics, field experience and judgement. On completion of this data correction procedure, the data is converted to hourly means and provided to Brighton & Hove City Council at quarterly intervals and a calendar year annual report is prepared.

PM_{10} and $PM_{2.5}$ Monitoring Adjustment

The $PM_{2.5}$ monitoring published includes Volatile Correction Model (VCM) in accordance with LAQM.TG16 Chapter 7: Particulate Matter Monitoring.

Automatic Monitoring Annualisation

As data capture for $PM_{2.5}$ monitoring at Preston Circus AURN site in 2021 was 63.6%, annualisation has been carried out.

NO_2 Fall-off with Distance from the Road

Brighton & Hove has ensured that air monitoring locations are representative of breathing exposure on a building-line façade, dwelling place or pedestrianised area. Kerbside monitors in AQMA1 (declared for the hourly mean) assess transient exposure to pollutants above busy footways. Some of Brighton & Hove's monitors at background locations (easily complaint with standards) do not require an NO_2 fall-off with distance calculation.

In practice the NO_2 fall-off with distance calculator is based on open field examples and is less suited to confined spaces or street canyons, that are the typical scenario for many of

England’s AQMAs including those amended in Brighton & Hove 2020. Ventilation might be better at kerbside than the leeside of buildings. It is not recommended that developers use the distance drop-off tool to justify planning situations for example continued enclosure of road traffic emissions.

Table C.2 – Annualisation Summary (concentrations presented in µg/m^3)

Site ID	Annualisation Factor North Steet ULEZ	Annualisation Factor Lewes Road near Background	Annualisation Factor Presston Park Background	Average Annualisation Factor	Raw Data Annual Mean	Annualised Annual Mean (before bias)	Comments
C13_2014	1.0133	0.9655	1.0598	1.0132	35.5	36	ULEZ site, Average used
C18_2010	1.0407	1.0002	0.9546	0.9985	41.8	43.5	Central North Street used
C19_2021	0.9734	0.9536	0.9907	0.9726	38.2	37.1	Average representative
C24_2015	0.9825	0.9997	1.0725	1.0182	43.8	44.6	Average representative
E32-2020	0.9609	0.9253	0.9139	0.9334	15.9	14.6	Background representative
Site ID	Annualisation Factor EB3 Eastbourne	Annualisation Factor BH6					
BH0 $PM_{2.5}$	0.8392	0.8611		Eastbourne representative	11.75	9.9	A lack of Sussex regional $PM_{2.5}$ monitors with >85% data capture. To be addressed by DEFRA air quality grant for that purpose.

A local bias correction was not used in 2021. For comparison with the combined national Gradko bias, local calculations are included above. Table C3 is not required.

Appendix D: Map(s) of Monitoring Locations and AQMAs

Figure D.1 1 –Map of Automatic Monitoring Sites

Figure D.2 2 – Map of Brighton & Hove AQMAs

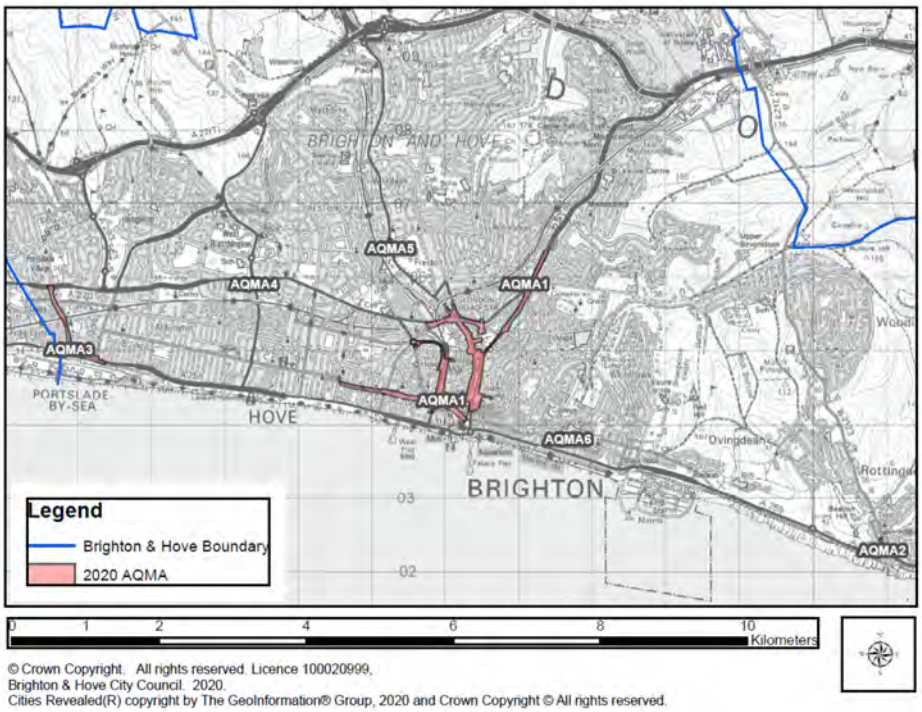


Figure D.2 3 - Map of AQMA 1

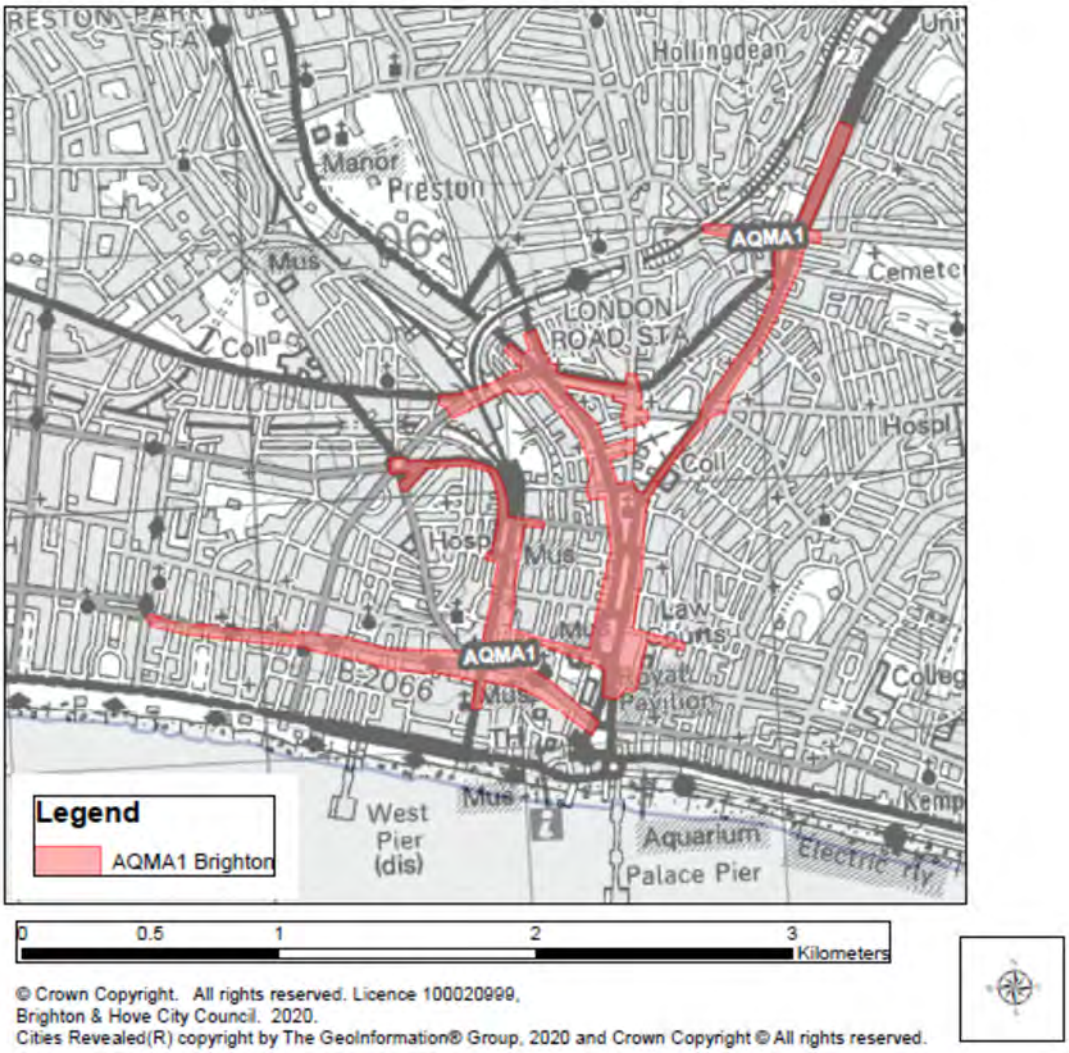
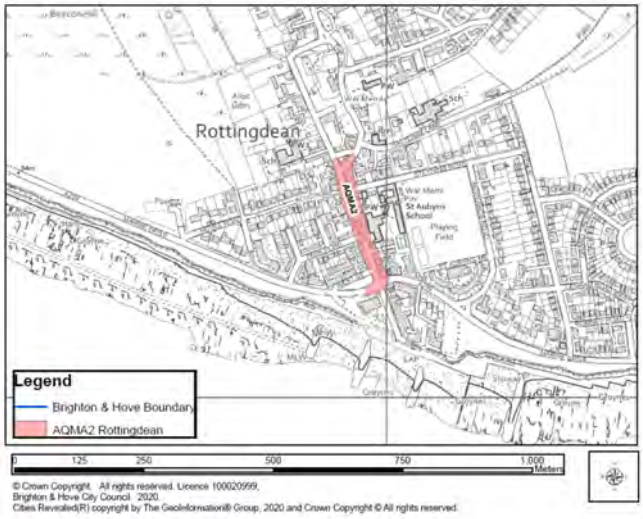
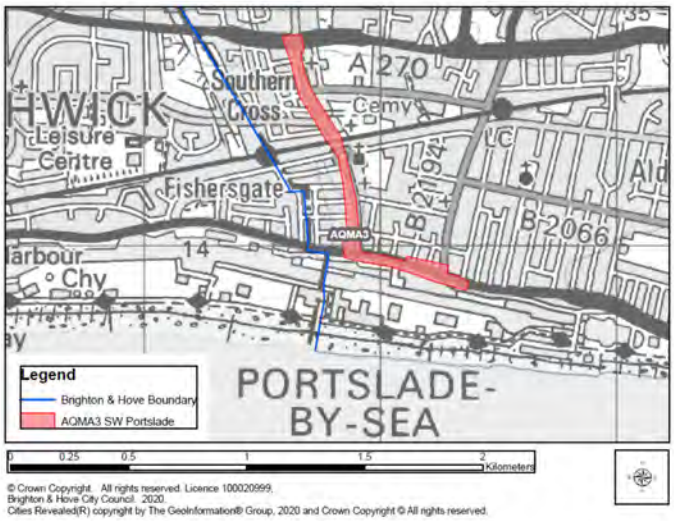
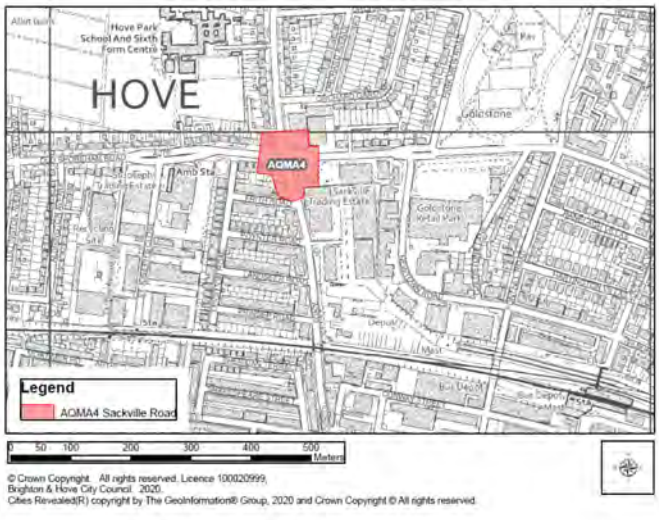
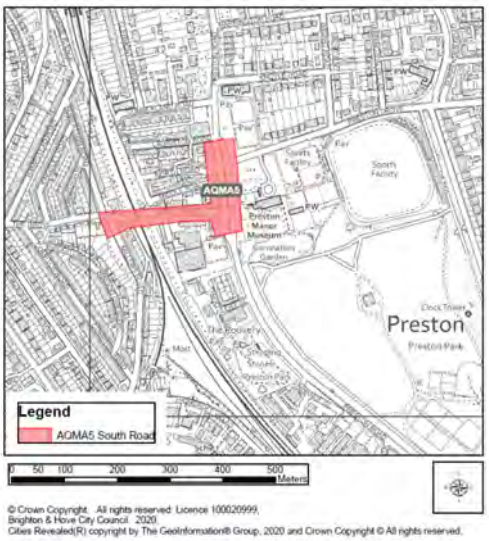


Figure D.2 4 - Maps of AQMAs 2, 3, 4, 5 and 6









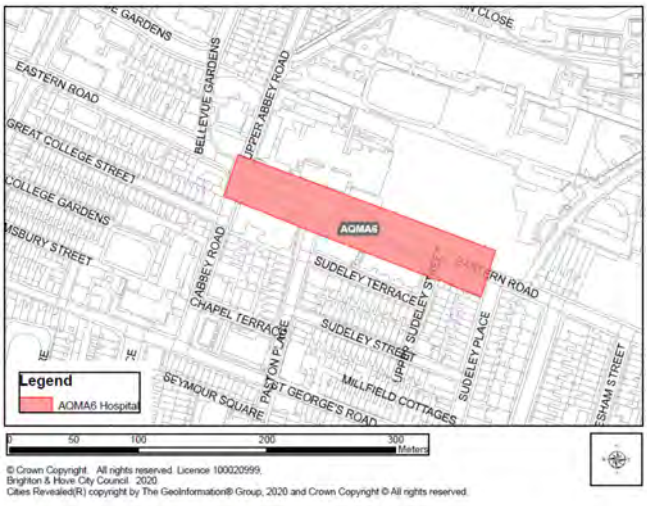


Figure D.2 5 - Map of AQMA 1 Monitoring Central ULEZ and Main Railway Station

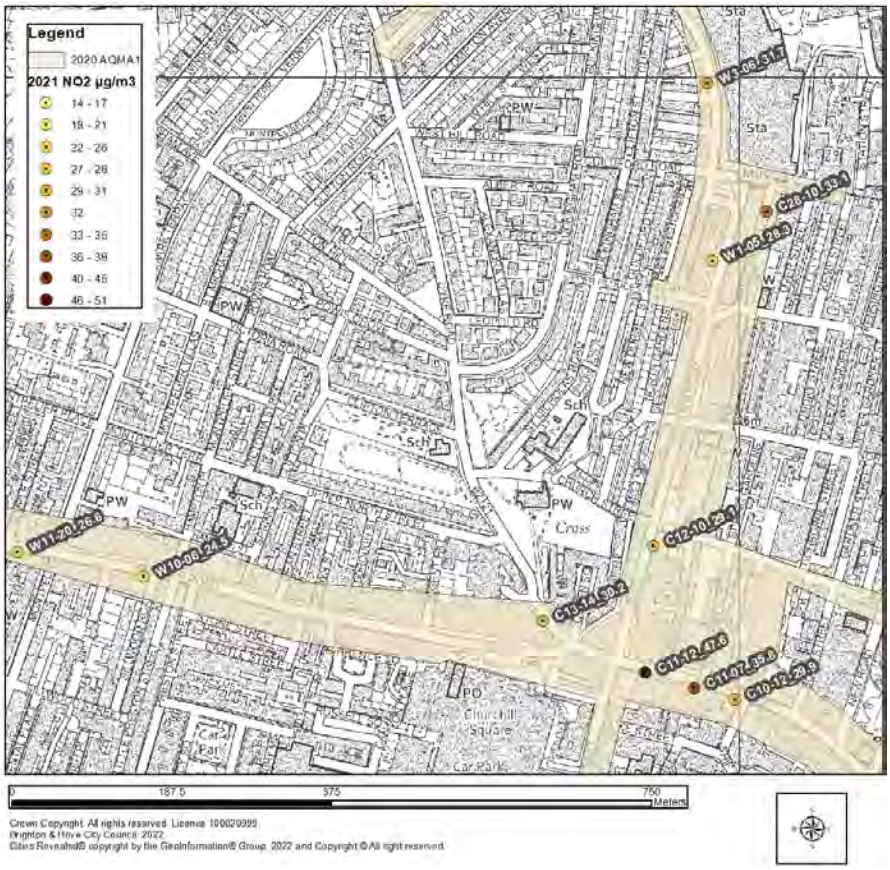


Figure D.2 6 - Map of AQMA 1 Monitoring Valley Gardens A23

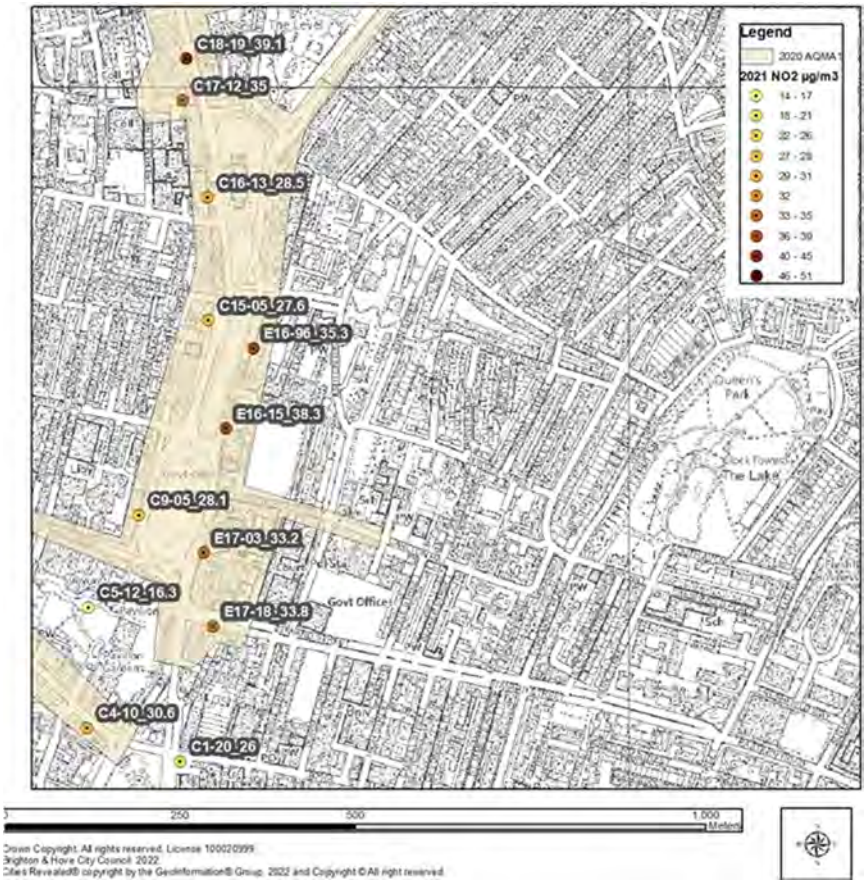


Figure D.2 7 - Map of AQMA 1 Monitoring Preston Circus Area A270 and A23

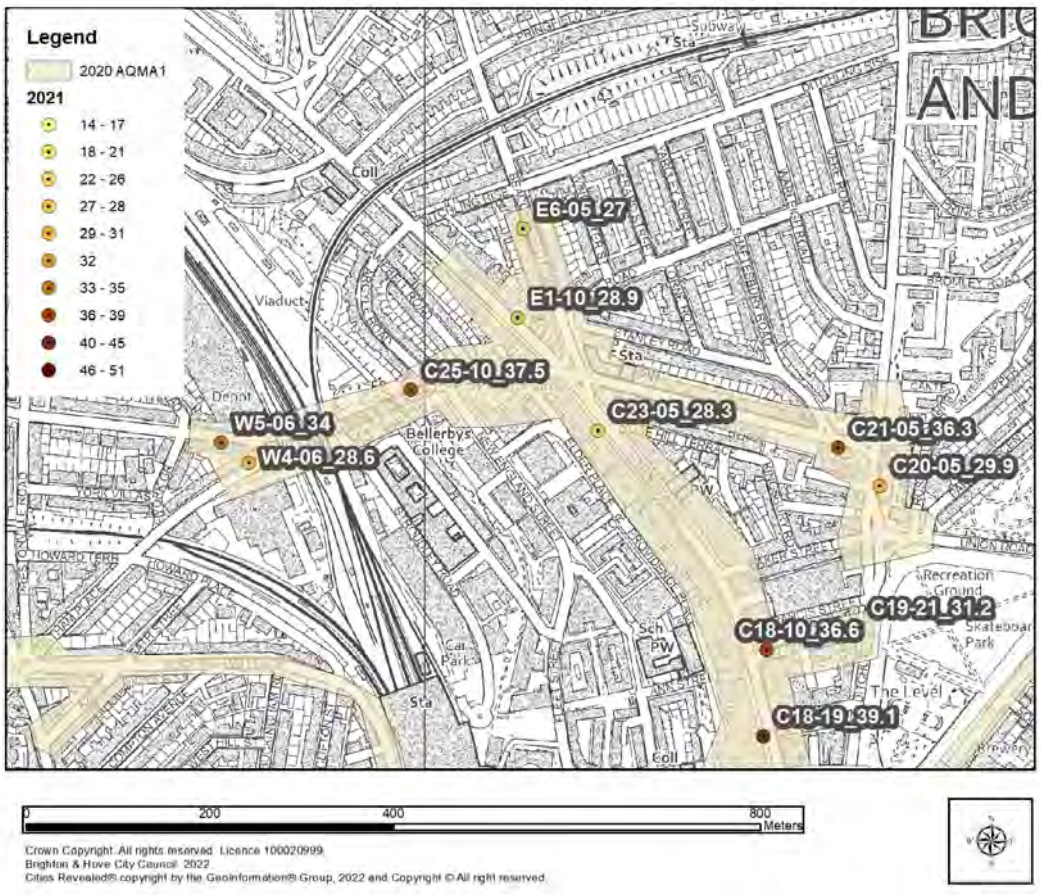


Figure D.2 8 - Map of AQMA 1 Monitoring Lewes Road Area A270

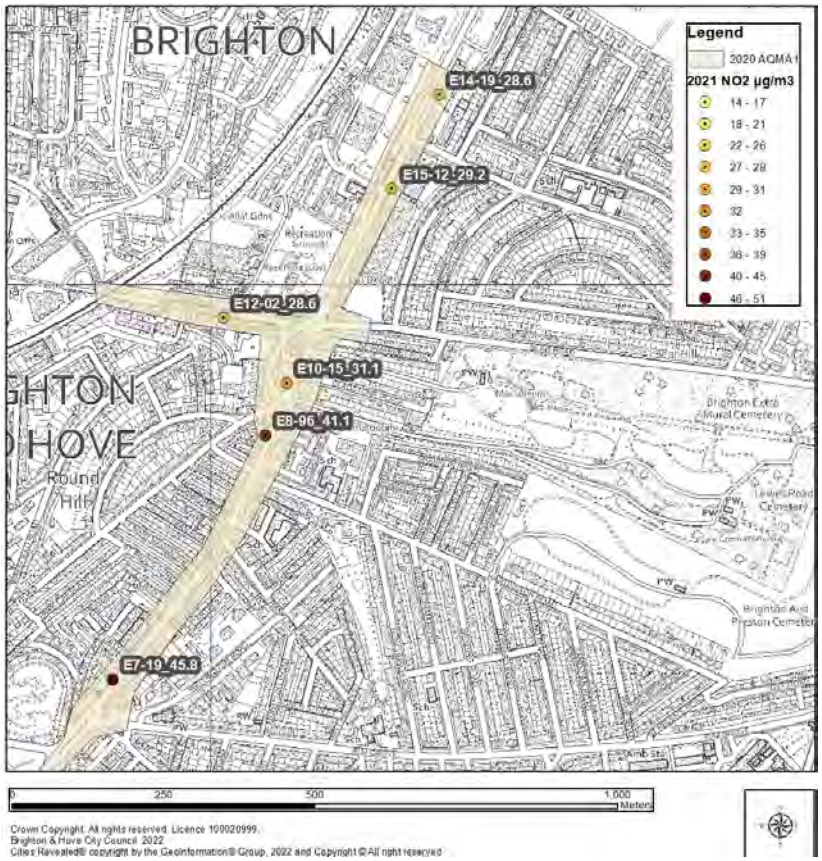


Figure D.2 9 - Map of AQMA 2 Monitoring Rottingdean B2123 and A259

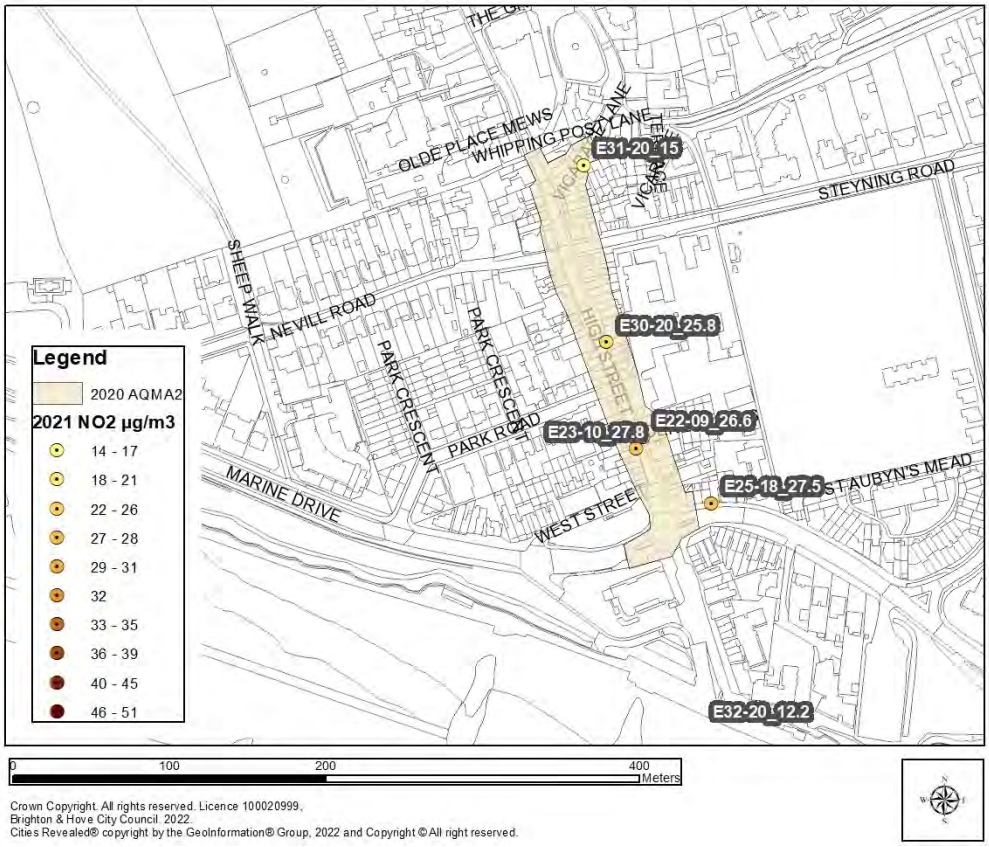


Figure D.2 10 - Map of AQMA 3 Monitoring Portslade A293 and A259

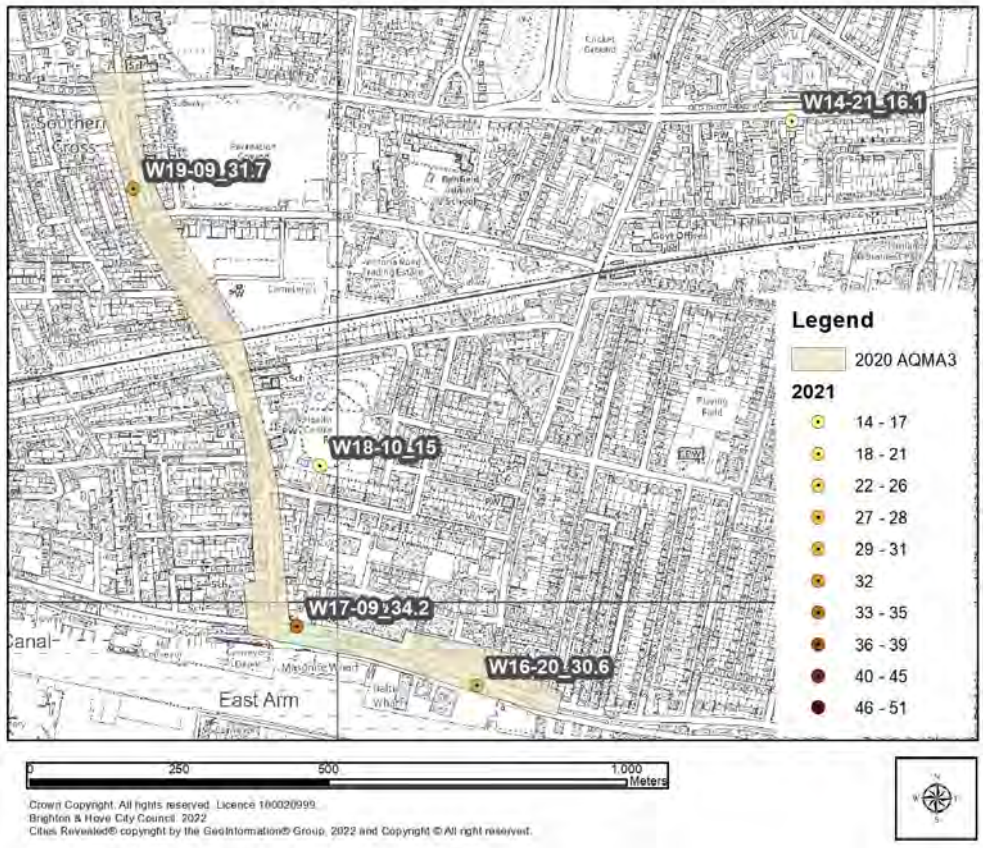


Figure D.2 11 - Maps of AQMA 4 Monitoring Hove A2023 and A270

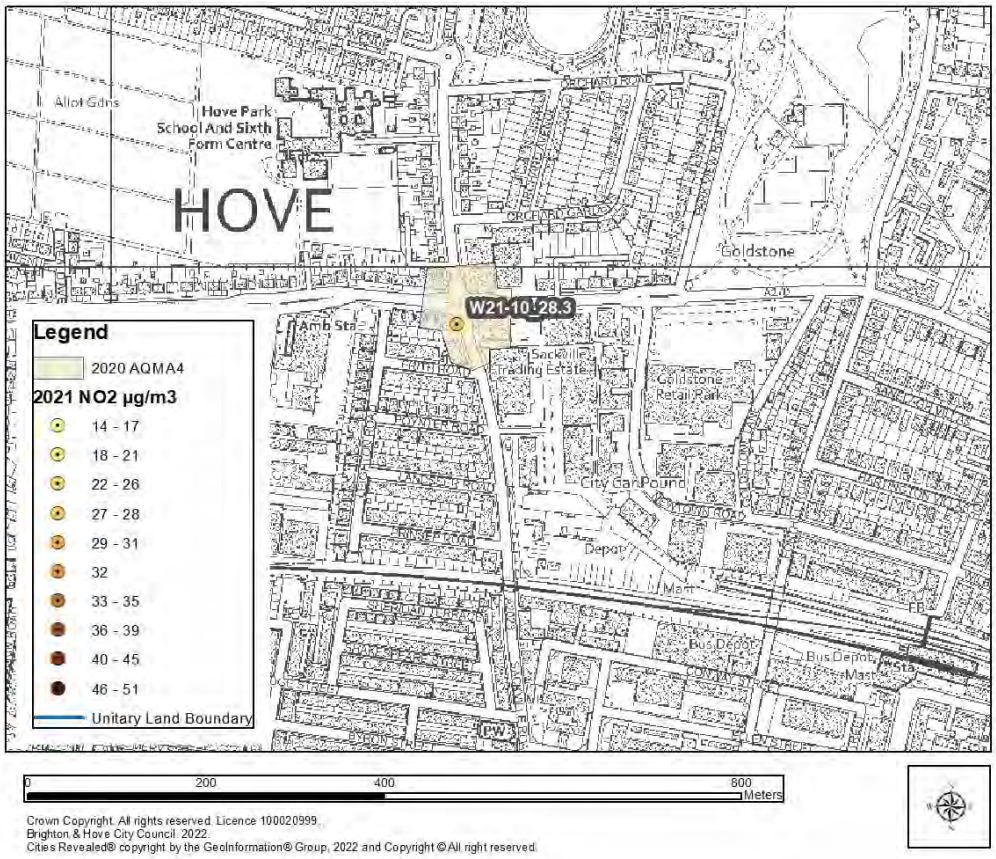


Figure D.2 12 - Maps of AQMA 5 Monitoring The Drove and Preston Road A23

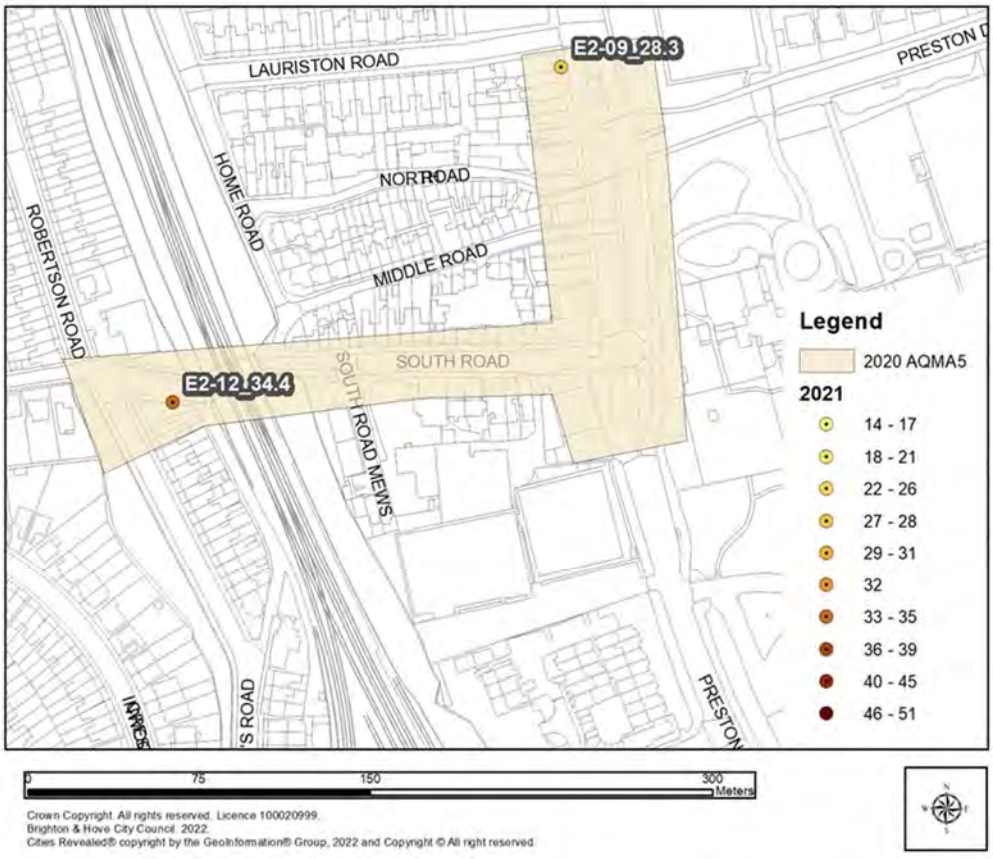
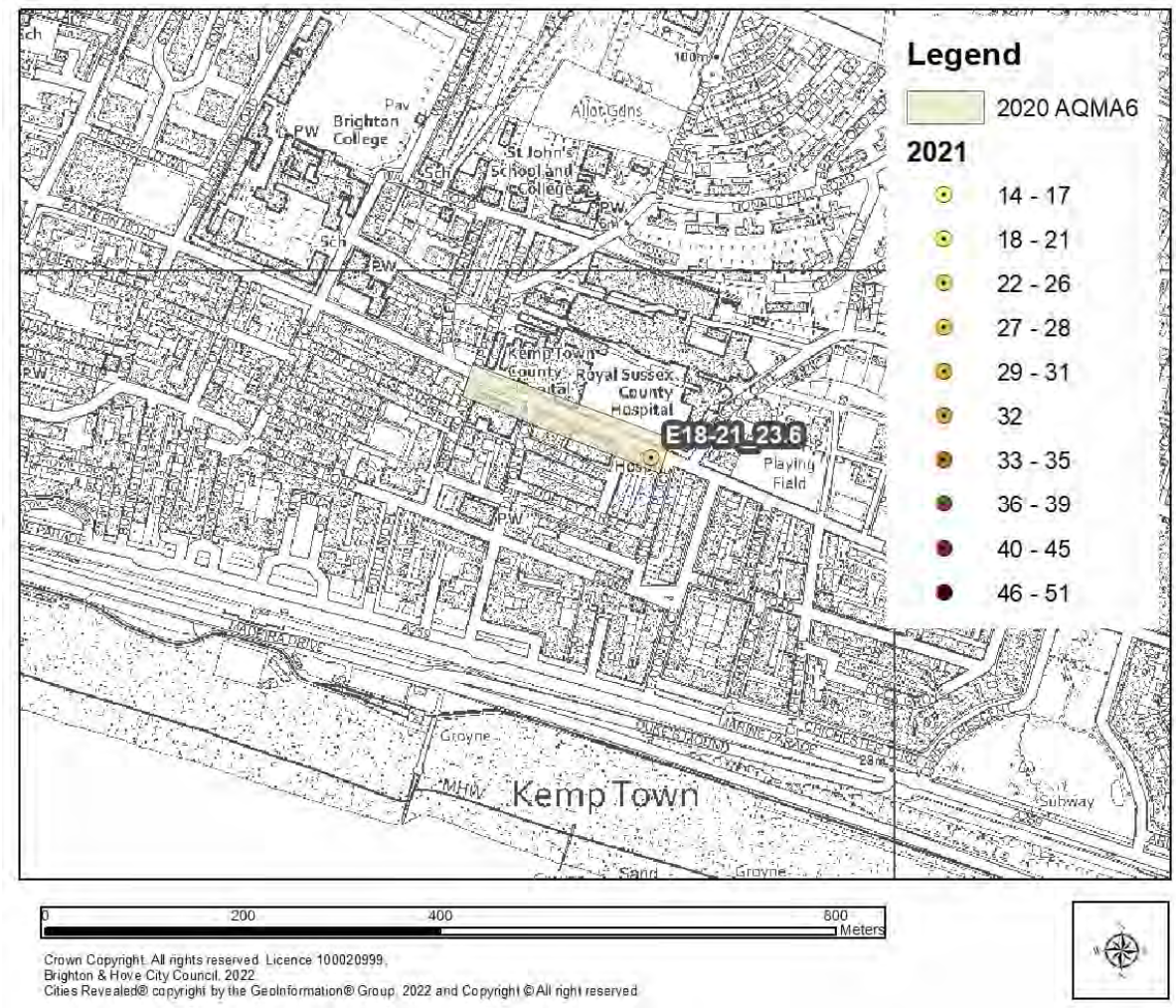


Figure D.2 13 - Map of AQMA 6 Monitoring The Drove and Preston Road A23



Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air quality standards in England (2005 Objectives)[7]

Pollutant	Air Quality Standards Concentration	Air Quality Standard
Nitrogen Dioxide (NO_2)	200 µg/m^3 not to be exceeded more than 18 times a year	1-hour mean
Nitrogen Dioxide (NO_2)	40µg/m^3	Annual mean
Particulate Matter (PM_{10})	50 µg/m^3, not to be exceeded more than 35 times a year	24-hour mean
Particulate Matter (PM_{10})	40µg/m^3	Annual mean
Sulphur Dioxide (SO_2)	350 µg/m^3, not to be exceeded more than 24 times a year	1-hour mean
Sulphur Dioxide (SO_2)	125 µg/m^3, not to be exceeded more than 3 times a year	24-hour mean
Sulphur Dioxide (SO_2)	266 µg/m^3, not to be exceeded more than 35 times a year	15-minute mean

Table E.2 – Proposed Brighton & Hove Objectives 2021 World Health Organisation guidelines and interim targets[8]

Pollutant	Air Quality Standards Concentration	Air Quality Guidline
Nitrogen Dioxide (NO_2)	50 µg/m^3 not to be exceeded more than 4 days per year	24-hour mean
Nitrogen Dioxide (NO_2)	Interim 2: 30 µg/m^3	Annual mean
Particulate Matter ($PM_{2.5.}$)	15 µg/m^3, not to be exceeded more than 4 times a year	24-hour mean
Particulate Matter ($PM_{2.5}$)	Interim 4: 8.5 µg/m^3	Annual mean
Particulate Matter (PM_{10})	45 µg/m^3, not to be exceeded more than 4 times a year	24-hour mean
Particulate Matter (PM_{10})	15 µg/m^3	Annual mean

[7] The units are in microgrammes of pollutant per cubic metre of air (µg/m^3).

[8] The units are in microgrammes of pollutant per cubic metre of air (µg/m^3).

Glossary of terms

Abbreviation	Description
ADMS-Urban	Atmospheric Dispersion Model System
AQAP	Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the local authority intends to achieve air quality limit values'
AQMA	Air Quality Management Area – An area where air pollutant concentrations exceed / are likely to exceed the relevant air quality objectives. AQMAs are declared for specific pollutants and objectives
ASR	Air Quality Annual Status Report
ATC	Automatic Traffic Counter
AURN	UK Automatic Urban Rural air Monitoring Network
CAZ	Clean Air Zone
CEMP	Construction Environment Management Plans
COMEAP	Committee on the Medical Effects of Air Pollutants
Defra	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by Highways England
EFT	Emission Factor Toolkit
EMIT	Atmospheric Emissions Inventory Toolkit
EU	European Union
HGV	Heavy Goods Vehicle

LAQM	Local Air Quality Management
LAQM (TG)16	LAQM Technical Guidance 2016
LAQM (PG)16	LAQM Policy Guidance 2016
LGV	Light Goods Vehicle
NRMM	Non Road Mobile Machinery
NAEI	National Atmospheric Emissions Inventory
NO_2	Nitrogen Dioxide
NO_x	Oxides of Nitrogen usually an emission rather than an outdoor concentration
NPL	National Physical Laboratory
PHE	Public Health England
PHOF	Public Health Outcomes Framework
PM_{10}	Airborne particulate matter with an aerodynamic diameter of 10µm (micrometres or microns) or less
$PM_{2.5}$	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
SCA	Smoke Control Zone
Section 106	Section 106 Planning Agreement Under Town and Country Planning Act
SO_2	Sulphur Dioxide
ULEZ	Ultralow Emissions Zone

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- Local Air Quality Management Policy Guidance LAQM.PG16. May 2016. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland.
- Public Health England. Air Quality: A Briefing for Directors of Public Health, 2017
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- Public Health England. Estimation of costs to the NHS and social care due to the health impacts of air pollution: summary report, May 2018
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- The units are in micrograms of pollutant per cubic metre of air (µg/m^3).

  The units are in micrograms of pollutant per cubic metre of air (µg/m^3).
- Brighton & Hove JSNA found at: http://www.bhconnected.org.uk/content/needs-assessments
- Public Health Outcomes Framework, Public Health England found at: https://fingertips.phe.org.uk/profile/public-health-outcomes-framework
- Please think twice about fires found at: https://new.brighton-hove.gov.uk/news/2020/please-think-twice-about-fires-indoors-or-outdoors

Other References Including Local

- AQMAs interactive map (defra.gov.uk)
- Brighton & Hove AQMA Orders 2020.
- How Brighton & Hove manages air quality
- Sussex-Air Promoting better Air Quality in Sussex

- Home - Defra, UK,
- Office for Zero Emission Vehicles - GOV.UK (www.gov.uk)
- Brighton & Hove Bus Service Improvement Plan (BSIP) (brighton-hove.gov.uk).
- Local Transport Plan (brighton-hove.gov.uk)
- Local Cycling and Walking Infrastructure Plan (brighton-hove.gov.uk)