Bath & North East Somerset Council

Improving People's Lives

Bath Clean Air Zone

ANNUAL REPORT 2024

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Acronyms and Abbreviations

ANPR	Automatic Number Plate Recognition
AQD	Air Quality Directive (2008 EU)
AQMA	Air Quality Management Area
AQO	Air Quality Objective
ASR	Annual Status Report
ATC	Automatic Traffic Counter
AURN	Automatic Urban and Rural Network
BID	Business Improvement District
B&NES	Bath and North East Somerset Council
CAF	Clean Air Fund
CAP	Clean Air Plan
CAZ	Clean Air Zone
COPD	Chronic Obstructive Pulmonary Disease
CSF	Critical Success Factor
CVRAS	Clean Vehicle Retrofit Accreditation Scheme
DEFRA	Department for the Environment, Food and Rural Affairs
DfT	Department for Transport
DVLA	Driver and Vehicle Licensing Authority
EU	European Union
FAS	Financial Assistance Scheme
FBC	Full Business Case
HGV	Heavy Goods Vehicle
JAQU	Joint Air Quality Unit
LAQM	Local Air Quality Management
LEP	Local Enterprise Partnership
LEV	Low Emissions Vehicle

LGV	Light Goods Vehicle
MTC	Manual Classified Counts
NO	Nitrogen Oxide
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
OS	Ordnance Survey
PCM	Pollution Climate Mapping
PCN	Penalty Charge Notice
PHGV	Private Heavy Goods Vehicle
PHV	Private Hire Vehicle
PM	Particulate Matter
$PM_{2.5}$	Particulate Matter with particles less than 2.5 micrometres diameter
PM_{10}	Particulate Matter with particles less than 10 micrometres diameter
P&R	Park and Ride
PRMS	Public Realm and Movement Strategy
Rinc	Roadside increment
TEA	Triethanolamine
TG	Technical Guidance
TMP	Traffic Management Plan
UK	United Kingdom
ULEV	Ultra-Low Emissions vehicle
UTC	Urban Traffic Control
UTMC	Urban Traffic Management and Control
WECA	West of England Combined Authority
WHO	World Health Organisation

Executive summary

In 2017, the Government directed Bath & North East Somerset Council (B&NES) to reduce nitrogen dioxide (NO_2) pollution in Bath to within the legal limits of an annual average value of **40 micrograms per cubic metre (µg/m^3)** and to do so in the shortest possible time.

In response to this, on 15 March 2021 the Council launched a charging class C Clean Air Zone (CAZ) in Bath's city centre to drive down NO_2 pollution at several locations which regularly exceeded these limits, risking children's and vulnerable resident's health.

Clean air zones work by deterring certain high emission vehicles from entering areas of high pollution by levying a daily charge, thus encouraging a more rapid replacement of polluting vehicles for cleaner, compliant ones that would otherwise naturally occur. Within Bath, NO_2 pollution is chiefly caused by road traffic emissions, and extensive technical work showed that a charging CAZ, coupled with the introduction of a traffic management scheme at Queen Square would be the only way to achieve success in the required time frame (at the end of 2021 by the latest).

In launching the CAZ, significant financial support was made available to individuals and businesses to replace non-compliant, chargeable vehicles regularly driving into the zone. A Financial Assistance Scheme (FAS) and Bus Retrofit Scheme were launched using Government funds to provide grants and loans to support the upgrade or retrofit of almost 950 vehicles. Additionally, there has been an ongoing behaviour change campaign aimed at helping people travel more actively and sustainably across B&NES, also supporting the aims of the CAZ.

Following the launch of the CAZ, the Council has been monitoring air quality and traffic flows just outside the zone to determine whether traffic has been displaced, and associated emissions have increased. Findings show that traffic outside the zone does not appear to have increased, and air quality continues to improve however, the composition of traffic may have changed. The Covid-19 pandemic greatly affected working habits and travel patterns, and we continue to see an increase nationwide in light commercial vehicles compared with 2019[1].

It is also important to note that private cars are not charged within Bath as the CAZ is a class C zone. However, whilst these vehicles have no reason to avoid the zone, there may from time to time be temporary road closures or road works affecting their journeys.

B&NES would like to thank the public for their continuing support with making improvements to air quality and public health.

[1] Department for Transport, 2024. Domestic Transport Usage by Mode. Available at: https://www.gov.uk/government/statistics/transport-use-during-the-coronavirus-covid-19-pandemic

Summary of annual air quality results from within the CAZ (CAZ_Only):

2019 is used as the baseline year for analysis as it is the most recent year with pre-CAZ data that has not been impacted by the Covid-19 pandemic.

- Average 2024 annual nitrogen dioxide (NO_2) concentrations within the CAZ are **40% lower than in 2019, representing a reduction of 13.0 µg/m^3**. This is the average reading from a total of 65 monitoring sites that recorded data in both 2019 and 2024. Note sites with less than 25% data capture have been discounted from this analysis. Sites with 25-75% data capture have been annualised, and sites with over 75% data capture have been averaged.
- In 2024, **no sites** recorded an annual average NO_2 concentration **greater than 36 µg/m^3**. This is a reduction of 21 sites when compared to 2019.
- **None of the 65 sites** were found to have increased in NO_2 concentrations since 2019.

Summary of annual air quality results from within the wider Bath urban area (CAZ_Boundary):

- Average 2024 annual nitrogen dioxide (NO_2) concentrations within the CAZ_Boundary are **41% lower than in 2019**, representing a reduction of 10.4 µg/m^3. This is the average reading from a total of 56 monitoring sites that recorded data in both 2019 and 2024. Note, sites with less than 25% data capture have been discounted from this analysis. Sites with 25-75% data capture have been annualised, and sites with over 75% data capture have been averaged.
- In 2024, **no sites** within the CAZ_Boundary recorded **greater than 36 µg/m^3.** This is a reduction of 7 sites when compared to 2019.
- None of the 56 sites were found to have increased in NO_2 concentrations compared with 2019.

Summary of annual air quality results from within the wider district (Wider_B&NES):

- Average 2024 annual nitrogen dioxide (NO_2) concentrations within the Wider_B&NES region are **37% lower than in 2019**, representing a reduction of 12.2 µg/m^3. This is the average reading from a total of 18 monitoring sites that recorded data in both 2019 and 2024. Note sites with less than 25% data capture have been discounted from this analysis. Sites with 25-75% data capture have been annualised, and sites with over 75% data capture have been averaged.
- In 2024, no sites within the Wider_B&NES recorded **greater than 36 µg/m^3.** This is a reduction of 6 sites when compared to 2019.

Summary of annual traffic flow figures:

With regards to traffic flows, 2016 – 2018 have been used as a baseline comparative year as they are the most recent years with good quality pre-CAZ data that has not been impacted by the Covid-19 pandemic.

- Throughout 2024 national traffic volumes were 0.7% lower than the 2019 pre-pandemic baseline, with light goods vehicles (LGVs), motorcycles and scooters exceeding pre-pandemic levels. Overall traffic volumes have increased to just less than 2019 levels, public transport has increased at a slower rate and remains below pre-pandemic volumes[2].
- Average 2024 traffic flows in Bath were below pre-pandemic levels, with a 0.7% decrease also identified when compared to 2023.
- Within the CAZ, data availability from the Council's permanent Automatic Traffic Counter (ATC) network has some variation due to network trials and upgrades. During 2022, the network, particularly within the CAZ, was being upgraded with new, more reliable technology to replace the older, faulty counters that were no longer maintained. As a result, there are some inconsistencies with data availability, and individual sites do not hold a full data set from 2016 through to 2023.
- Therefore, to understand traffic flows within the CAZ, data from two temporary surveys have been used for analysis. Although these surveys are not representative of a full year, indicative analysis shows a decrease in traffic flows when compared to a pre-CAZ baseline.
- On average, data analysed from the permanent ATC network within the CAZ_Boundary, **found an 11% reduction in 7-day average traffic flows** when compared to the baseline period.
- Similarly, data analysed within the Wider_B&NES area, **found an 8% reduction in 7-day average traffic flows** when compared to the baseline. The sites used for analysis can be found in 'Traffic flows within the CAZ_Boundary and Wider_B&NES'.
- Since the launch of the CAZ in March 2021, the Council has gathered extensive evidence to assess any potential traffic displacement due to CAZ.

Summary of annual vehicle compliance and Financial Assistance Scheme (FAS) figures:

- The Council's Financial Assistance Scheme (FAS) offered local businesses and individuals grants and interest-free loans to replace or upgrade non-compliant vehicles regularly driving into the zone.
- On average, **38,500 unique vehicles** were recorded in the zone each day throughout 2024.

[2] Department for Transport, 2024. Road traffic estimates in Great Britain, 2024: Headline figures. Available at: https://www.gov.uk/government/statistics/road-traffic-estimates-in-great-britain-2024/road-traffic-estimates-in-great-britain-2024-traffic-on-englands-road-networks

- Most vehicles recorded in the CAZ are private cars, with an average of **32,471 unique private cars** recorded in the zone each day during 2024, this equates to 84% of total vehicles. Private cars are **not** charged regardless of their emission standard.
- An average of 1,742 non-compliant vehicles were seen in the zone each day during the launch week of the CAZ, this compares to 275 during 2024, **a decrease of 84%.**
- Owners of over 1,500 vehicles applied for financial support to upgrade or retrofit their non-compliant vehicles through the FAS.
- The Council's FAS scheme, now closed, has supported the **upgrade of 949 vehicles** from higher emission to clean, compliant ones.
- The percentage of chargeable non-compliant vehicles (as a percentage of total traffic) entering the zone each week reduced from 6% in launch week to an average of **0.9% by the end of 2024.**
- Van/LGV compliance rose from 63% during launch week to **91% by the end of 2024**. 3,538 individual vans/LGVs (compliant and non-compliant) were recorded in the CAZ each day on average in 2024.
- The Council's FAS supported the **replacement of 783 vans/LGVs** from higher emission vehicles to clean, compliant ones by the end of the scheme.
- Taxi/Private Hire Vehicle (PHV) compliance rose from 67% during the launch week in March 2021, to **around 99% by the end of 2024**. An average of 642 individual taxis/PHVs were recorded in the CAZ each day during 2024.
- The Council's FAS supported the **replacement of 110 taxis/PHVs** from higher emission vehicles to cleaner, compliant ones by the end of the scheme.
- Bus/coach compliance rose from 73% during launch week to **99% by the end of 2024.** An average of 215 individual buses/coaches were recorded in the CAZ each day during 2024.
- The Council's FAS supported **the upgrade of 22 non-scheduled buses/coaches** from higher emission vehicles to cleaner, compliant ones by the end of the scheme.
- Out of a total fleet of 226 scheduled buses, 88 were non-compliant when the bus retrofit programme started. By the end of 2022, **all 88 buses had been successfully retrofitted** with financial support from the government. The full fleet is now compliant with the CAZ emission standards.
- Heavy Good Vehicle (HGV) compliance for vehicles weighing greater than 3.5T but less than 12T rose from 86% during the launch week to around **96% by the end of 2024**. An average of 125 vehicles were recorded in the CAZ each day during 2024.
- HGV compliance for vehicles weighing greater than 12T rose from 93% during the launch week to an average of **99% by the end of 2024**. An average of 271 vehicles were recorded in the zone each day during 2024.
- The Council's FAS supported the **upgrade of 32 HGVs** from higher emission vehicles to cleaner compliant ones by the end of 2024.

How to use this report

This report provides information on the CAZ's performance during 2024. The main areas discussed are:

- Air quality data
- Traffic flow data
- Fleet compliance data

The following is also discussed throughout the report:

- Retail/business/office space vacancy figures
- Retail footfall surveys
- Park and Ride passenger data
- Walking and cycling counts
- Bus usage data
- Stakeholder feedback from Council User Group Forums
- Taxi fares and unmet demand surveys
- Early Measures Fund, zero emission parking permits
- Bus Retrofit uptake/compliance
- Financial Support Scheme uptake
- Travel advisor session uptake
- Anti-idling enforcement
- Weight restriction enforcement
- E-cargo scheme

Timescales and baseline data

To determine the effectiveness of the CAZ, data following the launch of the zone is compared to that from similar periods before the launch. This is so the seasonal effects on air quality and traffic flows can be considered, and that data is like-for-like. Where quarterly data is discussed, this has been broken down into the following periods:

- Quarter 1 (Q1) - January, February, March.
- Quarter 2 (Q2) - April, May, June.
- Quarter 3 (Q3) - July, August, September.
- Quarter 4 (Q4) - October, November, December.

When reading the report please note the following:

- Given the unprecedented conditions brought about by the Covid-19 pandemic in 2020 (including significant changes in transport and travel behaviour), 2020 figures have been discounted for comparative purposes, unless otherwise stated in the report.
- Annual air quality data is bias-adjusted and annualised, where appropriate, unless otherwise stated. In some cases, a further adjustment is important where results are distance-adjusted to the façade. This may be used when considering the compliance of a diffusion tube site within Local Air Quality Management (LAQM) guidance.
- Baseline data from 2019 is used to compare air quality monitoring results.

- Data from 2017/2018 is used to compare traffic flows because the Council has insufficient data for some periods during 2019.
- Traffic flows also vary according to the seasons.
- Data from January-December 2024 is used throughout this report.
- Longer-term trends are also reviewed from 2017 to the end of 2024.

Where data is gathered and from/what locations

We have identified three site groupings for the comparison of data. This is to establish the impact of the zone on traffic flows and air quality both inside and out of the CAZ:

- The Clean air zone (sites within the boundary are referred to as the 'CAZ_Only')
- The boundary area (sites outside the boundary of the CAZ but within the urban area of Bath including Batheaston and Bathampton, referred to as the 'CAZ_Boundary')
- The wider area (sites outside of the urban areas of Bath, Batheaston and Bathampton, but within the rural areas and district-wide urban areas in Bath & North East Somerset, referred to as 'Wider_B&NES')

Climate summary 2024

Air pollution is affected by meteorological conditions. This is a brief roundup of the monthly climate for the year, as described by the Met Office[3].

- 2024 was the fourth warmest year on record for the UK, with the minimum temperature remaining above average. Eight of the twelve months of the year were above average, with May being the warmest on record.
- Despite periods of exception rainfall, the overall rainfall in the UK across the year was around average at 1242mm.
- Sunshine was variable for the year but overall, slightly below average, with the UK recording 1274 hours of sunshine, 91% of the long-term average. January was a particularly sunny month due to prolonged periods of high-pressure mid-month, bringing sunny conditions.

As most, (approximately 80%), of NO_2 arising from vehicles occurs as a result of chemical reactions of the nitric oxide (NO) directly emitted, meteorological conditions are a significant factor in the resulting measured concentrations. Atmospheric NO_2 levels are usually higher in winter due to the cooler temperatures of vehicle catalysts, significantly compromising the reduction of nitrogen oxides (Nox) from emissions. Heatwaves also increase levels of NO_2. Long periods of unusual weather can result in annual measured concentrations becoming an outlier in a long-term trend.

Air quality data in this report has not been adjusted to take account of weather conditions, a process known as de-weathering. This process is used to remove the

[3] Met Office, 2025. Annual Assessment – 2024.

impact of weather variations from trends so that the impact of other measures can be seen, such as the implementation of the CAZ or a lockdown.

Find more climatic information at:
https://www.metoffice.gov.uk/research/climate/maps-and-data/summaries/index

Cleveland Bridge closure

Cleveland Bridge was closed to all traffic on 28 June 2021 for emergency repairs. The bridge usually carries around 17,000 vehicles per day, and so the closure affected traffic flows throughout Bath. The bridge fully reopened on 02 October 2022, subject to an 18-tonne weight restriction to protect the bridge structure from further deterioration and damage, this weight limit was in place throughout 2024.

Partial and full closures of Cleveland Bridge took place between the following dates:

- Partially open with single-way signal-control: 04 May - 27 June 2021
- Full closure: 28 June - 24 October 2021
- Partially open with single-way signal-control: 25 October 2021 - 01 October 2022
- Fully reopened (subject to an 18-tonne weight restriction): 02 October 2022

The condition of the bridge, and associated weight restriction continues to be reviewed into 2025. Find additional information surrounding the bridge renovation at:
https://www.bathnes.gov.uk/cleveland-bridge-renovation-project/scheme-overview

Covid-19 and air quality

- Multiple lockdowns in response to the Covid-19 pandemic had a significant effect on transport and travel behaviour, locally and nationally.
- Throughout 2024 public transport usage has remained below pre-Covid levels nationally, conversely motor vehicle usage has increased and remained close to pre-pandemic levels[4]. This highlights the impact Covid-19 has had in altering behaviour long-term, with higher-rates of home-working and commuting by car compared to lower public transport use. This may also be linked to a more permanent change in working patterns towards more flexible working post-pandemic.
- Nationally, the number of commercial vehicles in 2024 remained higher than a pre-covid baseline. On average in 2024, LGVs were at 119% of the baseline period, whilst HGVs were at 104%[5]. This is likely associated with an increase in online shopping and home-deliveries, a result of behaviour changes due to Covid-19.

[4] Department for Transport, 2025. Usage of transport by mode from June 2024. https://www.gov.uk/government/statistics/transport-use-during-the-coronavirus-covid-19-pandemic/domestic-transport-usage-by-mode
[5] Department for Transport, 2025. Daily domestic transport use by mode. https://www.gov.uk/government/statistics/transport-use-during-the-coronavirus-covid-19-pandemic

World Health Organisation air quality targets

The World Health Organisation (WHO) sets air quality guidelines. These guidelines are for use as an evidence-informed reference tool to help decision-makers in setting legally binding standards and goals for air quality management at national and local levels. The guidelines were updated in 2021 to reduce the limits for some measures in response to emerging evidence of the health impacts of these pollutants. Those pollutants with reduced limits include NO_2 and particulate matter less than 2.5 microns diameter ($PM_{2.5}$). The WHOs new ambitious targets are much lower than the objective threshold limits currently mandated in the UK.

Bath and North East Somerset Council continues to work towards the current UK air quality objectives with the ambition to go further in adopting a local NO_2 target.

Further information

- Additional information on how the Council has measured and compared data is presented in each individual section.
- As part of the Council's obligations under the LAQM legislation (part IV of Environment Act 1995, as amended by the Environment Act 2021), an Annual Status Report is issued annually. These can be viewed at: https://beta.bathnes.gov.uk/document-and-policy-library/annual-air-quality-reports
- An interactive map of historical NO_2 data collected from monitoring locations across the authority area can be viewed at: https://beta.bathnes.gov.uk/nitrogen-dioxide-monitoring-data
- Live monitoring data from the Council's automatic analyser sites across Bath can be viewed at: https://www.ukairquality.net/

1 Background information

This section provides information on why a CAZ is needed in Bath, the type of air pollution that the Council is trying to tackle, and how a charging class C CAZ was decided. Further information can be found in the Full Business Case at: https://beta.bathnes.gov.uk/sites/default/files/2020-10/674726.br_.042.fbc_-_bath_clean_air_plan_fbc.pdf

1.1 Air pollution

Breathing in polluted air affects health and costs both the NHS and society billions of pounds each year. Air pollution is recognised as a contributing factor in the onset of heart and circulatory disease and cancer and can cause a range of health impacts, including effects on lung function, increasing hospital admission rates and mortality.

Air pollution particularly affects the most vulnerable in society, children, the elderly, and those with existing heart and lung conditions. Low-income communities are also disproportionately impacted by poor air quality, despite strengthening environmental policies[6]. Clean air is important for everyone. By preventing ill health, it will reduce pressure on the NHS, improve people's lives and make our society more equitable.

Types and causes of air pollution

There are different causes and sources of air pollution. Historically, combustion of fossil fuels for energy, such as coal, produced smoke and sulphur dioxide (SO_2).

A major source of poor air quality in the UK contributing to NO_2 pollution and particulate matter (PM) pollution, is road traffic.

Particulate matter pollution, referred to as particulate matter less than 10 microns diameter (PM_{10}) or $PM_{2.5}$ depending on the diameter of particles, is made up of tiny bits of material from many sources including smoke from fires, exhaust fumes, smoking or the dust from brake pads on vehicles. These particles are too small to see, and can be breathed in without being noticed

NO_2 comes from burning fuels or other materials, so concentrations are especially high around roads. It is also produced from home gas boilers, bonfires, and other sources as well. You cannot see or smell nitrogen oxides, but they mix with the air and are absorbed into our bodies. Vehicle exhaust emissions contribute to 35% of all UK NO_x emissions which is the single greatest source[7].

[6] B&NES Annual Status Report. Available at: https://www.bathnes.gov.uk/document-and-policy-library/annual-air-quality-reports

[7] DEFRA, 2019. Air quality: explaining air pollution – at a glance. Available at: https://www.gov.uk/government/publications/air-quality-explaining-air-pollution/air-quality-explaining-air-pollution-at-a-glance

1.2 How does air pollution affect our health?

Air pollution particles and gases enter our bodies and can damage our cells in different ways. They usually get into our lungs first and can then move into our bloodstream to reach organs such as our heart and brain.

Any amount of pollution can be damaging to our health, but the more that you are exposed to, the bigger the risk and the larger the effect on you and your family. Some people are more vulnerable to the impacts of air pollution than others. Those more at risk from the negative effects of air pollution include children, pregnant and older people; alongside people with lung conditions such as asthma, chronic obstructive pulmonary disease (COPD) and lung cancer. People with heart conditions such as coronary artery disease, heart failure and high blood pressure are also at risk.

Air pollution in Bath

In Bath, annual average nitrogen dioxide (NO_2) levels had exceeded the annual legal limit of 40 µg/m^3 at several locations within the city, chiefly caused by vehicle emissions.

This pollution is exacerbated by Bath's topography. The city sits in the bottom of a valley surrounded by hills, and its central roads are flanked by tall buildings, which means that in certain conditions, vehicle emissions can get trapped in the atmosphere causing high levels of NO_2 in certain locations.

PM in Bath was not found to exceed legal limits for either PM_{10} or $PM_{2.5}$, except at times when there were meteorological or other events that caused spikes in these pollutants. Bath is within the permitted number of 24-hour exceedances for $PM_{2.5}$ in a year.

Health impacts in Bath of NO_2 pollution

- NO_2 contributes to as many as 43,000 early deaths in the UK each year[8].
- It irritates and inflames the lining of airways – which can worsen asthma and make breathing difficult among those with lung diseases (such as bronchitis and emphysema).
- Research shows that high levels of NO_2 can affect children's lung development, with those children who grow up in highly polluted areas being more susceptible to asthma.

How we monitor air quality

B&NES has been monitoring air pollution for many years, frequently reviewing the monitoring sites to ensure coverage both within and outside of the CAZ. Three pollutants are measured around the district: NO_2, PM_{10} and $PM_{2.5}$.

[8] UK Health Security Agency, 2023. *Health Effects of Climate Change (HECC) in the UK: 2023 Report.* Available at: https://assets.publishing.service.gov.uk/media/6570a68b7469300012488948/HECC-report-2023-chapter-4-outdoor-air-quality.pdf

There are currently over 150 locations where NO_2 is measured, including over 20 key sites with higher levels of pollution where three diffusion tubes are located at each location to improve data confidence.

To read more about how air quality is measured and analysed in relation to the effectiveness of Bath's CAZ, see the 'Impacts of the CAZ on Air Quality' section.

More information about air quality across B&NES can be viewed online at: https://beta.bathnes.gov.uk/air-quality

1.3 Why we need a charging CAZ

In 2017, following a successful ruling by the Supreme Court in a case brought against the Government by Client Earth, the Government directed B&NES to reduce the annual average NO_2 levels in Bath to within legal limits in 'the shortest possible time'.

The Council then undertook significant technical work to understand what would be required to comply with air quality limits, establishing that a charging CAZ together with the introduction of a traffic management scheme at Queen Square would be the only suitable measures capable of delivering the necessary air quality improvements within the shortest possible time.

Other than meeting these objectives, the CAZ is seen in the context of the Council's wider commitments towards improving public health and the natural environment. In March 2019, the Council declared a Climate Emergency, resolving to provide the leadership to enable B&ENS to become carbon neutral by 2030[9]. In July 2020, the Council declared an Ecological Emergency, resolving to work with local and national partners to resist the destruction of natural habitats through planning policy and development management[10].

The Government has provided all the funds required to prepare and implement the CAZ. Work is overseen by the government's Joint Air Quality Unit (JAQU) and subject matter experts are also independently verifying the zone's performance.

1.4 How we decided on a class C charging CAZ

The options for Bath to achieve success were a Class D charging CAZ, charging all higher emission vehicles including cars and motorbikes, or a class C charging CAZ, charging all higher emission vehicles except private cars and motorbikes but including some additional traffic management.

The Council engaged extensively with the public throughout 2018/19 before reaching a decision on a class C charging CAZ. The overwhelming opinion was that while pollution needed to be tackled, a class C charging CAZ would strike a better balance

[9] Bath and North East Somerset Council, 2021. Climate Emergency, available at: https://beta.bathnes.gov.uk/climate-emergency
[10] Bath and North East Somerset Council, 2021. Ecological Emergency. Available at: https://beta.bathnes.gov.uk/ecological-emergency

between tackling pollution, and protecting central businesses and vulnerable residents that might be disproportionally affected by charging higher emission private cars.

Technical modelling suggested that the Council could achieve success with a class C CAZ provided additional traffic measures at Queen Square were introduced to address a particular NO_2 hotspot on Gay Street.

In addition, it was agreed that significant financial support would be given to local individuals and businesses to help them replace higher polluting vehicles regularly entering the zone with cleaner, compliant ones. This mitigation would reduce the impact of charges on affected businesses and individuals, while also further reducing emissions to support better air quality.

The full business case for the CAZ was approved by Central Government in January 2020 and can be read here: https://beta.bathnes.gov.uk/policy-and-documents-library/baths-clean-air-zone

1.5 How Bath's CAZ works

Daily charges apply to the following higher emission vehicles driving in the zone that do not comply with Euro 6/VI (diesel), or Euro 4/IV (petrol) emissions standards:

- Taxis, PHVs, vans (including pick-ups and N1 campervans), minibuses, and LGVs - £9 per day
- Buses, coaches and HGVs - £100 per day
- A discounted charge of £9 per day is also available for private HGVs, such as larger motorhomes and horse transporters, once registered with the Council.

Cars and motorbikes (except for taxis and PHVs) are not charged regardless of their emissions standard. This includes campervans classed as M1 on their V5C- (Vehicle Registration Certificate) issued by the Driver and Vehicle Licensing Authority (DVLA).

Importantly, the Council is not keen to penalise motorists or make money from the zone. Its priority is to inform people about the daily charges, deter polluting vehicles from entering the zone, and encourage those with chargeable, non-compliant vehicles regularly entering the zone to upgrade their vehicles, or consider alternative sustainable transport options.

Revenue from daily charges and penalty charges is used to fund the operational costs of the scheme. Any surplus proceeds above operational costs must be reinvested into projects which directly or indirectly support improvements to sustainable transport or air quality.

A full financial summary of the CAZ in 2024, detailing programmes supported by the reinvestment reserve, can be viewed in Appendix 3.

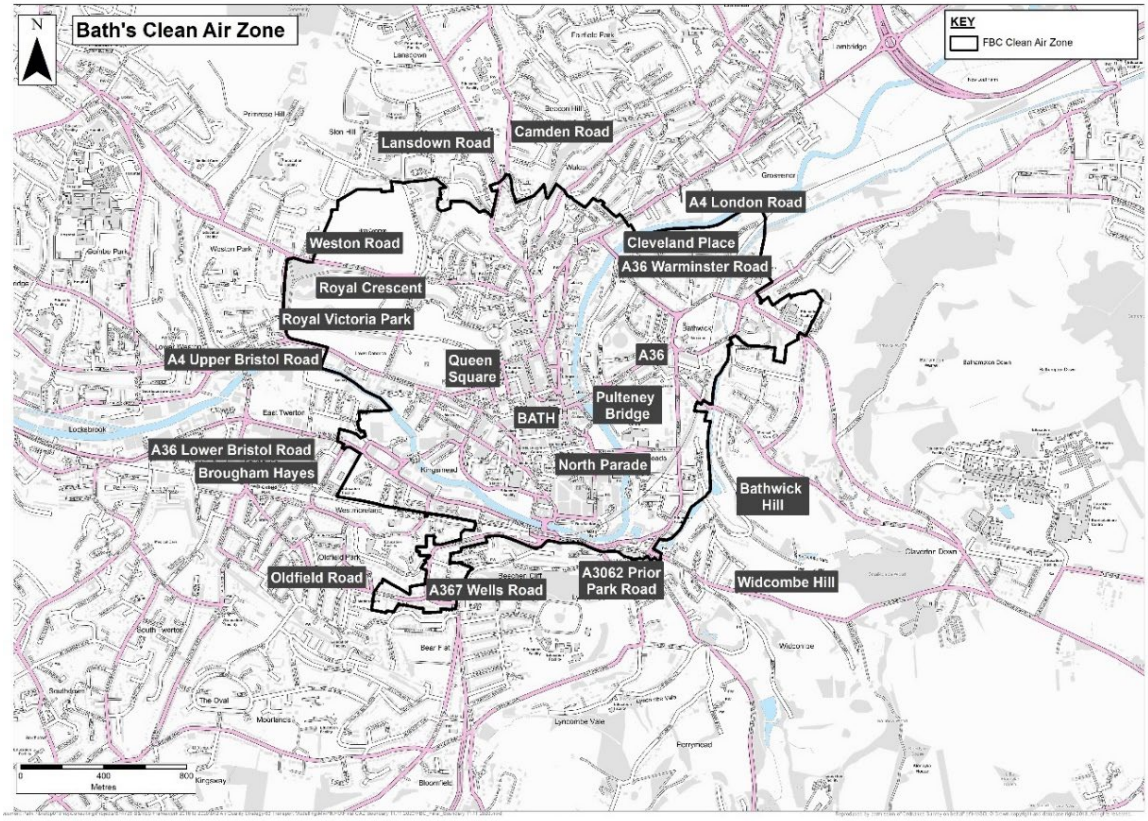
Zone boundary

The CAZ covers the very centre of the city (see Figure 1), but its boundary is designed to ensure that annual average levels of NO_2 both inside and outside the zone were

within acceptable legal limits. An interactive map can be viewed online at: https://beta.bathnes.gov.uk/view-map-baths-clean-air-zone

The CAZ is as small as possible to minimise the social, economic, and distributional impact of the scheme, whilst at the same time capturing as many non-compliant vehicle movements as possible in and around the city.

Figure 1 A map of the CAZ boundary.



Exemptions

National exemptions apply permanently for ultra-low emission vehicles, hybrid (within Bath) and alternatively fuelled vehicles, disabled passenger tax class vehicles, disabled tax class vehicles, military vehicles, historic vehicles, and vehicles with retrofit technology accredited by the Clean Vehicle Retrofit Accreditation Scheme (CVRAS).

Local exemptions applied temporarily from launch for up to two years for certain vulnerable groups, and hard-to-replace vehicles. Exemptions were also introduced to encourage applications to the now closed FAS to upgrade or replace non-compliant vehicles. Exemptions were developed in response to feedback from public consultations and to mitigate the impact of charges on certain groups. For more information on local exemptions see https://beta.bathnes.gov.uk/get-exemption-or-discount-baths-clean-air-zone

1.6 Assessing the impacts of Bath's CAZ

To show that the CAZ is having the desired effect and achieving success, evidence is required to show that the annual average levels of NO_2 recorded at every valid monitoring site (according to JAQU's criteria) in Bath (both inside and outside of the zone) do not exceed 40 µg/m^3.

It is also relevant to report on rates of vehicle compliance. There were initial concerns raised by the public as to how the zone might impact traffic flow, business and personal travel behaviour, and the local economy, and the report therefore considers data to measure any such impacts, to ascertain whether corrective action is required.

The purpose of the Council's annual reports is to provide a more in-depth view of the zone's performance with extra secondary measures considered, as outlined in Table 1. The full monitoring and evaluation plan, published as part of the Full Business Case, can be viewed at the following:

https://beta.bathnes.gov.uk/sites/default/files/2020-10/appendix_r_674726.br_.042.fbc-26_monitoring_and_evaluation_plan.pdf

Table 1 Data collection and collation for Bath CAZ annual reporting.

Measure	Data to be Used	Rationale for Inclusion	Data Collection Methods	Frequency of Data Output
M1: Air quality data	NO_2 concentrations data collected at existing monitoring locations in Bath and wider B&NES	To understand changes in air quality data, particularly NO_2 concentrations.	Diffusion tubes and real time monitoring	Quarterly and annually
M2: Traffic Flows	Traffic Flows in and around the CAZ areas are collected to understand the changes in traffic flows as a result of the scheme.	To understand changes in traffic flows along key corridors and links on the highway network. This includes possible 'rat-run' routes which may have been created by the CAZ, so responding to consultation concerns by residents in specific areas.	Automatic Number Plate Recognition (ANPR) cordon and ancillary Manual Classified Counts (MTC) or ATC on key roads or perceived 'rat-runs'	Quarterly and annually
M3: Vehicular fleet information	Number of compliant/non-compliant vehicles travelling within Bath	To understand changes in the type of vehicles travelling in Bath.	ANPR cordon, cross-referencing with DVLA vehicle database	Quarterly and annually
M4: Retail/business/office space vacancy figures	Vacancy statistics from internal Council data (B&NES economy and growth team). Market data from property consultants. Purchasing Managers Index.	To understand changes to the number of businesses operating in Bath in order to assess economic impacts.	Internal data collection as part of ongoing process. Regular property market reports published by property consultants in the public domain could also be utilised.	Annually

Measure	Data to be Used	Rationale for Inclusion	Data Collection Methods	Frequency of Data Output
M5: Retail footfall surveys	Footfall data from Bath Business Improvement District (BID) data and internal Council data.	To understand changes to the number of people entering shops in Bath as well as the time they spend in each shop.	Bath BID and B&NES collect this data as part of ongoing processes.	Annually
M6: Park and Ride passenger data	Occupancy statistics (Cloud Amber) and bus ticket data (First). Monitor fleet mix	To understand changes in the number of people and the type of vehicle using the Park and Ride (P&R) into Bath.	Collected as part of ongoing monitoring activities by operators. ANPR at entrance to Park and Rides	Annually
M7: Walking and cycling counts	Pedestrian and cycle counts on key arterial routes	To understand changes in the number of people walking and cycling on key routes within Bath.	Commissioning of new surveys	Annually
M8: Bus usage and fare data	Occupancy statistics (Cloud Amber) and bus ticket data (First).	To understand changes in the number of people using the bus on each route into Bath.	Collected as part of ongoing monitoring activities by operators.	Annually
M9: Stakeholder Feedback from Council User Group Forums	Stakeholder Feedback covering relevant elected members, stakeholder groups, the Local Enterprise Partnership (LEP). Voice Box survey. Protected groups survey.	Understand the views of stakeholders to scheme delivery and impacts, and to understand some of the less quantified effects, including package effects.	Part of the on-going consultation process for transport strategies in the city.	Annually

Measure	Data to be Used	Rationale for Inclusion	Data Collection Methods	Frequency of Data Output
M10: Taxi fares and unmet demand	Taxi fare data and unmet demand surveys	To understand changes to fares and demand on taxis in order to assess the economic impacts	Collected as part of ongoing monitoring activities by operators.	When unmet demand surveys are performed (every three years)
M11: Early Measures Fund – Zero-Emission Parking Permits	Statistics on zero-emission vehicle parking permits scheme uptake	To understand the popularity	Collected as part of the parking permit scheme operation	Annually, and finally in 2022 when the scheme has ended
M12: Bus retrofit uptake/compliance data	Statistics on bus retrofit scheme uptake and bus compliance	To understand changes to bus fleet operating in Bath.	Collected by ANPR cameras, as part of ongoing monitoring activities by operators and from the retrofit scheme	Quarterly and annually
M13: Financial support scheme uptake	Statistics on financial support scheme uptake	To understand the success and popularity of the financial support schemes in changing to compliant vehicles	Collected as part of the financial support scheme operation	Quarterly and annually and finally after the scheme has ended
M14: Travel advisor session uptake	Statistics on meetings with travel advisors	To understand the overall success of travel advisors and	Collected as part of the travel advisor scheme operation	Quarterly and annually
M15: Anti-idling enforcement	Data from enforcement action for anti-idling	To understand the success of the measure in reducing idling	Collected as part of the anti-idling enforcement scheme operation	Annually
M16: Weight restriction enforcement	Data from enforcement action for anti-idling	To understand the success of the measure in enforcing weight restrictions	Collected as part of the weight restriction enforcement scheme operation (from Trading Standards)	Annually

Measure	Data to be Used	Rationale for Inclusion	Data Collection Methods	Frequency of Data Output
M17: Only-mile delivery uptake	Statistics on only-mile delivery uptake	To understand the success of the only-mile delivery measure with businesses	Collected as part of the delivery and servicing plans operation	Quarterly and annually

2 Impacts of the CAZ on air quality

2.1 Critical success factors of the CAZ

To successfully monitor and evaluate the performance of the CAZ, two Critical Success Factors (CSF) were developed.

The primary CSF seeks to deliver compliance (in the shortest possible time) with the NO_2 concentration limit values outlined in the 2008 EU Air Quality Directive (AQD). This directive sets out sighting guidelines for monitoring locations. The Pollution Climate Mapping (PCM) model used by JAQU in their assessment of Bath's scheme, uses locations based on these requirements. To ensure that a receptor is compliant with AQD guidelines, it must be at least 25m away from a junction, 0.5m away from the nearest obstruction (including building façades), represent 100m stretch of road and be 1.5-4m high. An ideal location is 4m from the road and 2m high. Additionally, as the AQD looks at NO_2 concentrations at the point of monitoring, results are not adjusted to the façade, unlike the requirements of a LAQM site.

Currently not all diffusion tube receptor sites in Bath comply with AQD guidelines because many have been in place for several years to comply with LAQM positioning (see below).

The secondary CSF aims to deliver a scheme which leads to compliance with the LAQM Air Quality Objectives for NO_2 concentrations. As LAQM focuses on NO_2 concentrations at the point of relevant public exposure (facades of schools, care homes, hospitals etc) NO_2 concentrations are adjusted to the nearest façade. Unlike the AQD requirements, sites can be placed on junctions and within 0.5m of a building façade, providing there is relevant public exposure.

2.2 Have we achieved success?

Official air quality data from 2021 was submitted to the Government's JAQU in summer 2022. Their findings confirmed that B&NES had successfully reached State 2 and achieved 'success'. Success is defined by the Government as "all measured NO_2 concentrations at valid locations within the geographical extent of the local authority clean air plan are below or equal to the annual average limit value."

Following the submission of official 2022 air quality data to the Government for an independent review, JAQU confirmed that B&NES had passed the State 3 Assessment in a full report. The report confirmed that there were reductions in the annual mean NO_2 target between 2019 and 2022, and there were no observations of increased concentrations at any of the diffusion tube sites. The summary report can be viewed at the following: https://beta.bathnes.gov.uk/sites/default/files/BaNES-2022-State-3-Summary.pdf

B&NES are continuing to monitor concentrations of NO_2 and will follow guidance from JAQU to progress along their roadmap to success.

2.3 How air quality data is measured and collected

The Council has measured air quality in Bath and North East Somerset since the mid-1990s. Currently NO_2, $PM_{2.5}$ and PM_{10} are measured using multiple methods.

Automatic analysers measure NO_2 and PM in three permanent roadside locations in Bath. They take hourly readings of air pollution concentrations and provide more accurate readings than diffusion tubes. One of these monitoring stations is linked to the UK Automatic Urban and Rural Network (AURN) which provides national coverage of a range of pollutants.

Diffusion tubes are light, mobile and can be placed in many locations around the area, usually 1 to 15 metres from the road or at the kerbside (less than 1 metre from the road) and around 2-3 metres above ground level. The ambient air reacts with a chemical reagent in the tube so that NO_2 concentrations can be measured. The tubes are exposed to the air for one month before they are collected and sent to a laboratory for analysis. During 2024, there were over 150 diffusion tube locations across Bath & North East Somerset.

In recent years, average annual levels of particulate matter pollution in Bath have not exceeded the legal limit of 40 µg/m^3 for PM_{10} and 20 µg/m^3 for $PM_{2.5}$. Occasional 24-hour exceedances occur but only at times when there were meteorological or other events that caused spikes in these pollutants. Additionally, during 2024, where the 24-hour average was exceeded, the number of exceedances across the year was within the permitted number. Whilst the Council continues to measure it, PM data does not form part of the annual CAZ reports.

Figures 2 and 3 below detail the placement of diffusion tube monitoring sites within and outside the CAZ respectively.

Figure 2 A map showing the CAZ and the automatic analyser (orange squares) and diffusion tubes (blue triangles) locations in Bath

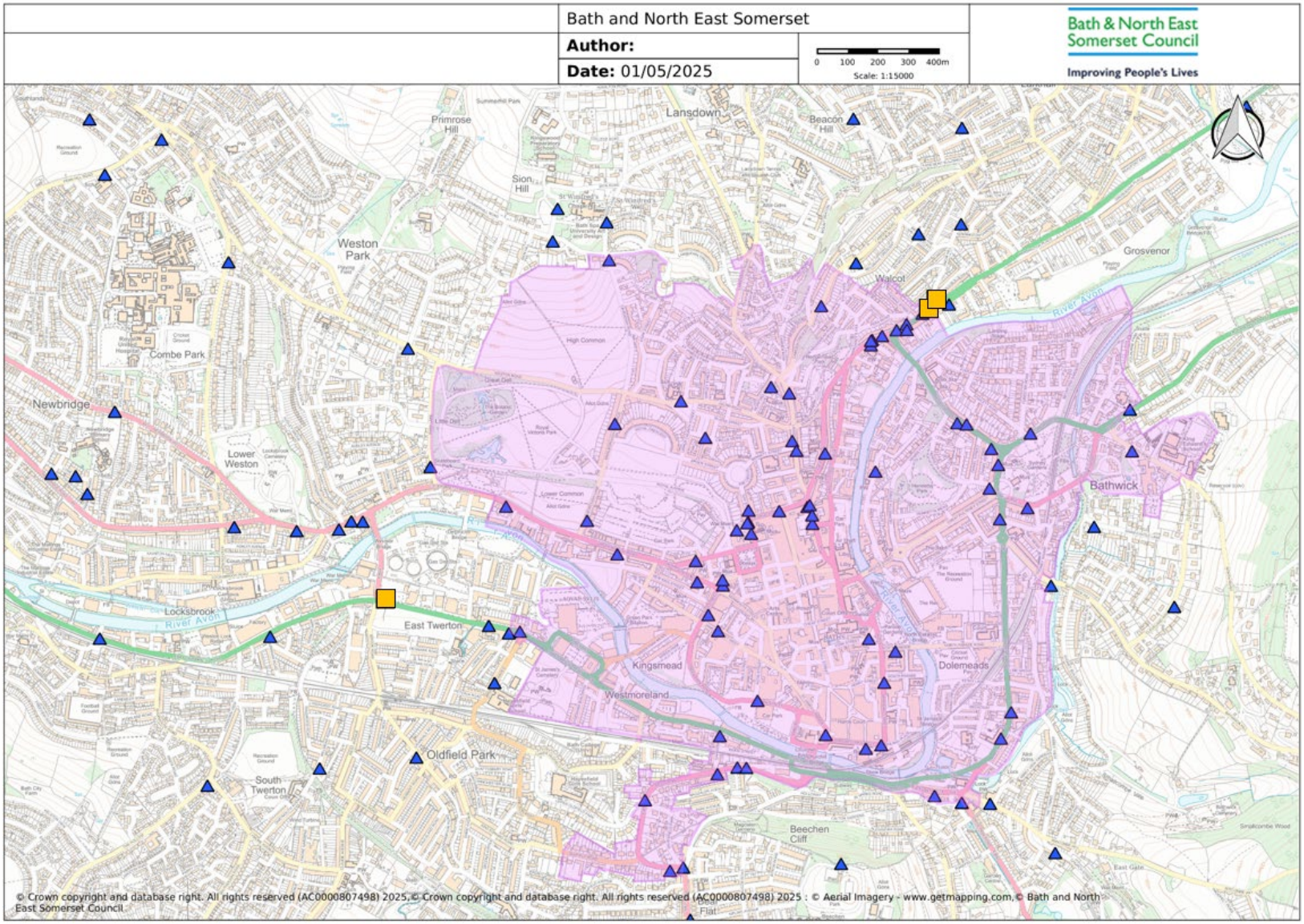
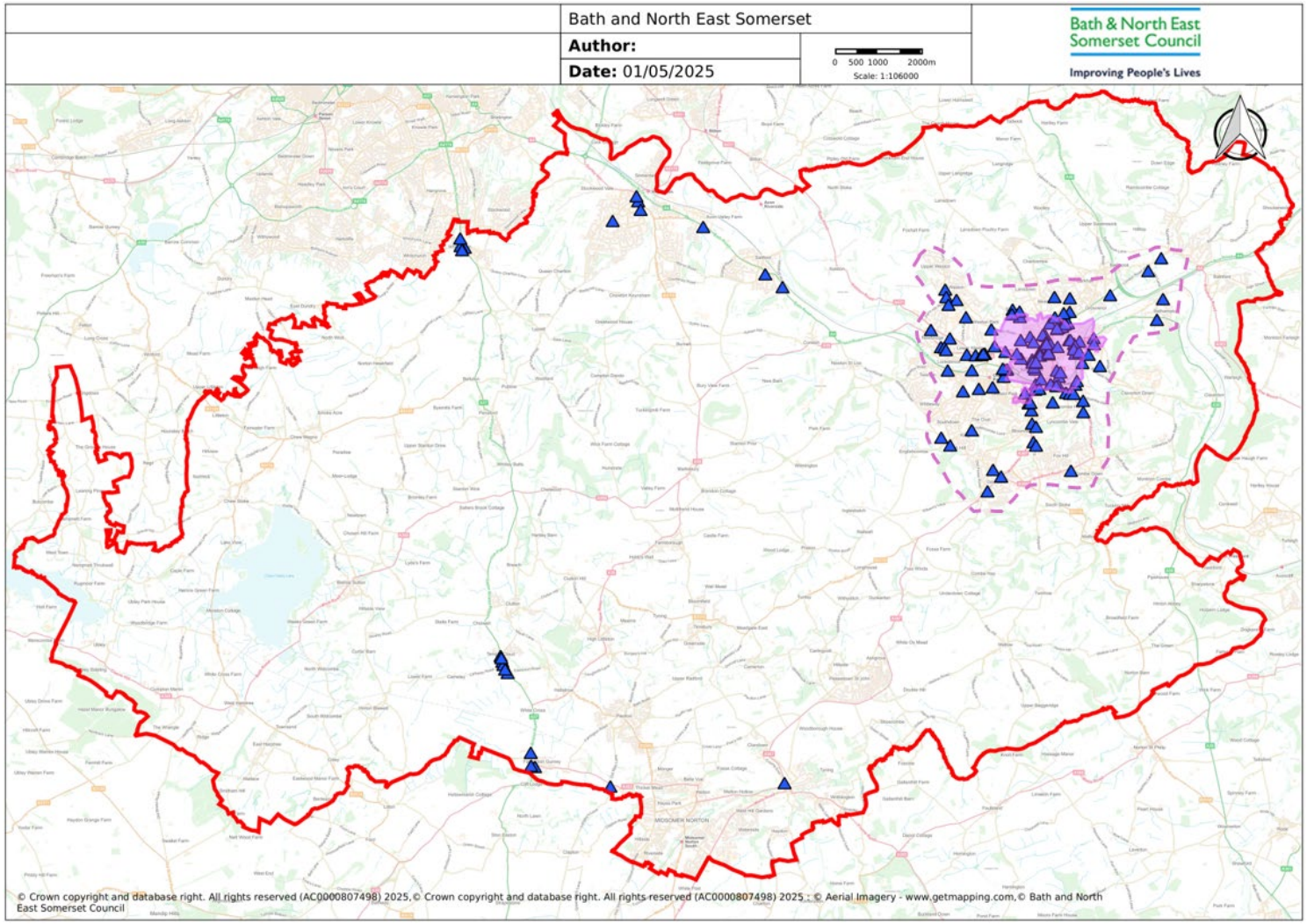


Figure 3 A map showing diffusion tube locations in three site groupings: The wider district of Bath and North East Somerset (the red line; Wider_B&NES), the wider Bath urban area outside of the CAZ (the dotted pink line; CAZ_Boundary) and the CAZ (the pink area; CAZ_Boundary).



Number of diffusion tube sites in each location

Table 2 shows the changing number of diffusion tube air quality monitoring sites across the authority area. Additional sites were chosen based on the air pollution dispersion model developed for the CAZ Full Business Case, enabling the impact of the CAZ to be checked against what was modelled.

Triplicate sites are where three diffusion tubes are co-located at one monitoring site to improve accuracy. These are located where annual NO_2 concentrations are predicted to be greater than 34 µg/m^3. The NO_2 concentration from each triplicate diffusion tube is averaged to produce one result for the site, so triplicate measurements are only counted once for analysis.

Table 2 Number of diffusion tube sites providing annualised data (triplicate sites are averaged, so only considered one location) from 2019 to the end of 2024, in the three site groupings.

Year	CAZ_Only	CAZ_Boundary	Wider_B&NES
2019	65	56	29
2020	65	56	34
2021	66	57	40
2022	71	67	33
2023	72	64	29
2024	72	65	29

Measuring air quality to take account of seasonal effects

Annual average concentrations are useful because they account for varying seasonal cycles of pollutants such as:

- Meteorological conditions, for example wind, precipitation, and temperature.
- And to a lesser degree, human sources of air pollution, for example increased energy generation for heating in winter or increased agricultural activities in spring

This is also why air quality data is compared against similar time periods, for example comparing data from 2024 to the baseline of 2019. Further information on monitoring can be found in the 'Monitoring Explained' section at the end of the report.

3 Annual air quality results, 2024

Although the focus of the report is 2024, historical data is analysed to identify longer-term trends, as well as focusing closely on certain sites, which do not meet the 40 µg/m^3 annual limit value. 2024 data is largely compared with baseline data from 2019. However, it will also occasionally be compared to 2023, 2022 and 2021. 2020 data has been discounted as a baseline because of Covid-19s unprecedented effect on traffic and travel behaviour.

The full annual diffusion tube results can be found in the Air Quality Data appendix supporting this report.

A note on distance adjusting

NO_2 concentrations reduce rapidly as you move away from the source (road). A LAQM receptor for NO_2 is a residential property, school, hospital etc. If a monitor is located at a roadside/kerbside location, then the concentrations are distance adjusted using a diffusion tube processing tool to calculate the concentration at the building façade. This is only carried out on concentrations which are above 36 µg/m^3 (within 10% of the limit value) and has not been performed on any results in this report. It is an important consideration when considering the success of the CAZ.

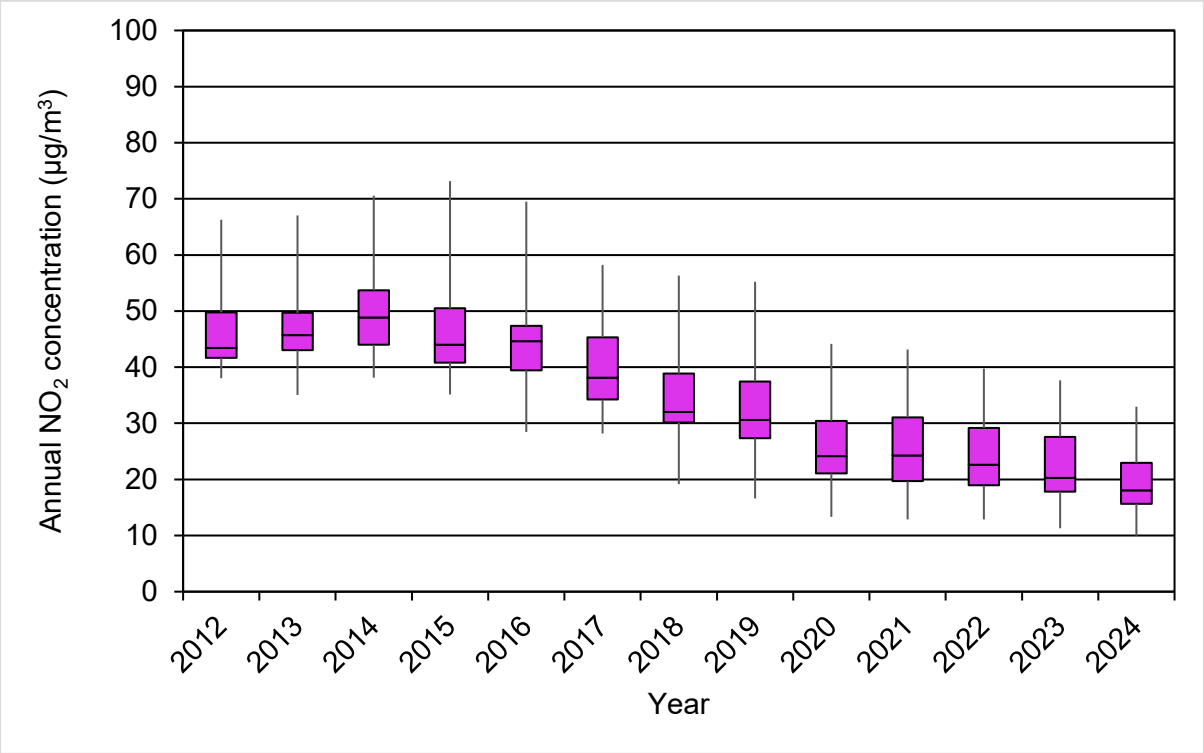
Comments and key findings:

- This analysis considers annual data from all sites within the CAZ and the surrounding urban area.
- No sites within the CAZ or CAZ_Boundary recorded an annual mean concentration above 36 µg/m^3.
- No sites recorded an increase in NO_2 concentrations between the baseline year of 2019 and 2024.
- Within the CAZ, 21 fewer sites recorded concentrations above 36 µg/m^3 compared with 2019, and 10 fewer sites recorded concentrations above 40 µg/m^3.
- Within the CAZ_Boundary, 7 fewer sites recorded concentrations above 36 µg/m^3 compared with 2019, and 2 fewer sites recorded concentrations above 40 µg/m^3.

3.1 Long-term trends - Box plots

It is important to investigate individual sites where NO_2 concentrations are high or increasing. It is also important to understand longer-term trends and more wide-ranging trends. Figure 4, below, shows boxplots of sites within the CAZ for the last 13 years.

Figure 4 Boxplots within the CAZ showing the range in NO_2 concentrations over the last 13 years.

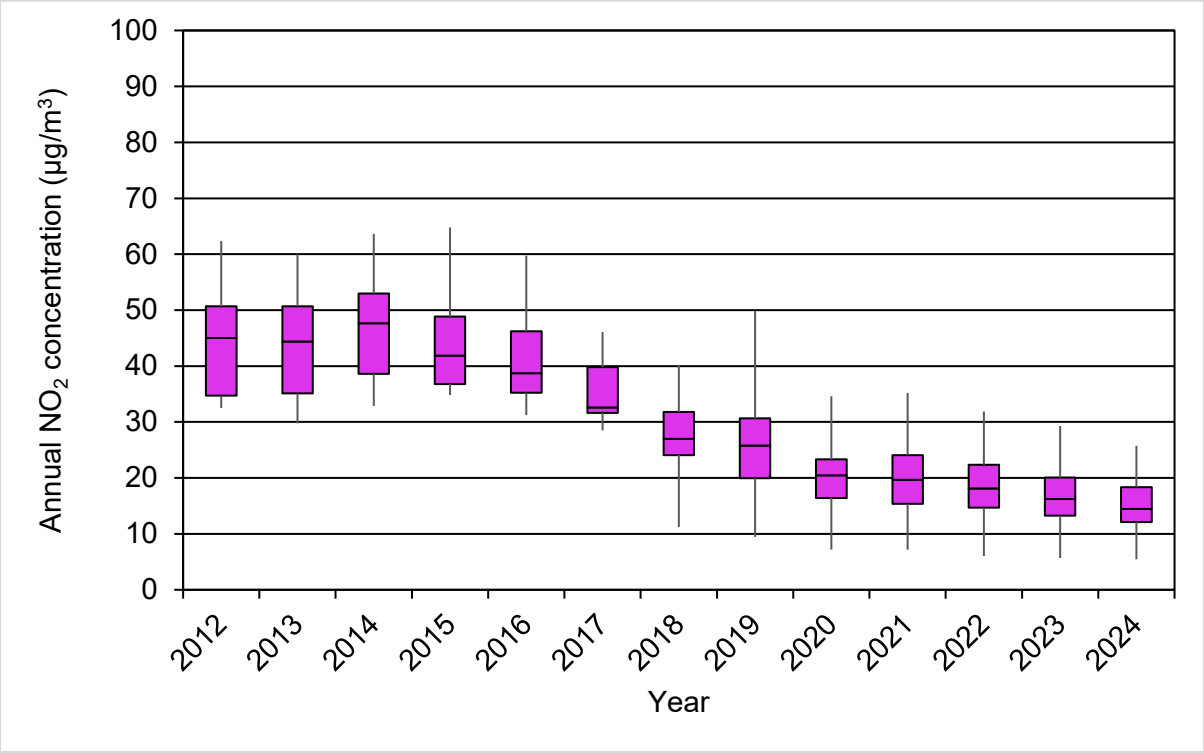


The whiskers show the minimum and maximum annual average NO_2 concentrations during that year. The bottom of the blue box shows the first quartile, the black line in the box is the median result and the top of the pink box is the third quartile. The box therefore represents the inter-quartile range, where 50% of the data is found.

Comments and key findings:

- There is a clear decrease in the full range of data from 2014 onwards, with there being a gentler decrease from 2020 onwards.
- Aside from the slight increase in median NO_2 during 2021 likely because of the impact of Covid-19, the last increase in median was 2016.
- The minimum and maximum data continues to decrease, as shown by the whiskers. The lowest datapoint in 2012 is greater than the highest data point in 2024.
- Figure 4 shows that the interquartile range and median results for 2024 are much lower, whereas they remained relatively unchanged between 2020 and 2022.
- NO_2 concentrations in 2020 were lower than average likely due to the impact of Covid-19. However, concentrations in 2024 are lower than 2020 on average.

Figure 5 Boxplots showing the range in NO_2 concentrations within the CAZ_Boundary over the last 13 years



Comments and key findings:

- The CAZ_Boundary shows a greater interquartile range in the earlier years than the CAZ, which may represent that the wider urban area contains many monitoring sites located at road sides (higher concentrations of NO_2) and those sites which are located as background sites (much lower concentrations), thus resulting in a greater range of values.
- The interquartile range reduced in size through time. This is despite there being an increase in sites but may be because the reducing NO_2 concentrations are approaching background levels towards the end of 2024, so the reduction is smaller.
- Like that of the CAZ_Only grouping, the maximum 2024 data is less than the lowest NO_2 concentration in 2012. This overall shows how significant the reductions have been since 2012.

3.2 Long-term trends - Histograms

An alternative way to consider the data is the use of histograms. The blue columns in Figures 6 and 7 below relate to the baseline data in 2019, whilst the pink columns relate to 2024 data.

Figure 6 A histogram showing the number of CAZ sites listed in 'bins' (x-axis) of annual NO_2 concentrations in both 2019 and 2024.

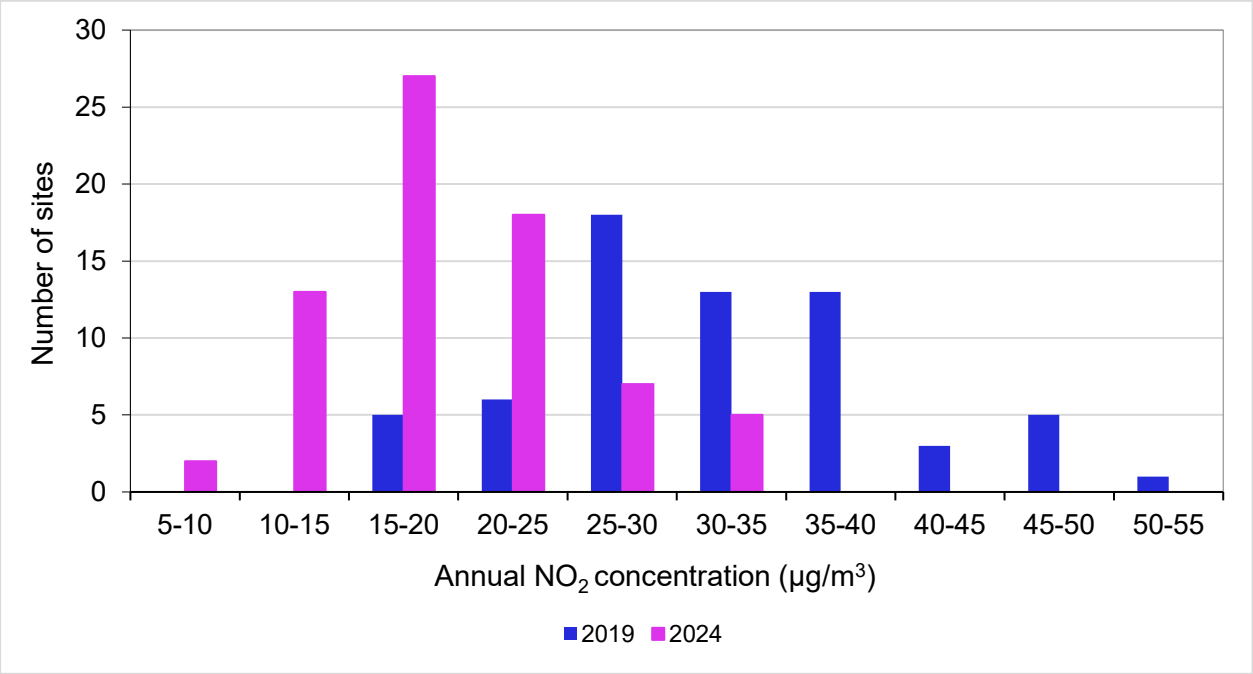
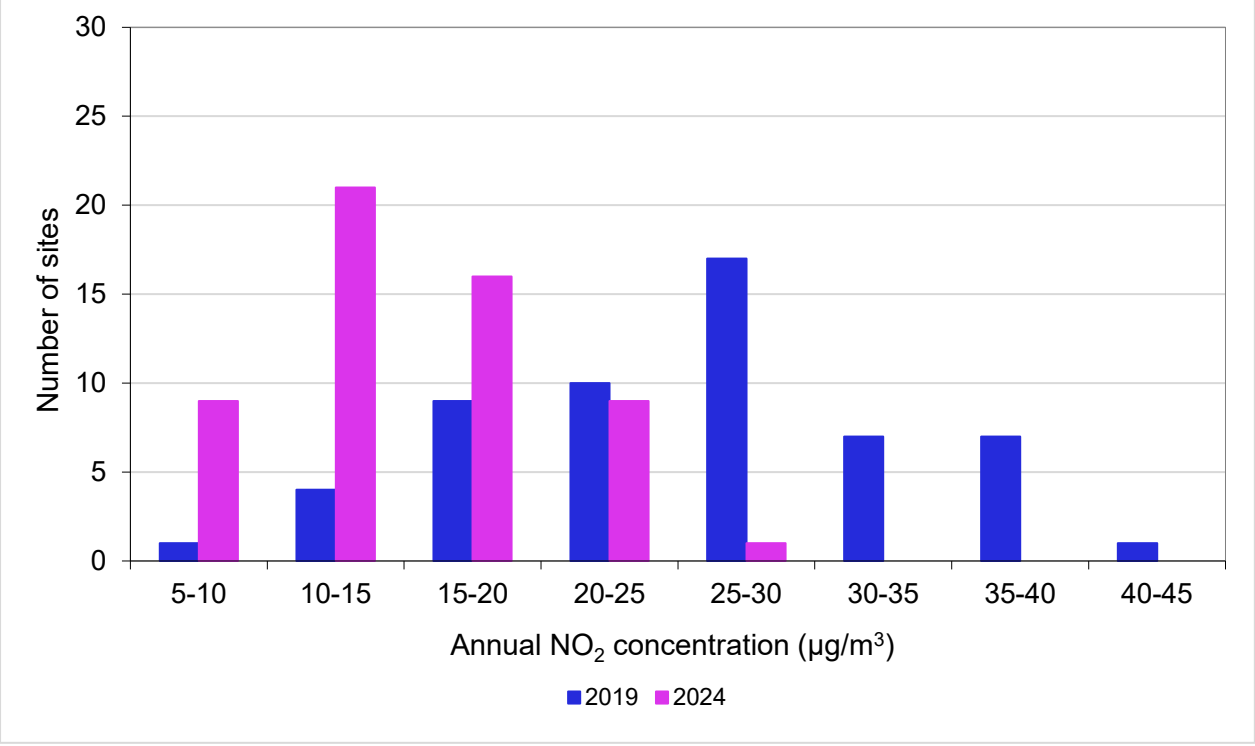


Figure 7 A histogram showing the number of CAZ_Boundary sites listed in 'bins' (x-axis) of annual NO_2 concentrations in both 2019 and 2024.



Comments and key findings:

- There is a clear shift in the distribution of sites, as they record lower NO_2 concentrations in 2024 than in 2019.
- Zero sites within the CAZ and CAZ_Boundary recorded above the objective of 40 µg/m^3 in 2024.
- Within the CAZ and CAZ_Boundary, no site recorded greater than 36 µg/m^3 in 2024.
- Overall, Figures 6 and 7 indicate a positive improvement in NO_2 concentrations since the implementation of the CAZ in 2021.

3.3 Long-term trend analysis

Here the trend analysis for the NO_2 diffusion tube data is presented by comparing 2024 to previous years. Within this analysis sites are discounted that are missing data, therefore only comparing sites that have full data from 2019 through to 2024, ensuring that the analysis is like-for-like and robust. Note that the results for 2020 have not been included due to the impacts of Covid-19.

Table 3, below, provides a breakdown of the NO_2 concentrations at sites across the three site groupings. The annual average NO_2 concentration across all three site groupings is shown dependent on how many sites were recording data during both 2019 and 2024.

Table 3 Provisional NO_2 concentrations across the three site groupings

Period	CAZ_Only NO_2 (µg/m^3)	CAZ_Boundary NO_2 (µg/m^3)	Wider_B&NES NO_2 (µg/m^3)
2019	32.4	25.7	32.7
2021	25.4	20.0	26.5
2022	23.9	18.6	24.8
2023	21.9	17.0	22.2
2024	19.4	15.3	20.6
Number of sites reporting results	65	56	18

Comments and key findings:

- NO_2 concentrations have continued to fall across all site groupings since the baseline year of 2019. There has been a 40% reduction within the CAZ, or a reduction of 13.0 µg/m^3. Within the CAZ_Boundary, there has been a 41% reduction, or 10.4 µg/m^3. Note that the CAZ_Only grouping has a greater

actual NO_2 reduction despite the percentage reduction being marginally lower.

- Within the Wider_B&NES grouping there has been a reduction of 37% or 12.2 µg/m^3.
- NO_2 concentrations have continued to decrease when compared to 2023. Concentrations within the CAZ have decreased a further 12% in 2024 when compared to 2023, with reductions also being seen in the CAZ_Boundary (10%). Note that the CAZ_Only grouping has a greater actual NO_2 reduction despite the percentage reduction being marginally lower.
- An additional reduction was also seen in the Wider_B&NES category where there was a reduction of 7% in 2024 when compared to 2023.

3.4 Automatic analyser trends

With hundreds of diffusion tubes sited across the CAZ and the wider authority, they are useful for understanding trends in air quality and localised pollution, but they are not as accurate as automatic analysers.

The locations of the Council's three permanent automatic analysers can be found in Figure 2, earlier in the report. These analysers are bulky and cannot be moved, therefore, whilst they are more accurate than diffusion tubes, they are less useful for monitoring localised air pollution or wider geographical trends. Note that due to low concentrations of NO_2 at the Guildhall site, monitoring ceased at this site at the end of 2023.

Table 4 Annual average NO_2 Data from the three automatic analysers in Bath

Year	A4 London Road	Chelsea House	Guildhall	Windsor Bridge
2016	-	29	34	33
2017	-	29	30	33
2018	-	26	29	30
2019	29	22	27	29
2020	28	20	19	23
2021	27	18	20	23
2022	25	18	20	21
2023	24	17	20	19
2024	20	14	-	18

Comments and key findings:

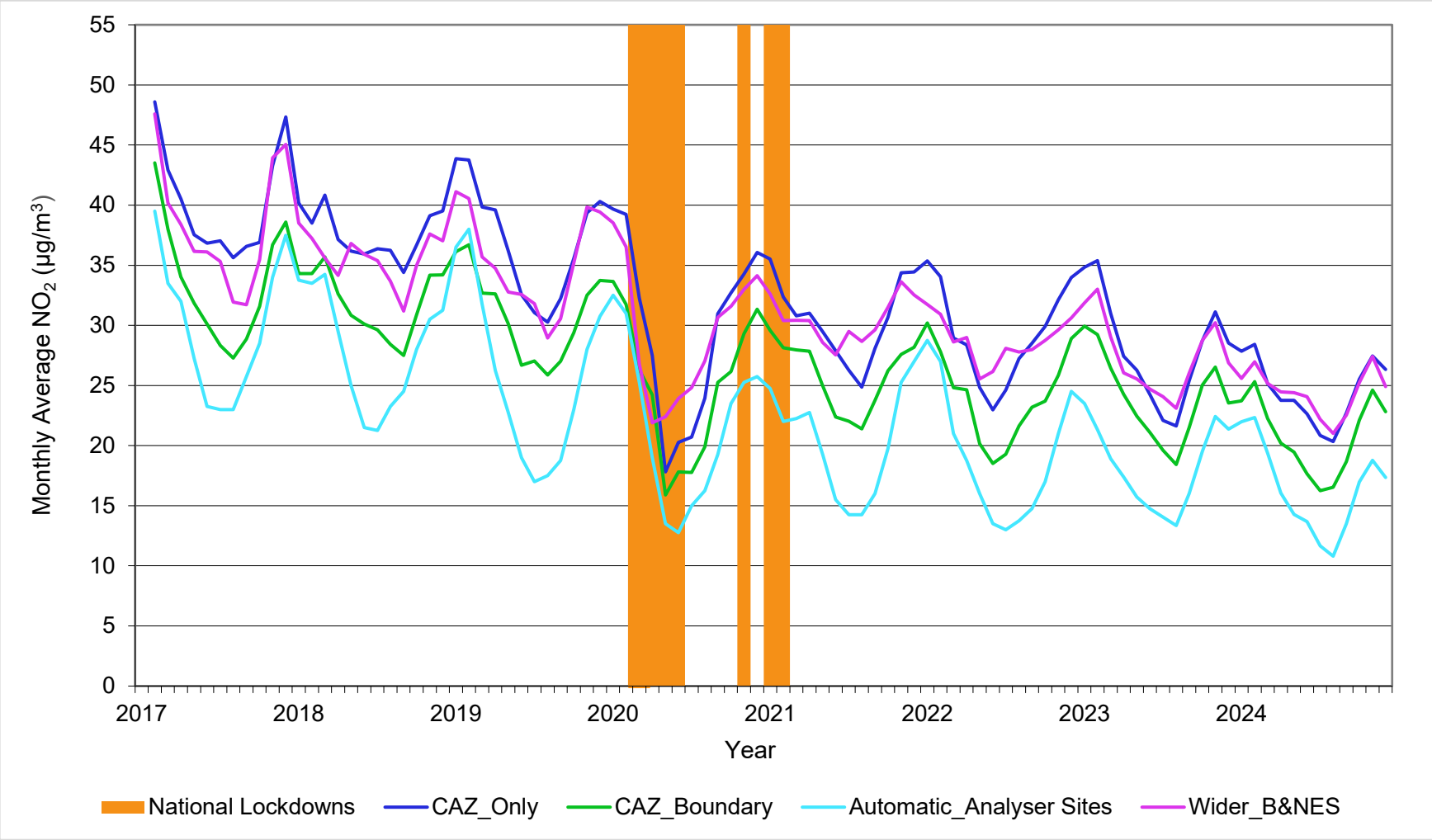
- All three automatic analysers in 2024 continued to record annual average NO_2 concentrations well below the 40 µg/m^3 annual limit value.

- Both the Chelsea House and Windsor Bridge have seen a decrease of 15 µg/m^3 since 2016.
- The A4 London Road side recorded the highest NO_2 concentration in 2024 at 20 µg/m^3. However, this is still well below the limit value and lower than at the same site in 2019.
- when compared to 2019.
- Due to continued recording of low concentrations at the Guildhall, monitoring ceased at this site at the end of 2023.

3.5 Monthly long-term data

Figure 8, below, shows the monthly average readings that were taken from 41 long-term monitoring diffusion tube sites (18 within the CAZ, 11 in the urban area outside of the CAZ, and 12 in the wider area outside of Bath) and two automatic analysers at Chelsea House and Windsor Bridge in Bath. Data collected from the Guildhall analyser (where monitoring ceased at the end of 2023) and the A4 London Road was omitted as it was incomplete for the period between 2019 and 2024.

Figure 8 Monthly average diffusion tube NO2 concentrations in B&NES from 2017 to 2024, separated into the three site groupings alongside the average of three automatic analyser sites in Bath.



Comments and key findings:

- The data used in this analysis is raw monthly data and is unadjusted.
- For comparative purposes, sites have only been included and compared that have been in place since 2017 (many additional monitoring sites have been added which are not included).
- The automatic analyser data is lower than that of the diffusion tubes for multiple reasons. One reason is that the automatic analysers are more accurate than diffusion tubes which need to be adjusted with a bias factor from the automatic analysers.
- There is a general downward trend with average monthly NO_2 concentrations falling since 2017. This is likely due to the natural replacement of older, more polluting vehicles with cleaner, compliant ones, with the CAZ increasing this natural replacement rate more rapidly.
- There is a clear seasonal trend in the data, with increased NO_2 concentrations in the winter. This is part of the reason why concentrations appear to be increasing and then dropping towards the end of 2024.
- A marked decrease in mid-2020 is due to significantly less traffic on the roads due to the impacts of Covid-19.

As mentioned above, increased winter NO_2 concentrations are primarily due to:

- Lower vehicle catalytic temperatures meaning exhaust emissions abatement technology is less effective.
- Increased emissions from domestic sources, such as gas flues.
- NO_2 is retained in colder air for longer than warmer air.

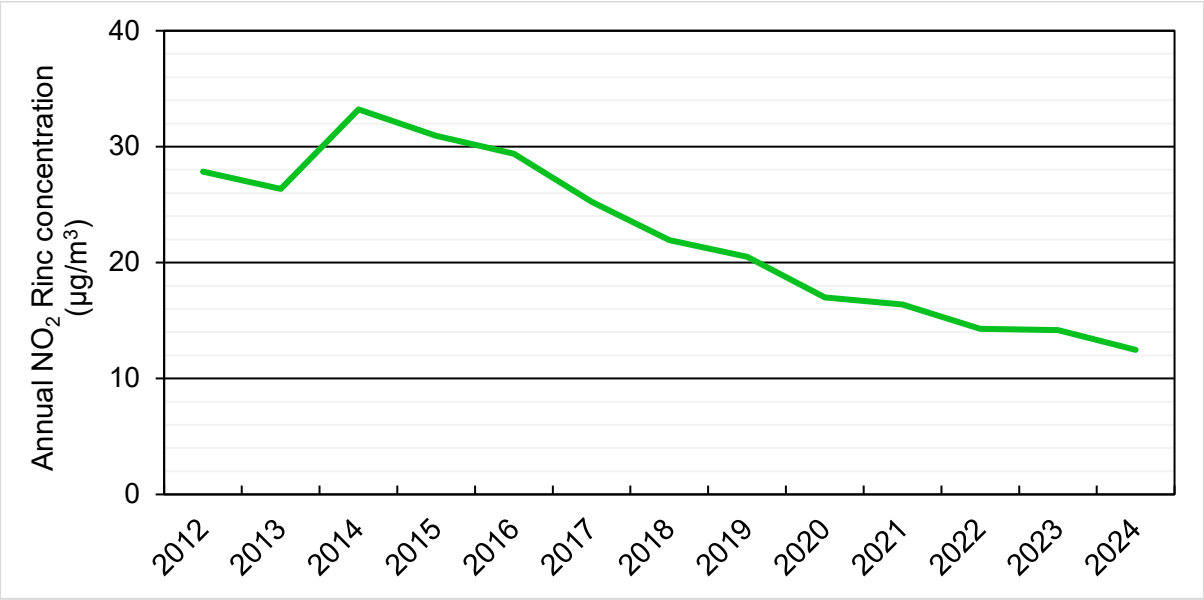
Roadside increment

The roadside increment (Rinc) of NO_2 concentration shows the changes in traffic-related NO_2 concentration, derived by the following equation:

Average NO2 concentration - Background NO_2 concentration

The graph below, (figure 9), shows a deeper understanding of the contribution of traffic to the NO_2 concentration near the CAZ.

Figure 9 Trends in Rinc in the CAZ_Boundary area since 2012.



Comments and key findings:

- In this analysis, the Rinc has been calculated by subtracting the annual average Alexandra Park NO_2 concentration, from the annual average NO_2 concentration from seven sites within the CAZ_Boundary area (that have data from 2012).
- The Rinc is useful as it demonstrates the proportion of NO_2 pollution from road traffic sources, as opposed to other sources e.g., gas boilers.
- Background sites are positioned away from roads to avoid localised pollution from road traffic. In Bath, the urban background location is at Alexandra Park, which is in the urban area outside of the CAZ.
- There is a clear decreasing trend in the Rinc from 2014 likely due to natural fleet upgrades and the introduction of Euro 6 emission standards in 2015.
- The Rinc decreased 1.7 µg/m^3 between 2023 and 2024. It is anticipated that the rate of decrease may begin to slow as the uptake to newer Euro 6 vehicles also begins to slow.

4 Impacts of the CAZ on traffic flow

A CAZ is primarily designed to improve the compliance of vehicles driving in polluted areas rather than reducing traffic volumes meaning it is aimed at reducing pollution, not congestion.

However, road traffic is the most significant cause of NO_2 pollution in Bath, so the Council monitor any changes in traffic flow in and around the zone and on the highway network around the city. This data helps us understand whether the zone is negatively impacting air quality and/or road safety on other roads.

It is important to remember that not all vehicles are chargeable, and most vehicles have no need to avoid the zone or seek alternative routes. Our traffic counts record any traffic movement, regardless of the vehicle type or compliance status.

4.1 How changes in traffic flow are measured

B&NES monitor the direction and volume of traffic on specific routes using MTCs, ATCs and ANPR cameras. This report focuses on key roads inside and outside the CAZ and on connecting highways.

4.2 Understanding the data used throughout this section

To understand the impact of the zone, data from 2024 has been compared to 2023, 2022 and a baseline year ranging from 2016 to 2018 depending upon data availability. Data from 2020 has been discounted due to the impacts of Covid-19 on traffic and travel. The Council additionally holds insufficient data for the year 2019. Where sites are new or temporary, there is no baseline year available.

Within the CAZ, data availability from the Council's permanent ATC network has some variation due to network trials and upgrades. During 2022, the network, particularly within the CAZ, was being upgraded with new, more reliable technology to replace the older, faulty counters that were no longer maintained. As a result, there are some inconsistencies with data availability, and individual sites may not hold a full data set from 2016 through to 2024.

To understand traffic flows within the CAZ, data from ATCs and some temporary surveys where required. Temporary surveys are not representative of the whole year and are instead being used to provide an indicative overview of traffic flows. The locations and results of surveys and ATCs are provided below.

It may be noted that the Council's ATC network is separate to the ANPR network that is used to enforce the CAZ. The ANPR cameras were not used to analyse traffic flows as they were not in place prior to the launch of the zone so there is no baseline for comparison.

4.3 Traffic flows within the CAZ

Table 5 ATC locations used within CAZ_Only analysis. The locations can be viewed below in Figure 10.

Site ID	Location	Site Category

96	A4 Upper Bristol Rd, West of Crecent Gardens	CAZ_Only
92	A36 Pulteney Road, South of Archway Street	CAZ_Only

Figure 10 ATC locations (red diamonds) used for traffic flow analysis within the CAZ. The number refers to the site ID which can be found in Table 5, above.

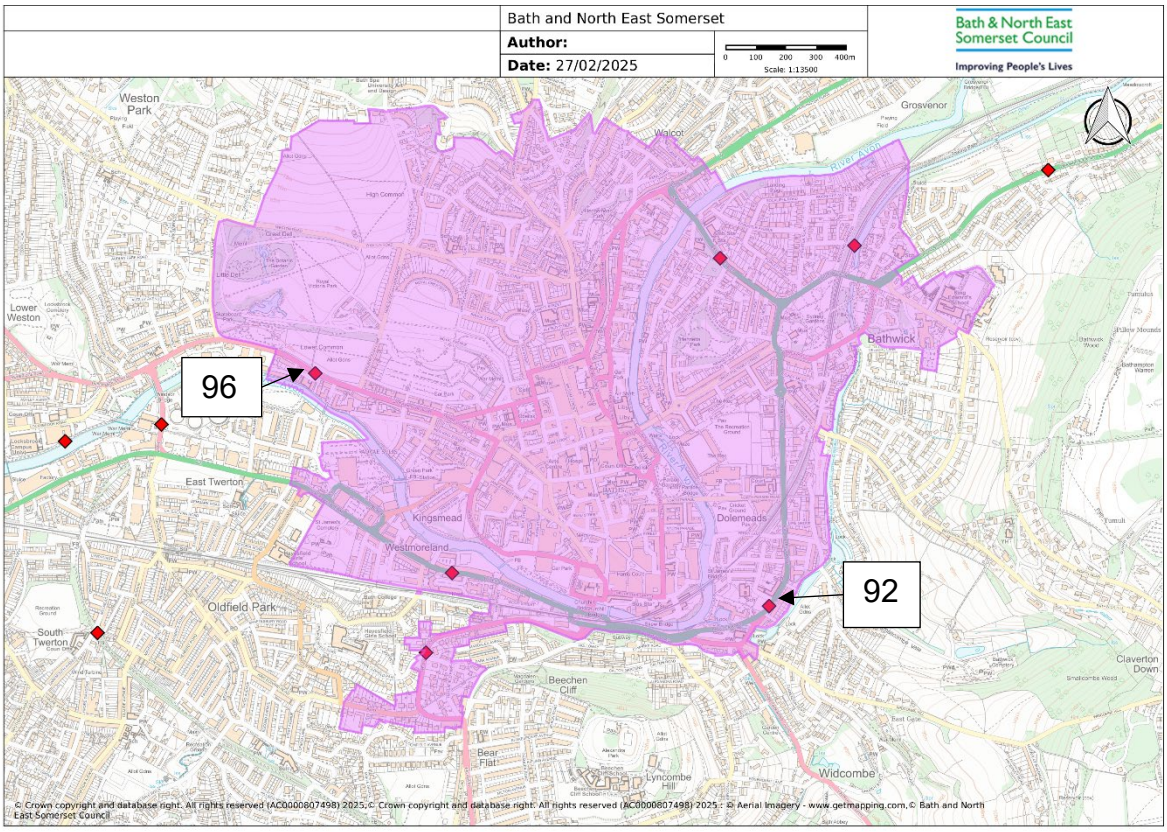
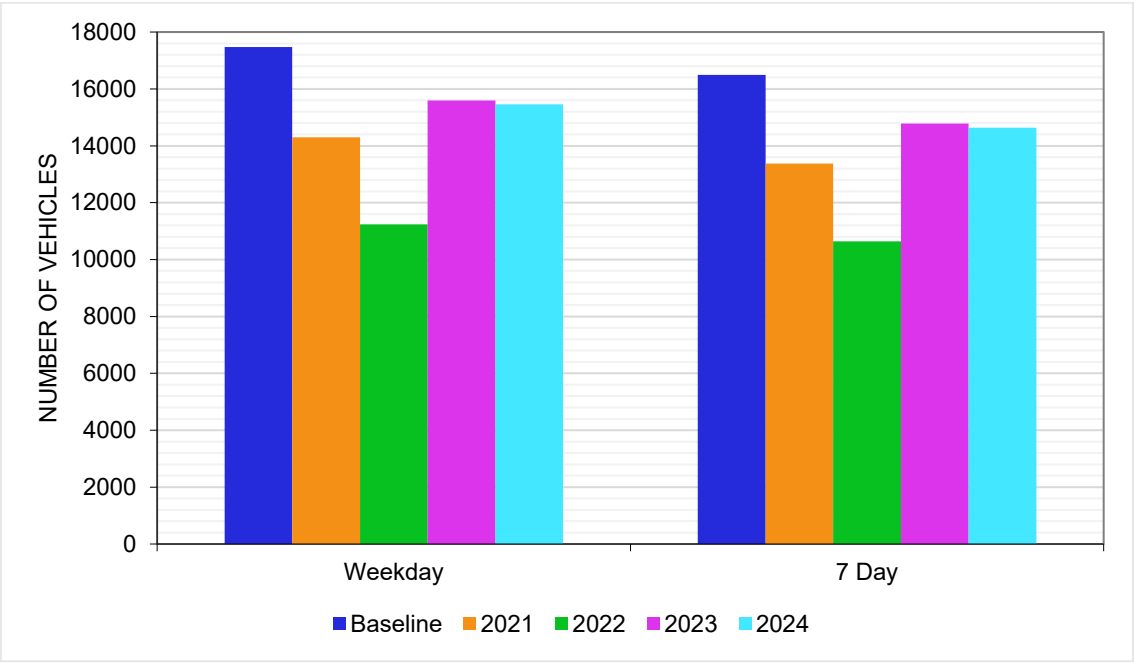


Figure 11 2024 traffic volumes within the CAZ compared to the baseline period (2016/2017) at the two ATC sites.



Comments and Findings

- Sites have been selected on the availability of data within the baseline years, 2022, 2023 and 2024.
- The baseline year comprises of data from 2016 and 2017
- Whilst an initial decrease was noted in 2022 due to the impacts of Covid-19, traffic volumes increased in 2023.
- However, traffic volumes in 2024 remain below that of the baseline, and marginally lower than 2023 with a decrease of 0.9%,

Table 6 Permanent ATC locations used within the CAZ_Boundary and Wider_B&NES analysis. Locations can be viewed in Figure 12.

Site ID	Location	Site Category
09	A36 Lower Bristol Road, East of Westmoreland Road	CAZ_Boundary
06	A3064 Windsor Bridge Road, North of Stable Yard	CAZ_Boundary
08	A4 Newbridge Road, East of A36 Lower Bristol Road	CAZ_Boundary
37	B3130 Chew Magna, East of Sandy Lane	Wider_B&NES
31	A4175 Durely Hill, West of Durely Lane	Wider_B&NES
10	A4 Box Road, West of County Boundry	Wider_B&NES

Annual and quarterly traffic flow is analysed to identify both the short and long-term trends. This section outlines data from the selected permanent ATCs identified in the above table and is used to identify trends around the CAZ.

Figure 12 Permanent ATC locations use for traffic flow analysis within the CAZ_Boundary and Wider_B&NES. The number refers to the site ID which can be found in in Table 6, above.

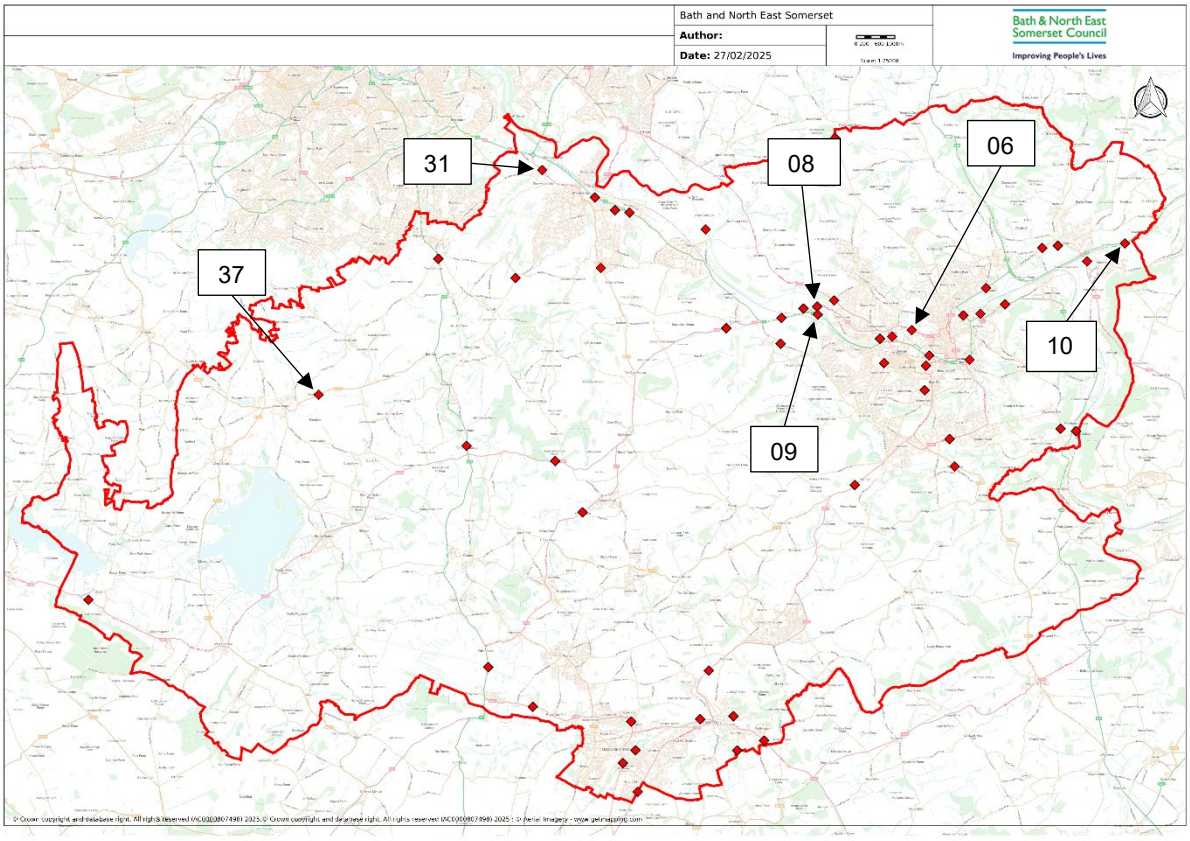


Figure 13 Two-way traffic flow data for the permanent ATC sites within the CAZ_Boundary. The graph compares pre-CAZ baseline between (2016-2017) and 2021-2024.

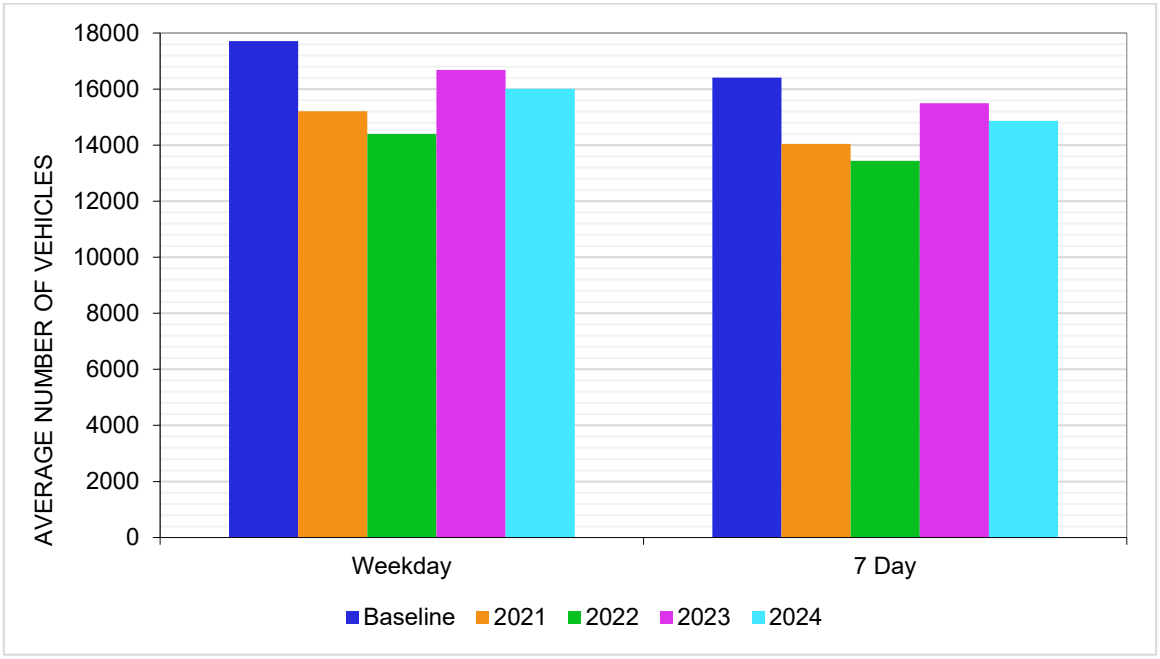


Figure 14 Two-way traffic flow data for the permanent ATC sites (outlined in map) within the Wider_B&NES. The graph compares pre-CAZ baseline between (2017-2019) and 2022-2024.

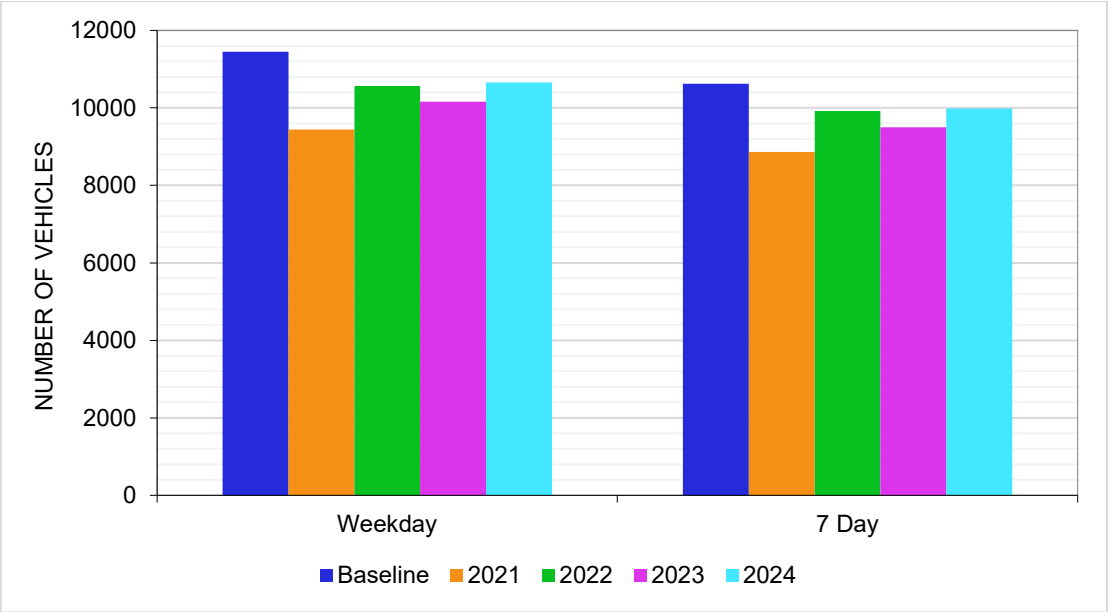


Table 7 Percentage change in quarterly traffic flows within both the CAZ_Boundary and Wider_B&NES from the baseline year to 2024. Analysis is based on a 7-day average.

Quarter	CAZ_Boundary	Wider_B&NES
1	-6%	-13%
2	-11%	-4%
3	-18%	-10%
4	-7%	-3%
Average Change	**-11%**	**-8%**

Comments and Key Findings

- Whilst annual average vehicle figures have fluctuated annually both CAZ_Boundary and Wider_B&NES areas have experienced a decrease in vehicle volumes in 2024 when compared to the baseline.
- 2024 data show a decrease in traffic flow within the CAZ compared to 2023 which was slightly higher.
- Within the CAZ_Boundary there is significant 10% reduction from 2023 traffic volumes, and an 11% reduction in traffic volumes for 2024 when compared to the baseline period. The Wider-BANES area also sees a reduction in traffic volumes of 8% from baseline period, a further 2% reduction from 2023 volumes.
- During the second quarter a significant decrease in traffic volumes was recorded. This is due to a four-week road work period where southbound traffic was diverted on Windsor Bridge. The impact of the roadworks will have contributed to the reductions seen in the quarterly change displayed in the table

above. When removing Windsor Bridge data for this month, the quarterly change decreases to a still significant amount of 16%.

- A substantial decrease in traffic volumes was also observed on Lower Bristol Road in April 2024 compared to the baseline period, with traffic volumes down 31% from the baseline period, and 27% lower than the previous month.
- A significant decrease in traffic volumes was observed on Windsor Bridge ATC in August 2024 compared to the baseline period, with traffic volumes down 33% from the baseline period, and 29% lower than the previous month.
- Noticeable fluctuations in traffic volumes could be due to temporary roadworks and traffic measures put in place throughout the network.
- Minor increases and decreases throughout the year may be present due to changing weather conditions

4.7 Diurnal traffic flow trends

An ‘inner cordon’ traffic survey has been carried out in Bath using data from eleven Manual Traffic Counters (MTCs), as seen in Figure 15 that are roughly around the CAZ boundary. The survey can offer insights into the diurnal trends in traffic flow in the city centre to help us understand changes in travel behaviour.

Figure 15 Map of inner-cordon ATC sites for hourly traffic flow analysis

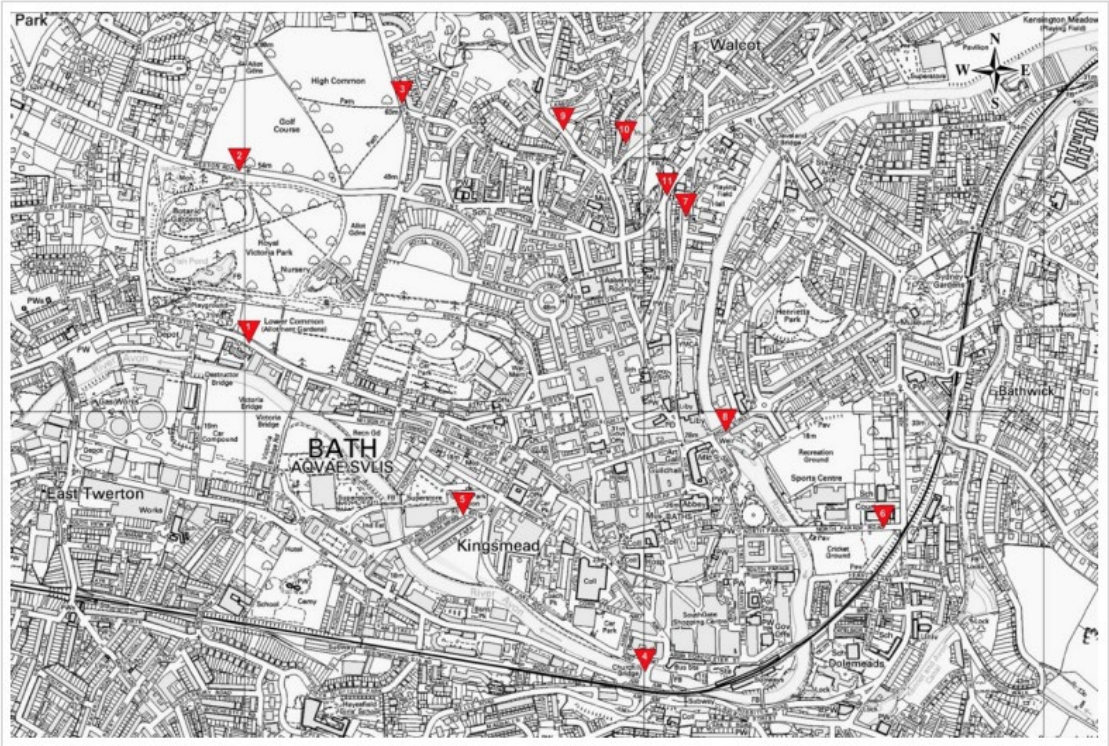
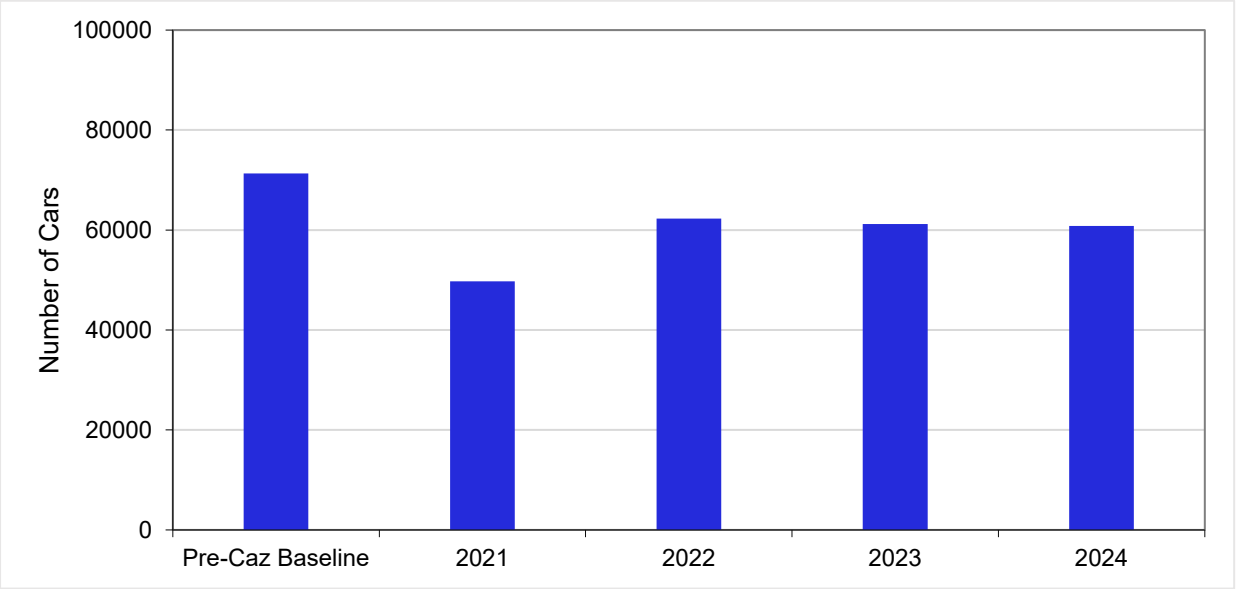


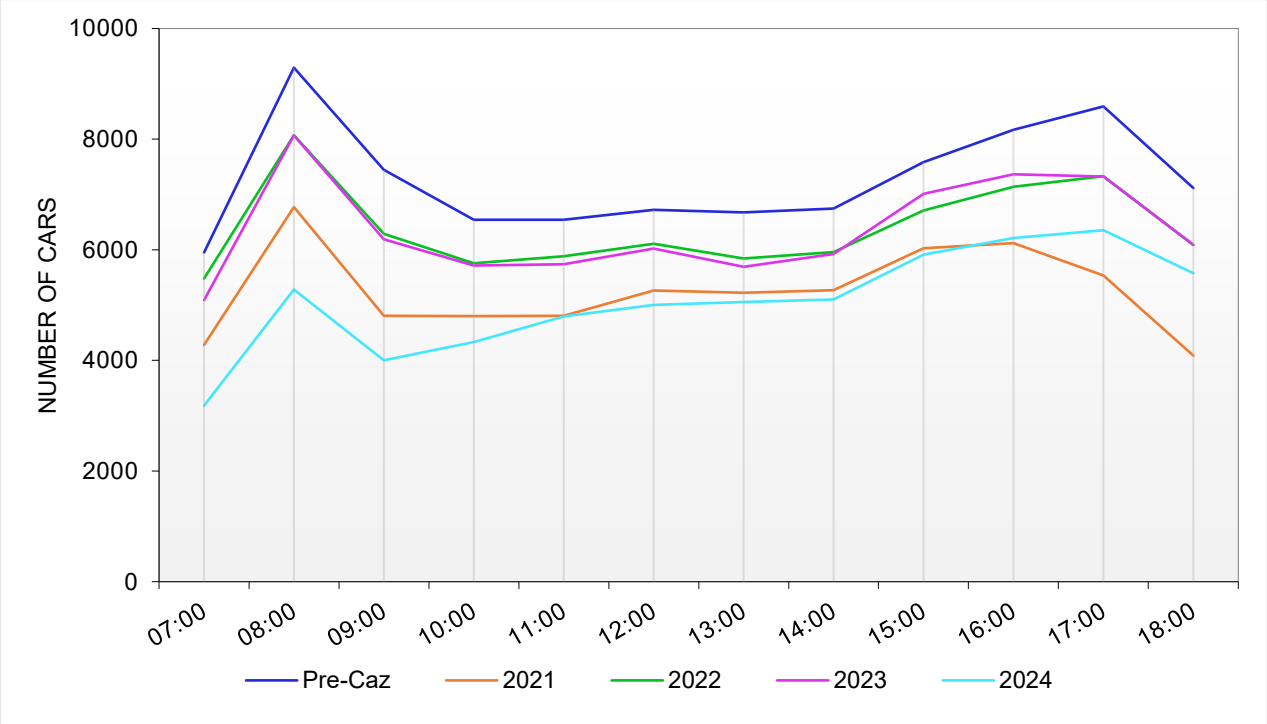
Figure 16 displays the number of cars passing eleven ATCs within Bath city centre, split over a day, to illustrate changes that occurred from 2021.



Comments and Key Findings

- The pre-CAZ baseline comprises of data from 2000-2020, excluding years 2014 and 2019, equating to an 18-year average.
- The pre-CAZ average baseline remains higher that present vehicle numbers. Traffic volumes through 2021 will have been impacted by the multiple Covid-19 lockdowns the nation experienced and therefore, traffic volumes are substantially lower than other years.

Figure 17 Bath inner cordon car count over the time of day. The pre-CAZ baseline draws on data from 2000-2020 but does not include 2014 or 2019.



Comments and key findings:

- Between 2021 and 2024, fewer cars travelled through the inner cordon per year compared to the pre-CAZ baseline.
- Whilst an increase in cars was seen in 2022 and 2023 when compared to 2021. 2024 saw an 11% decrease in cars when compared to the previous year, this equates to just under 2000 cars.
- Throughout 2021 to 2024, the morning peak remained pronounced between the hours of 8-9am. However, this peak has remained below pre-CAZ levels.
- Evening peaks between 4-5pm have noticeably decreased since 2022.
- The increase in morning peaks in 2022, 2023 and 2024 are indicative that travel and working patterns returned to normal post-Covid during the morning rush-hour.
- In 2024, morning, peak times are below that of 2021 for the first time. This could be due to adaptations in travelling patterns as flexible working has become more commonplace.

5 The Impacts of the CAZ on fleet compliance

Transport is widely acknowledged as a key driver of air quality issues. It is estimated that around 92% of all NO_x emissions in the wider area are attributable to road traffic[11]. Older vehicles generally emit more NO_x as recent technological advances in selective catalytic reduction has led to a lowering of NO_x emissions from vehicles, particularly those with a Euro 6 standard.

The purpose of the CAZ is to speed up the natural replacement of older, more polluting vehicles with cleaner, compliant ones that meet the city's minimum emission standards. It does this by levying charges on owners of non-compliant vehicles that do not meet emission standards, so that drivers are incentivised to upgrade or replace their vehicle sooner than they might otherwise do (to avoid paying a daily charge).

Improvement in Bath's fleet are brought about in the following ways:

- Naturally as part of regular fleet upgrade programmes and because of pressure on manufacturers from government, environmental organisations, and the public to improve vehicle emissions.
- More recently and locally, as a specific response to the introduction of Bath's CAZ, followed by other zones around the country. We are likely to be particularly supported by Bristol, and we have seen drivers bring forward plans to upgrade or replace older vehicles to avoid charges.
- And in response to direct Council and government-funded interventions to encourage upgrades, including a bus retrofit scheme and the FAS.

To understand whether the CAZ is working to reduce emissions and air quality, the Council are monitoring rates of vehicle compliance in the zone.

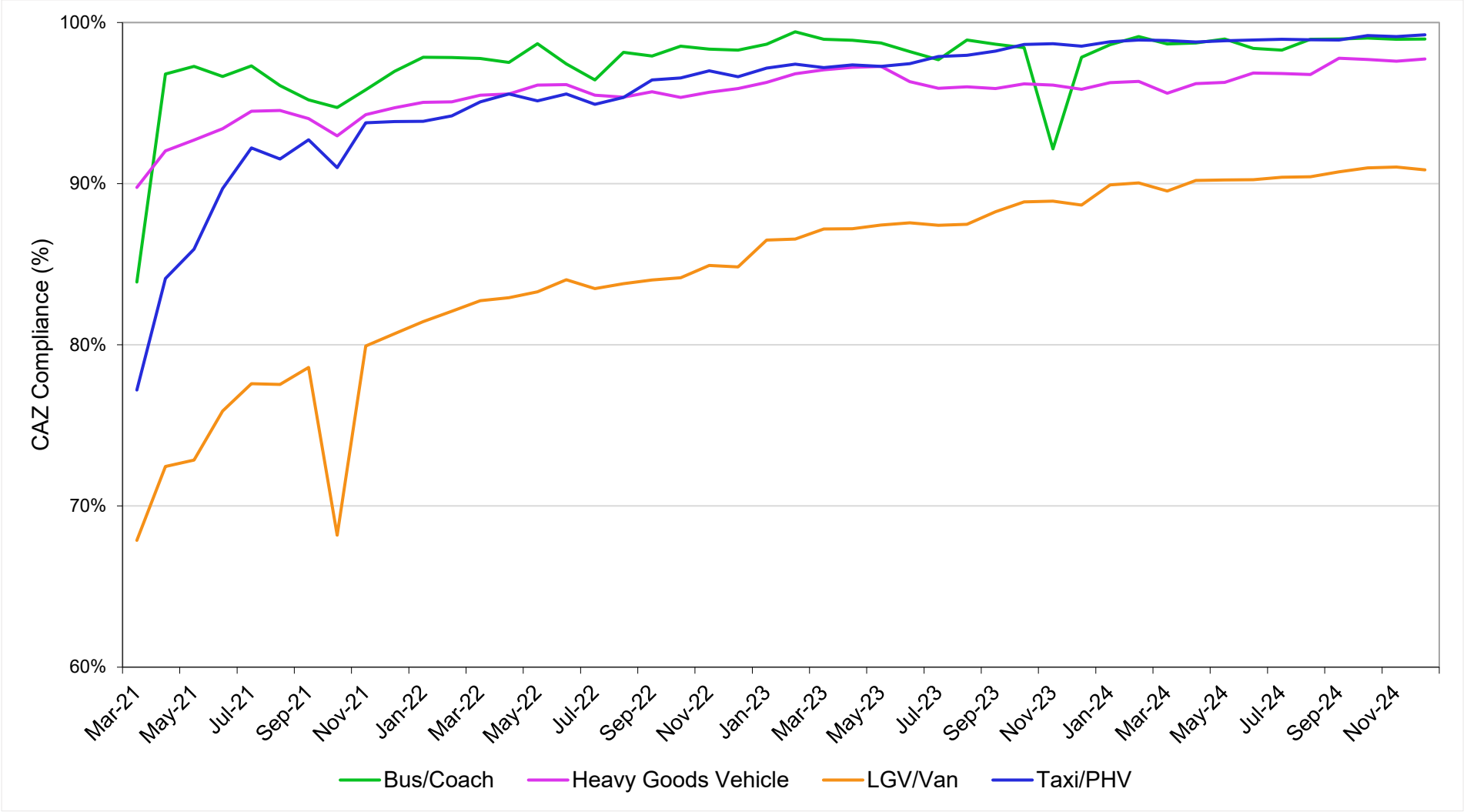
5.1 How B&NES measure fleet compliance in Bath

The Council measures changes in fleet composition using data gathered from 68 automatic number plate recognition (ANPR) cameras positioned around the perimeter of Bath's CAZ, and within the zone itself. The camera captures individual number plates which are then cross referenced with a DVLA vehicle database to establish the number of vehicles in the zone on any given day, the type of vehicle captured in the zone (*e.g.*, bus, HGV, van etc) its age, and the euro standard of the vehicle (if available). This enables the number of compliant vehicles driving in the zone to be understood, whilst identifying areas of potential traffic displacement. To understand how fleet compliance in the zone has changed following the introduction of the CAZ, weekly data from the cameras is analysed.

[11] Jacobs, 2020. Bath Clean Air Plan, Full Business Case. Available at: https://beta.bathnes.gov.uk/sites/default/files/2020-10/674726.br_.042.fbc_-_bath_clean_air_plan_fbc.pdf

Vehicle compliance data for Bath CAZ

Figure 19 Vehicle compliance rates within the CAZ. Please note the y-axis compliance rates start at 60%.



Comments and key findings:

- An average of 38,500 unique vehicles within the CAZ were recorded each day on average in 2024 (compliant, non-compliant, exempt, undetermined and unrecognised vehicles).
- A vehicle is compliant when it meets the minimum emission standards for Bath's CAZ i.e., it's either Euro 6 diesel, Euro 4 petrol, hybrid, alternatively fuelled or electric.
- Most vehicles in the zone are private cars, with an average of 32,471 unique private cars seen in the zone each day during 2024. This equates to 84% of all vehicles.
- The percentage of chargeable non-compliant vehicles (as a percentage of all traffic) entering the zone each week fell from 6% in the launch week to 0.9% by the end of 2024.
- 1,742 non-compliant vehicles were seen in the zone, on average, each day, during the launch week in March 2021, compared to 275 each day, on average, during December 2024. This is a decrease of 84%.
- Bus/Coach compliance rose from 73% during the launch week to 99% by the end of 2024. 215 individual buses/coaches were recorded, on average, in the CAZ each day during 2024. The drop in bus/coach compliance during December 2023 is likely associated with Bath's Christmas Market. During this period, a higher volume of buses and coaches visit Bath from elsewhere, and may be non-compliant, causing this drop.
- HGV compliance for vehicles weighing greater than 12T rose from 93% during launch week to 99% by the end of 2024. An average of 271 vehicles were recorded in the CAZ each day during 2024.
- HGV compliance for vehicles weighing greater than 3.5T but less than 12T rose from 86% during launch week to 96% by the end of 2024. An average of 125 vehicles were recorded in the CAZ each day during 2024.
- Taxi/PHV compliance rose from 67% during the launch week to around 99% by the end of 2024. An average of 642 vehicles were recorded in the CAZ each day during 2024.
- Van/LGV compliance rose from 63% during the launch week to around 91% by the end of 2024. 3,538 individual vans/LGVs (compliant and non-compliant) were recorded in the CAZ each day, on average, during 2024.
- Compliance was supported through the government-funded FAS and bus retrofit scheme, in addition to drivers upgrading outside of these schemes.

6 The impact of the CAZ on other measures

The Council committed to measuring the impact of the zone on the city of Bath, in terms of footfall, business, retail, public transport *etc.* to understand any adverse or positive effects. The plan was published prior to the Covid-19 pandemic and during the public consultations when the Council was potentially proposing a class C charging CAZ that would also charge private cars.

After significant consultation, a charging zone C (not charging private cars) was approved and the CAZ was launched five months later than planned in March 2021, more than a year into the Covid-19 pandemic.

Please note that the following measures may well have been disproportionately affected by Covid-19 and many of our partners, providing data, have concluded that the effect of Covid is far greater than that of the CAZ. Nonetheless, the Council has considered each measure to assess the effect of the zone.

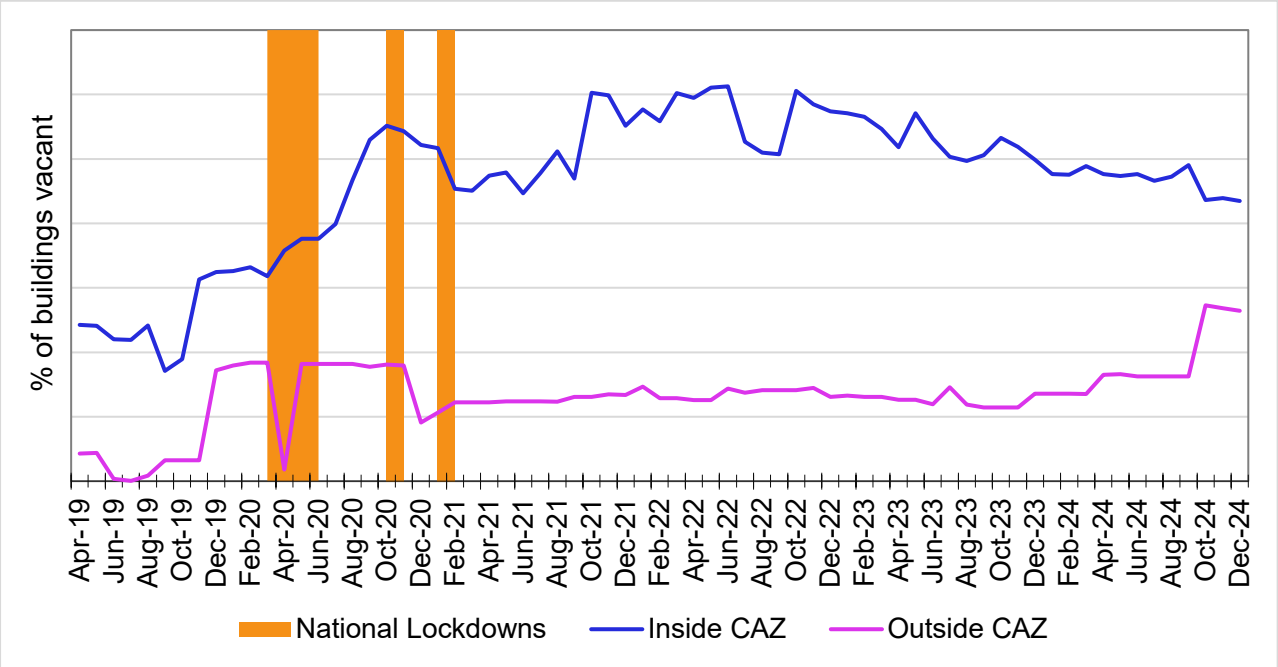
6.1 Retail, business, and office space vacancy rate

To assess the impact on the CAZ on the number of businesses operating within Bath, the vacancy figures for buildings within the city are considered to ensure the economic impacts of the CAZ are not negative.

As most of the Council-owned properties are within the CAZ Boundary, the vacancy data is continually collected by the Council's Property Service team relating to its own assets.

The theoretical rent is the full amount the Council could collect if all the Council-owned properties were filled. To add context, rental values in the centre of Bath have dropped dramatically in the last few years. The reason the theoretical rent has dropped is largely due to the impact of Covid-19, together with the move of some retailers to online retailing, reducing demand for business space in the centre of cities.

Figure 18 below, the percentage of Council-owned buildings which are vacant at a given time.



Comments and key findings:

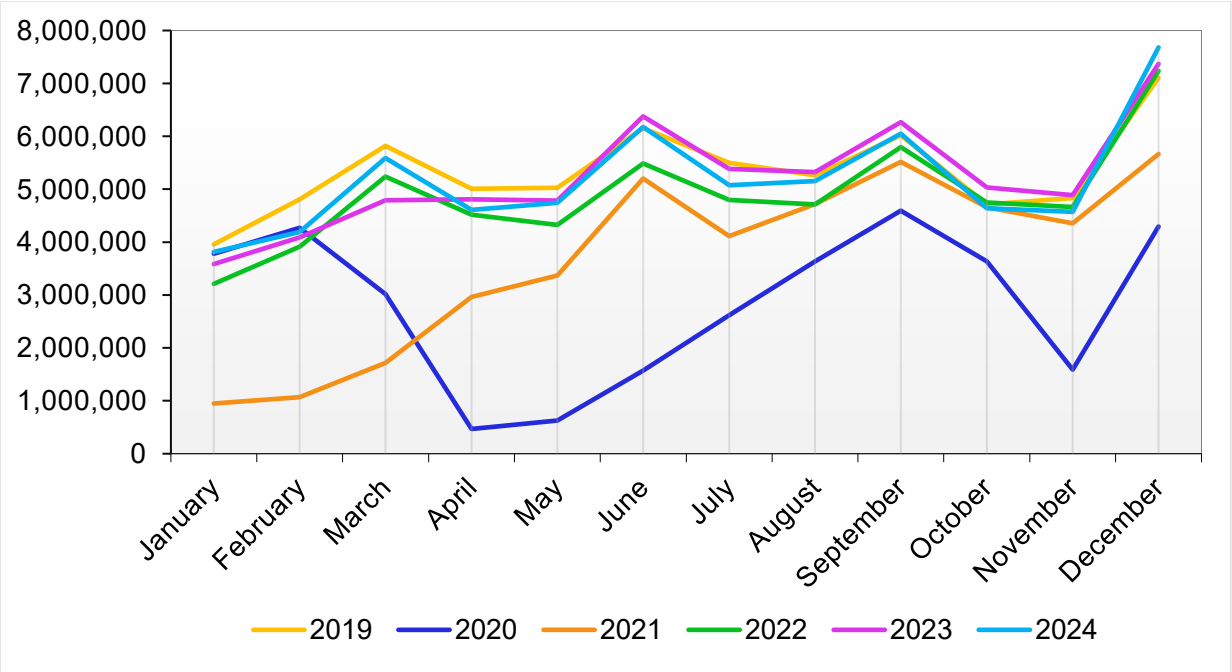
- Property vacancies have decreased within the CAZ from approximately 5% in April 2019 to approximately 9% in December 2024.
- Outside of the CAZ, within the same period, vacancies have risen from approximately 1% to 5.28%.
- During the Covid-19 lockdowns between 2020-21, the nation experienced notable impacts which subsequently saw an increase in vacancies especially within the CAZ_Boundary, which is centred in the city of Bath.
- Whilst vacancies outside of the CAZ remained relatively consistent post Covid-19 lockdowns, they have increased 2.5% in the past year. Conversely, vacancies within the CAZ_Boundary increased 3.5% between post Covid-19 lockdowns and 2023 yet have decreased approximately 1% since 2023 figures.
- Since the implementation of the CAZ in mid-March 2021, vacancy figures outside have remained relatively consistent, whereas vacancy figures within the CAZ_Boundary have seen much more fluctuation.
- The Council owns more properties within the CAZ and therefore this area is subject to the possibility of more fluctuation than outside the CAZ boundary

6.2 Retail footfall trends

Footfall trend data from Bath's BID has been analysed to understand the number of people in Bath. The data is produced by Springboard Footfall Counters provided by MRI Software and is not the Council's own data.

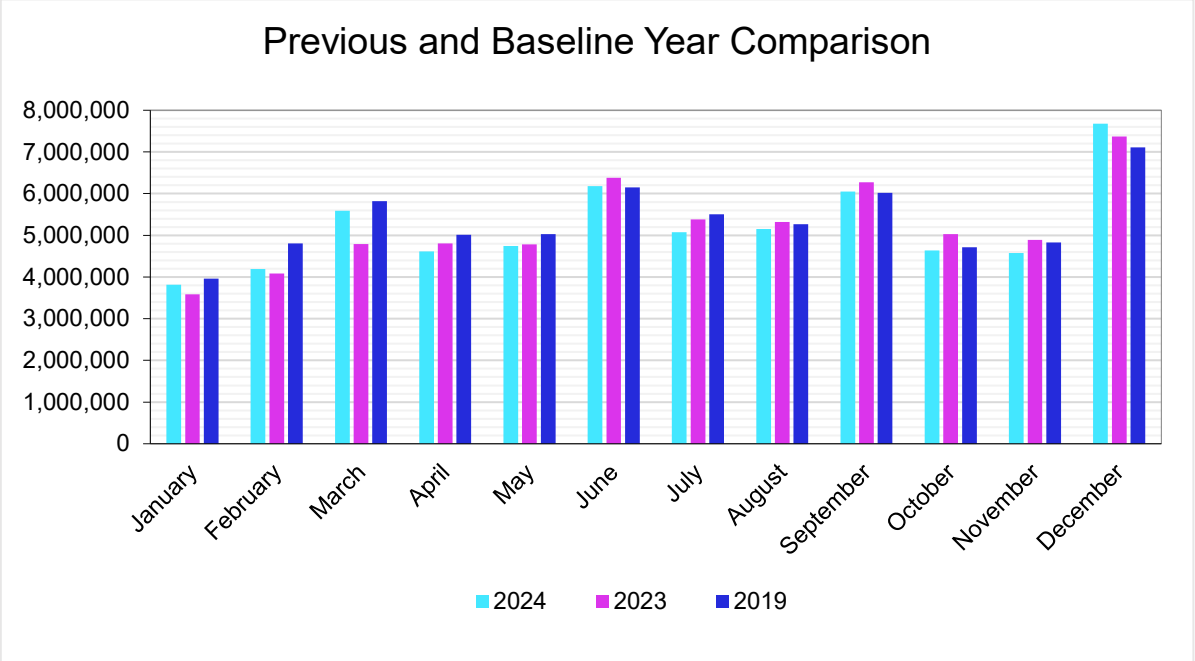
The below figure highlights the footfall trends in Bath from 2019 until 2024. Data is gathered from the following locations: Burton Street, House of Fraser (Milsom Street), Milson Street, Northgate Street, Sawclose and Southgate Street.

Figure 19 Footfall trends in Bath city centre from the Bath BID. Data is collected from locations mentioned above.



Note that footfall data is provided by counters in 10 locations and therefore is not reliable as a true measure due to the same individual may potentials be counted in multiple locations. However, data is useful for identifying long-term trends, as demonstrated in Figures 19 and 20.

Figure 20 Comparison of baseline and previous year



Comments and key findings

- In 2019, prior to the Covid-19 Pandemic, footfall trends were relatively stable, with some seasonal spikes such as beginning of the new academic year (September), and a marked increase in December.
- There are noticeable and sudden drops in footfall during 2020 and 2021 which are likely due to the Covid-19 Pandemic. Footfall does gradually increase from 2021 to near pre-pandemic levels, with 2023 levels being only 2% lower than that of 2019.
- 2024 does show a slight 1% decrease in annual footfall compared to 2023. However, monthly numbers remain higher than 2019 levels at key seasonal periods including the start of the new academic year and the Christmas Period.

Whilst the Bath BID trends show that Bath has had a good post-pandemic recovery rate and that the city is keeping pace, it is too difficult to determine the impact of the CAZ on footfall trends across Bath due to the impacts of Covid-19.

6.3 Park and ride (P&R) passenger rates

P&R data is collected by bus operators and contributed to the West of England Combined Authority (WECA). The data is used to understand travel habits into Bath city centre. P&R sites are located at Lansdown to the north of Bath (878 spaces), Newbridge to the west of Bath (698 spaces) and Odd Down to the south of Bath (1230 spaces). P&R is a convenient travel alternative into the city centre, as opposed to driving and parking, contributing to improved air quality within the centre.

The below figure illustrates total monthly P&R bus passenger numbers for the three P&R sites in Bath: Lansdown, Newbridge and Odd Down. Passenger numbers collected are based on a financial year and subsequently present data from April-December.

Figure 21 Total daily P&R bus passenger numbers for the three P&R sites in Bath, listed above. As figures are collected based on a financial year, with present data from April-December.

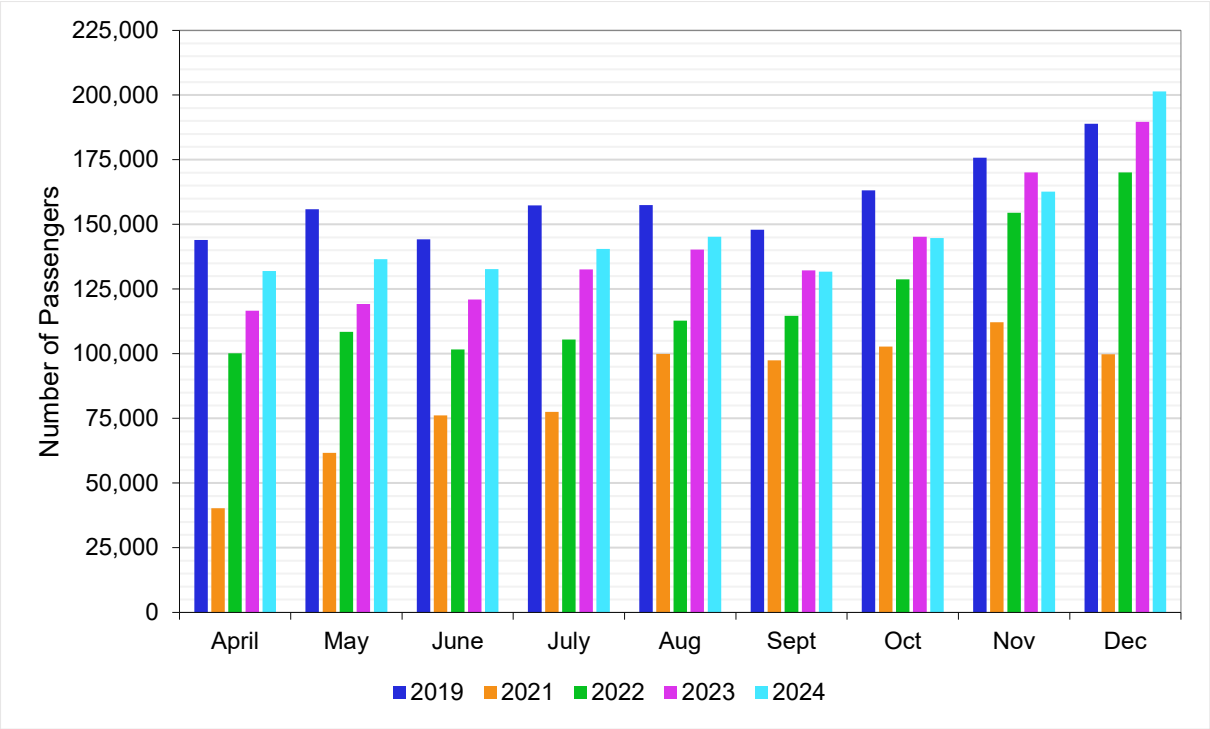
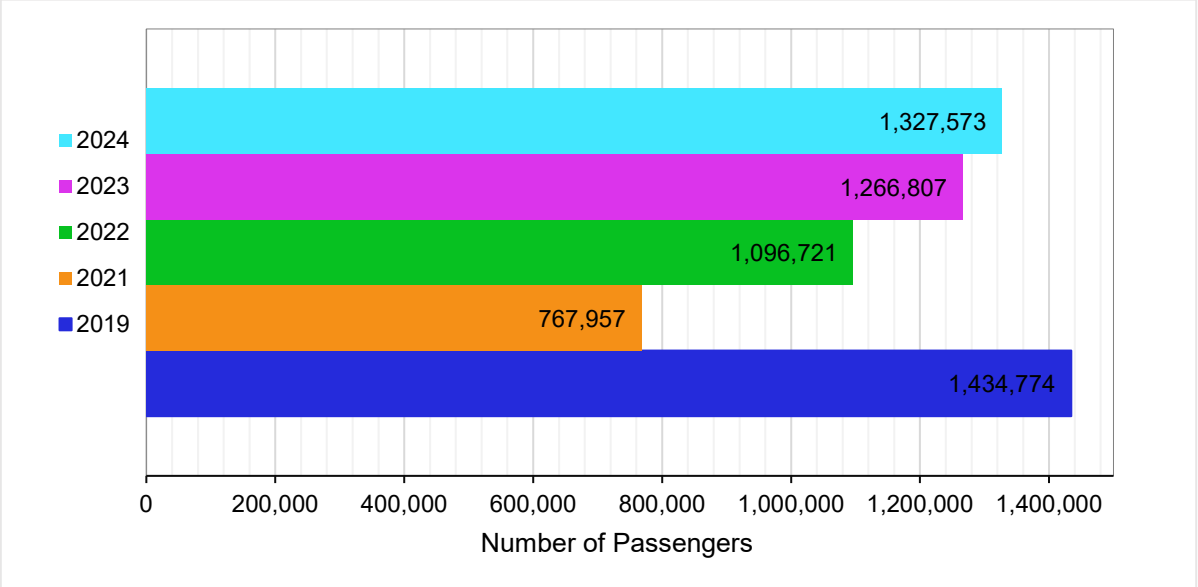


Figure 22 Total annual P&R bus passenger numbers for the three P&R sites in Bath: Lansdown, Newbridge and Odd Down. Figures collected are based on a financial year and present data from April-December.



Comments and Key Findings

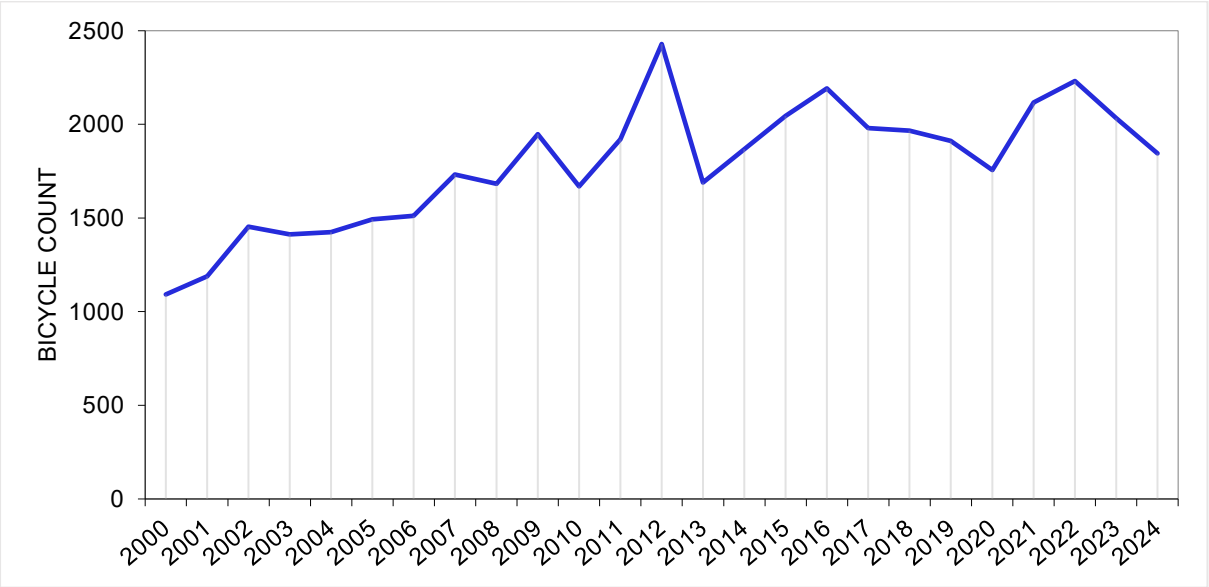
- Post Covid-19 Pandemic, P&R annual ridership has remained below 2019 figures. Though increases in bus ridership is noted annually, 2024 numbers remain below 2019 levels.

- After the Covid-19 pandemic, P&R bus ridership throughout 2021 was clearly reduced with figures increasing slightly towards the end of the year but not returning to pre-pandemic figures. Unlike other years, there was no marked increase in December's figures in 2021, with ridership being 50% of that seen pre-pandemic. This is likely due to Bath's Christmas Market being cancelled.
- Monthly ridership numbers excluding 2021 show a marked increase in November and December. This is the result of enhanced P&R services for Bath's Christmas Market which ran from November 28th until December 15th. Throughout this period, there was increased frequency in P&R buses (one every five minutes) to account for the significant number of people returning to the market for the first-time post-pandemic. The success of this meant ridership figures were particularly elevated and were higher than those seen in 2019.
- Though 2024 annual figures remained lower than 2019. We saw a noticeable increase from 2022. In 2024, ridership was only 7% below 2019 figures, whereas in 2021, the figure was 47% below 2019. This could be due to the work undertaken throughout 2023 to attract new users. Work included bespoke parking solutions for Royal United Hospital staff, Bath University open days and extended hours of service during local sporting events (such as the Bath Half Marathon and Bath Rugby home games).
- For information, in April 2025 the opening hours of P&R services at all three sites were extended on a trial basis until 31 August 2025 meaning that the last bus will now leave the city centre at 11:30pm. By providing later service hours, the Council aims to support local businesses, enhance the visitor experience and offer greater convenience for workers and tourists.

6.4 Cycling Counts

Cycling counts are collected by the Council to understand how people are travelling in Bath. Increasing active and sustainable transport is part of the wider Council strategy due not only to their environmental benefits, but also to the associated health benefits of walking, wheeling, and cycling. The Council measures cycle numbers using a network of ATCs that can detect bicycles passing over them. Figure 23, below, shows the overall number of bicycles detected passing over eleven inner-Bath ATC sites. Please note that the data is collected on one day per year and can therefore be significantly affected by bad weather.

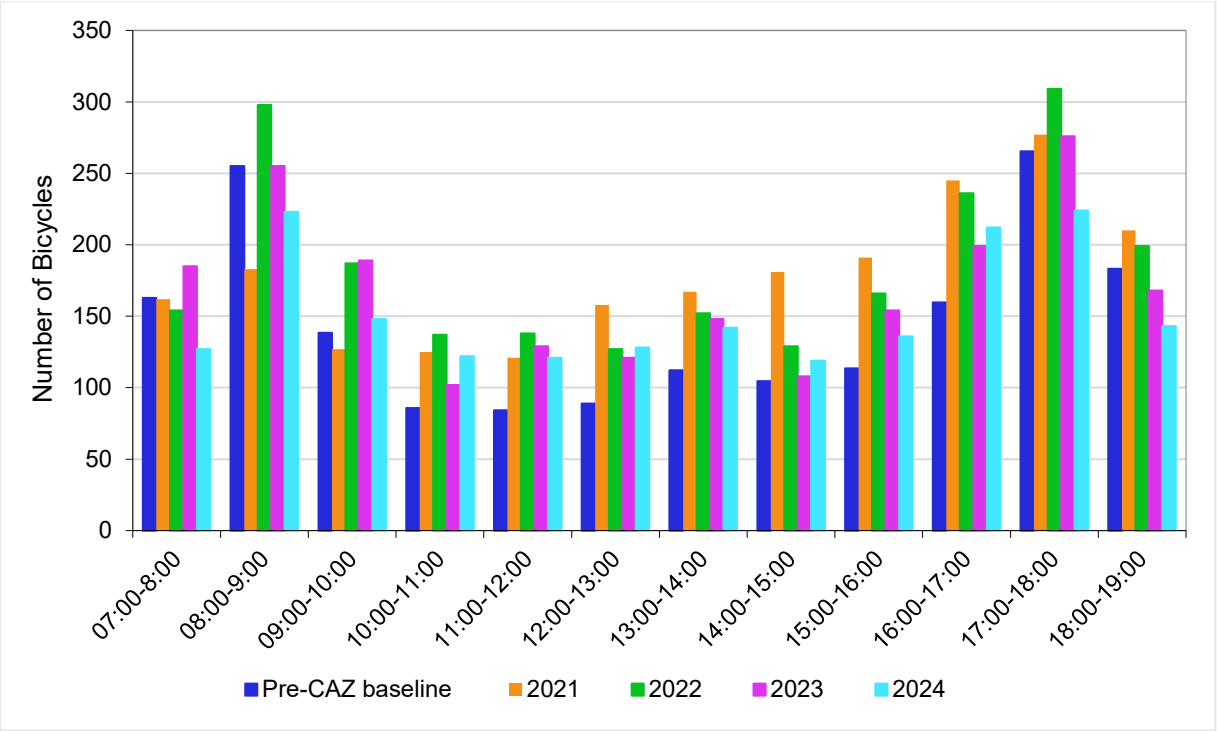
Figure 23 Bath inner cordon bicycle count trend over the last 24 years.



Comments and key findings:

- This survey is carried out on one day during the year, meaning the weather can significantly impact upon the number of people cycling that day.
- People choosing to travel by bicycle has increased in Bath since 2000.
- The 2012 peak may be related to the London 2012 Olympics, which spurred interest in cycling around the UK.
- Following a dip throughout 2020, likely linked to the Covid-19 pandemic and corresponding lockdowns, the following boost in bicycles may be due to more people choosing not to take public transport.
- The number of cyclists observed has decreased since 2022, with an approximate 9% decrease each year. Note, as the survey is only carried out on one day of the year, the results may have been impacted by poor weather.
- Schemes promoting active and sustainable travel are gaining traction across the country and in Bath, with behaviour change being promoted both through the CAZ, but also through the implementation of Liveable Neighbourhoods and other measures to support active travel in B&NES.
- Development of the Scholars Way walking, wheeling and cycling path is due to begin construction in 2025. This scheme will connect communities with educational establishments across the south of Bath to make active travel safer and more accessible.

Figure 24 illustrates the number of bicycles passing the same eleven ATCs according to time of day. The pre-CAZ baseline is from 2000-2020 without 2014 and 2019, equating to a 19-year average.



Comments and key findings:

- The pre-CAZ daily spread of cycle movements shows a clear morning (8-9am) and evening (5-6pm) peak. This trend wasn't as clear in 2021 due to the impacts of Covid-19 but returned in both 2022 and 2023. Whilst cycle movements reduced on the day measurements were taken in 2024, we see the return of peaks during the rush hour, suggesting that working patterns may have returned to pre-pandemic working patterns.
- The hourly number of cyclists in 2024 exceeds that of the pre-CAZ baseline but does remain slightly lower than those recorded in 2023 and 2022.
- Whilst cycle movements have decreased since 2022, when comparing overall cycle movements recorded in 2024 to the pre-CAZ baseline, cycle travel has remained 7% above pre-CAZ figures for inner cordon surveys. This suggests that the increased uptake of active travel seen in Bath following the pandemic has been maintained.

6.5 Bus usage rates

Now the scheme is operational, the Council has reviewed the available bus usage statistics and is unable to draw any meaningful conclusions. This is due to the absence of a pre-pandemic (2019) baseline, and to fluctuating numbers of operators. Additionally, this data includes journey data for trips across the whole of B&NES and not just into Bath.

6.6 Stakeholder feedback from Council user groups

Ipsos Mori have produced an in-depth evaluation report investigating how the CAZ has affected people in a deep-dive case study.

The baseline research findings for the evaluation of local NO_2 plans, including the Bath CAZ, can be viewed at the following:

https://www.ipsos.com/sites/default/files/ct/publication/documents/2021-02/15012_localno2plans-baselineresearchfindings.pdf

The annual report, which includes the case study findings from Bath's CAZ can be viewed at the following link:

https://www.ipsos.com/sites/default/files/ct/news/documents/2022-05/local-no2-plans-main-report-may-2022.pdf

6.7 Taxi fares and unmet demand rates

The taxi survey is performed by the council as an indication of unmet demand. The survey is reviewed in response to requests from those within the trade annually and are determined by indices set from the Office for National Statistics. The survey is only an indication of whether there is any unmet demand on Hackney Carriages and does not include wider taxi trade. Since 2015, there has been no change in the number of Hackney Carriage licenses issued with the cap set at 125.

An unmet demand survey was carried out in 2023 where the recommendation was to retain the current number of licenses. There is no evidence from the Council's licensing team that the introduction of the CAZ has impacted the Hackey Carriage license numbers of fares.

6.8 Early measures fund

On 1 April 2019, the Council introduced a trial scheme to reduce the cost of parking permits for zero-emission vehicles. Discounts on the standard permit prices were available across a range of parking permit types.

There was a total of 170 reduced price permits available each year, the trial scheme ran from April 2019 through to March 2022. Table 8, below, shows the number of zero-emission parking permits issued up until March 2022 (when the scheme closed).

Table 8 Number of zero-emission parking permits issued per financial year.

Year	Number of Ultra Low Emission Vehicle (ULEV) permits issued
2019-2020	18
2020-2021	30
2021-2022	43

Key comments and findings:

- The number of permits issued grew each year, although they did not reach the total number of permits available.
- The Council expect growth in the local zero-emission market to continue and this will be beneficial.
- Ultra-low emission vehicles (ULEVs), including hybrids, made up an average of 12% of total private cars at the end of 2023. This is around 4300 ULEVs out of a total of 37,000 private cars. This figure continues to grow.

6.9 Bus Retrofit uptake and compliance rates

Traffic and air quality modelling prepared for the CAZ Final Business Case included the assumption that all scheduled public bus services would be compliant (Euro 6 standard) by its launch. Prior to the launch of the CAZ, 88 out of a fleet of 226 scheduled buses operating in Bath were non-compliant.

To prepare for the introduction of the CAZ, the Council secured Government funds to support bus operators to upgrade the remaining 88 buses with engine emissions abatement technology as certified by CVRAS.

In autumn 2020, agreements were finalised with six bus operators to commence installation of the retrofit technology as soon as possible. In addition, two buses not operating as a public-registered bus service (Wessex Water) were upgraded (replaced with new Euro 6 buses). Additionally, some coaches were retrofitted through the Council's FAS.

Approximately £1.7 million was awarded towards grants to operators to retrofit buses operating on public registered bus services.

Comments and key findings:

- By the end of June 2022, all 88 non-compliant buses operating as public buses in central Bath were successfully retrofitted with emission abatement technology.
- Preliminary reporting continues to suggest that on average, the NO_x reduction for retrofitted vehicles exceeds the 80% target set as part of CVRAS and therefore the vehicles are operating in line with compliant/Euro VI standards.

6.10 Financial Assistance Scheme (FAS)

To mitigate the impact of charges and further support air quality improvements, the Council invested £9.4 million of Government funds in a FAS that offered grants and interest-free loans to businesses and individuals wishing to replace non-compliant, chargeable vehicles with cleaner, compliant ones.

Businesses and individuals could apply for funding to upgrade or retrofit their vehicle if they passed a basic eligibility test, proving that they travel at least two days per week on average in the zone over a 60-day period. Those passing the test could then apply for grants and/or interest free loans via the Council's approved FAS administrators.

Table 9 Vehicles eligible for the FAS and the number of vehicles that were replaced up until the end of December 2023 when the scheme closed.

Vehicle category	Number vehicles eligible for FAS funding to upgrade/ retrofit	Number of vehicles upgraded
M1 (taxis or private hire vehicles as private cars are compliant)	150	110
M2 (minibuses)	4	2
M3 (buses and coaches)	22	22
N1 (light goods vehicles i.e. vans)	1347	783
N2; N3 (heavy goods vehicles <12T; HGVs>12T	38	32
Total	1560	949

**The two minibuses upgraded were LGVs and so included in those figures, below.*

Comments and key findings:

- By the end of 2023, the date the scheme closed, 1560 vehicles had passed basic eligibility tests, and 949 vehicles had been replaced.
- 783 non-complaint LGVs (including 2 minibuses) regularly travelling into the zone and 110 taxis/PHVs have already been replaced through the scheme.
- HGVs already have a higher compliance rate across the UK and in Bath, therefore were not a priority for the FAS. However, 38 HGVs regularly travelling into Bath have been approved for finance and 32 have been replaced.
- Throughout the scheme's life, approximately £8 million has been spent upgrading and retrofitting vehicles via the FAS (this includes the Bus Retrofit Programme).

6.11 Travel advisor session uptake rates

The Council's team of travel advisors have been the main point of contact for people applying to the FAS. They worked to provide information and support to people throughout the FAS process.

Throughout the life of the FAS, Travel Advisors contacted a total of 2000 people, informing and guiding people through the various stages of the scheme. An additional 100 online questionnaires were also complete when engaging with the public on allocating the final remains of the funding.

6.12 Anti-idling enforcement

Since the launch of the CAZ in March 2021, the Council has been keen to increase drivers' awareness of the impacts of their behaviour, including the request not to idle engines, especially in locations where vulnerable people could be negatively impacted by the effects of pollution, *e.g.,* outside schools.

The Council launched an anti-idling 'Kick the Habit' campaign in 2022 targeted at schools across B&NES. It offered limited free printed resources, including banners and posters, to raise awareness of the dangers of engine idling. Throughout 2024, the

Council has re-engaged with schools in the authority about the campaign, and printed resources have been sent to 22 schools.

The Council continues to engage with members of the public where engine idling frequently occurs, and as a result the following web-form has been generated, so that incidents of engine idling can quickly be reported: https://www.bathnes.gov.uk/form/report-engine-idling

6.13 Weight restriction enforcement

A webform for members of the public to report allegations of breaches of vehicle weight restrictions, both within and outside of the CAZ, was successfully launched in 2022. Officers within Trading Standards have carried out proactive monitoring of the roads with weight restrictions, and to date, 25 cases of contravention had been reported, with five further cases detected based on observation.

To view the webform and report a breach of a weight restriction, visit the following webpage: https://beta.bathnes.gov.uk/report-breach-road-weight-restrictions

6.14 E-Cargo scheme

The Council hopes to encourage more sustainable delivery practices within the city to further support air quality improvements, tackle congestion, and help reach carbon neutrality by 2030.

In 2021, the Council secured £500,000 from the Government to support the use of e-cargo bike for deliveries within Bath. E-Cargo bike couriers offer fast, zero-emission deliveries for businesses who need to transport small to medium sized packages over a short distance. This delivery method offered businesses an affordable, eco-friendly alternative to fossil-fuelled deliveries made by vans.

The E-Cargo Bath Scheme encouraged businesses in Bath to trial deliveries with e-cargo bike couriers to reduce the number of vehicles on our roads. The scheme hoped to inspire businesses to adopt e-cargo bike deliveries in the long-term and prove that sustainable delivery practices are cost efficient in comparison to traditional delivery methods.

Whilst several businesses expressed an interest in making use of the trial, overall uptake was low, and the scheme has since been aborted in early 2023. However, other E-cargo bike projects are planned locally and are to be delivered by WECA.

7 Conclusions

NO_2 levels above the annual limit value of 40 µg/m^3 present a public health risk that is not acceptable to the Council, or to central government. Any amount of pollution can be damaging to our health, but the more pollution you are exposed to, the greater the risk and larger the effect. Some people are more vulnerable to the impacts of air pollution than others. Those more at risk from air pollution include children, those who are pregnant, and older people; people with lung conditions such as asthma, COPD and lung cancer; and people with heart conditions such as coronary artery disease, heart failure and high blood pressure.

The Council is committed to reporting on the impact of the CAZ on air quality, traffic flow and vehicle compliance so that progress towards the target can be monitored. This target is to reduce NO_2 concentrations to below the annual limit value of 40 µg/m^3 at all individual monitoring locations in Bath.

This report has set out related data and key findings from 2024, and as highlighted in our summary, the trends are very encouraging. Air quality is improving across the entire district, despite traffic returning to near pre-pandemic levels.

7.1 Air quality conclusions

Average NO_2 concentrations within the CAZ in 2024 are 40% lower than in 2019, representing a reduction of 10.5 µg/m^3. A reduction of 41% or 10.4 µg/m^3 was also recorded in the urban area outside of the zone, showing that areas outside of the CAZ are sharing the benefits on air quality of the CAZ.

We have seen a significant reduction in concentrations of NO_2 with no sites within either the CAZ or CAZ_Boundary measuring above the legal limit of 40 µg/m^3. In 2024, there were no sites which recorded an annual average NO_2 concentration greater than 36 µg/m^3.

Every diffusion tube site within the CAZ in both 2021, 2022, 2023, and 2024 recorded NO_2 concentrations lower than 2019. As NO_2 is also continuously improving in areas outside of the zone, it implies that the CAZ is having its intended effect, with parts of the authority outside the CAZ also benefiting from improved air quality as a result.

7.2 Traffic flow conclusions

Whilst national traffic flows have almost returned to pre-pandemic levels, volumes within Bath remain on average slightly lower than those recorded pre-Covid19. Within the CAZ, data availability from the Council's permanent ATC network has some variation due to network trial and upgrades. During 2022, the network, particularly within the CAZ, was being upgraded with new, more reliable technology to replace the older, faulty counters that were no longer maintained. As a result, there are some inconsistencies with data availability, and individual sites do not hold a full data set from 2016 through to 2024. However, two temporary ATC surveys from a 7-day period within the zone show a reduction in traffic flows when compared to a pre-pandemic

baseline. It may be noted that these surveys are not representative of the year and are instead included to provide an indicative overview.

On average, data analysed from the permanent ATC network within the CAZ_Boundary, **found an 11% reduction in 7-day average traffic flows** when compared to the baseline period. Similarly, data analysed within the Wider_B&NES area, **found an 8% reduction in 7-day average traffic flows** when compared to the baseline.

7.3 Vehicle compliance conclusions

The CAZ is encouraging the purchase of new or second hand, lower emission vehicles, and is discouraging motorists with polluting vehicles from entering, with resulting in desired effect of improving local air quality.

On average 38,500 unique vehicles a day enter the zone. By the end of 2024, just 275 non-compliant, chargeable vehicles were seen in the zone each day, compared to 1,742 per day during the first week of launch in March 2021.

By the end of 2024, 949 of the most polluting vehicles had been replaced or upgraded via the Council's FAS which is now closed.

Next steps

We would like to thank both the public and local businesses, for their commitment to supporting the Council to improve air quality, not only in the city, but also across the wider district, especially those who have upgraded their vehicles. We continue to urge all residents to do their bit by walking, wheeling, cycling, by taking public transport, or by ensuring their vehicles are compliant, wherever possible.

8 Monitoring explained

8.1 Air Quality Monitoring Techniques

Across B&NES, there are two main monitoring methods whereby data on air quality is obtained: diffusion tubes and automatic analysers. These methods are outlined below.

Automatic Analysers

High-resolution measurements can be taken by automatic analysers that draw in ambient air. In 2024, there were three of these instruments located within B&NES that were constantly monitoring air quality. The locations of the automatic analysers can be viewed in Figure 2 or via the following link: https://www.ukairquality.net/

One of the automatic analysers, located along the A4 London Road, makes up part of the AURN which feeds into a national monitoring network. The data produced by these analysers is compared with that of diffusion tubes to ensure accurate results, also known as bias adjusting.

Bias adjusting represents the overall tendency of the diffusion tubes to under or over-read relative to the automatic analysers, this is calculated by co-locating diffusion tubes with an automatic analyser to calculate the difference.

Diffusion Tubes

Less expensive than automatic analysers, diffusion tubes can be located on existing street furniture, often a lamppost or drainpipe. Due to the ease of deployment, hundreds of diffusion tubes can be located across a local authority to gain an overall view of pollution. Current locations of diffusion tubes can be viewed in Figures 2 and 3, or alternatively, via the interactive map at the following link:

https://beta.bathnes.gov.uk/nitrogen-dioxide-monitoring-data

The diffusion tubes are exposed to ambient air for one month at a time, before being sent to a laboratory for analysis. The data is then adjusted to consider inaccuracies before an annual mean is derived at the end of each calendar year. Diffusion tubes are passive samplers and consist of a small plastic tube containing a chemical reagent called triethanolamine (TEA), in the case of NO_2 monitoring.

8.2 Traffic Monitoring Techniques

Across B&NES, there are multiple methods used to collect traffic flow data, as well as composition and the compliance of these vehicles if travelling within the CAZ.

Automatic Number Plate Recognition (ANPR)

As part of the CAZ project, ANPR cameras were installed at the entry/exit points of the boundary as well as within the zone, to form a cordon. Bath CAZ utilises “Axis P Series” and “Axis Q Series” cameras which obtain the numberplates from the vehicles and the vehicle information can be drawn from the DVLA database. Further useful

data can be generated from matching entries into the system, for example, journey times through the CAZ.

Automatic Traffic Counters (ATC)

Permanent Automatic Traffic Counters

As part of the ongoing traffic monitoring network across B&NES, that was in place before the implementation of the CAZ, there are permanent ATCs located at multiple locations across the authority. The current ATC locations can be seen in Figure 13. These counters are built into the road surface and continuously monitor data on vehicle volume, speed, and classification.

As mentioned within section 'Traffic flows within the CAZ', the permanent ATCs, largely located within the CAZ, were being upgraded throughout the second half of 2022 and into 2023. The new counters are capable of monitoring the volume, classification, speed and movement paths of active travel modes (e.g., bicycles), as well as different vehicle types.

Temporary radar Automatic Traffic Counters

To quickly respond to potential traffic issues, particularly in locations where permanent ATCs are not installed, it is important to have monitoring equipment that is ready to deploy at short notice. Temporary radar ATCs can be fastened to existing street furniture and monitor vehicle volume and speed. However, they are not capable of detecting the vehicle type.

Video survey equipment

Much like the temporary ATCs mentioned above, video survey cameras are easy to install on existing street future at short notice, often for shorter periods of time. This survey technique does not record the speed of vehicles but can detect volume and classification. This can be useful in cases where it is important to know the type of vehicle using a particular route. These cameras can also be used to assess how many vehicles enter/exit junctions and are reliable in analysing turning counts, which can be important.

Manual traffic counts

At times, MTCs are superior to automatic monitoring equipment. Enumerators can be deployed for shorter periods of time to manually count vehicles passing along a specific place or turning into a specific road.