Clean Air Zone

Air Quality and Road Traffic Update Report

Published October 2023

KEY FINDINGS

Birmingham City Council launched a Class D[1] Clean Air Zone on the 1st June 2021. This report covers the period from launch to June 2023 and is an update to the interim report published in March 2022. It should be noted that the interim report made use of provisional data, which has since been ratified and is reflected in this latest progress report.

- In 2022 the levels of nitrogen dioxide in the Clean Air Zone reduced by an average of 17% when compared to 2019 (pre Covid) results. When compared to the 2016 baseline there has been a reduction of 37%. It should be noted that the number of monitoring locations has significantly increased since 2016.
- Non-compliance vehicle rates at the launch of the Clean Air Zone in June 2021 were recorded at 15.2%, which has improved to 6.0% as of June 2023, an improvement of 9.2 percentage points, a change of 60.5%.
- Compliance for passenger cars has improved from 85.3% in June 2021 to 94.2% in June 2023.
- Compliance for Light Goods Vehicles (LGV) has improved from 68.6% in June 2021 to 85.7% in June 2023.
- Compliance for Heavy Goods Vehicles (HGV) has improved from 92.2% in June 2021 to 97.8% in June 2023.
- Bus and Coach compliance rates have remained consistently high from 99.3% in June 2021 to 99.4% in June 2023.
- The overall trend in the number of daily average unique vehicles entering the zone appears to indicate comparable trends in 2021, 2022 and 2023 which fluctuate between a low of 88,609 and a high of 109,438 vehicles. Between June 2021 and June 2022 an average of 98,112 daily unique vehicles were recorded. Between June 2022 and June 2023 this stood at 102,392.

[1] A Class D Clean Air Zone allows for charging of buses, taxis, PHVs, HGVs, LGVs and private vehicles which do not comply with the euro class standard. For more information on Clean Air Zones please see https://www.gov.uk/government/publications/air-quality-clean-air-zone-framework-for-england and https://www.gov.uk/clean-air-zones to check if your vehicle is compliant.

Compliance data for the Clean Air Zone can be found at Clean Air Zone data | Brum Breathes

- Based upon Unique Vehicle Traffic Data the vehicle fleet is dominated by cars comprising approximately 80% of the total, Light Goods Vehicles (LGVs) 8.3%, HGVs 1.1%, with buses/coaches making less than 0.6%. The remainder is made up of exempt and unrecognised / undetermined vehicles.

1.0 – SUMMARY

There has been a reduction in the levels of nitrogen dioxide (NO_2) within the Clean Air Zone (on average 17%) when comparing diffusion tube data for the baseline year of 2019 to 2022.

Within the interim Clean Air Zone report published in March 2022 a provisional bias adjustment factor of 0.81 was used for the 2021 data set. This was derived from the factor used for 2020. This has now been adjusted to 0.84 following release of the national factor which was not available at the time.

This has resulted in a slight adjustment to the results reported in the interim Clean Air Zone report with the updated values noted in this report. This report also corrects for any omissions made in the interim report published in March 2022. This includes an update to tables 1-4 of the interim report due to an error in processing 2016 diffusion tube results, this in turn impacted upon table 5 of the interim report which summarised the percentage change in the Clean Air Zone, Ring Road and Wider City.

Since the launch of the Clean Air Zone in June 2021 there has been a steady improvement in vehicle compliance rates in all vehicle categories that are subject to the charge. The rate of overall vehicle compliance improvement is approximately 0.4% per month.

Assuming this trend is maintained it is likely that the modelled rates of vehicle compliance, as per the full business case agreed in March 2019, may be met in 2024, however this is a hypothetical assumption and not a prediction.

It is also important to note that while improvements to the rate of compliance in the vehicle fleet provide an indication that the desired change is taking place the primary objective of the scheme is to reduce the levels of nitrogen dioxide to within the legal limit in the shortest possible time. Therefore, improvements in the rates of compliance for each of the vehicle categories, and overall, should be considered as lead indicators of change rather than an end in themselves. And improvements to air quality are critical to the delivery of the predicted health benefits.

Furthermore, achieving compliance with the legal limits for nitrogen dioxide is critical to being able to demonstrate success to the Government's Joint Air Quality Unit (JAQU) against the plan approved by the Government in 2019.

Prior to the launch of the Clean Air Zone there was a potential risk that its introduction would result in a 'displacement' of vehicles from within the city centre to the ring road. Based on the vehicle numbers observed, this risk does not appear to have been realised.

Similarly, the Clean Air Zone does not appear to have caused a reduction in the overall volume of vehicles entering the Zone albeit that the composition of that fleet has changed with fewer 'non-compliant' vehicles, for all vehicle categories, entering the Zone. On that basis the scheme appears to be having the desired effect of discouraging non-compliant vehicles from entering the zone.

Of the exceedances of nitrogen dioxide recorded in 2022 within and around the Clean Air Zone, these can be grouped into three distinct areas –

- **Moor Street** (and surrounding area) – Exceedances have been recorded within the area of Moor Street, Carrs Lane, Masshouse Lane and Priory Queensway. The majority of these roads are dominated by bus traffic. For example, Carrs Lane is designated a bus/taxi/access only and recorded a level of 47.3 µg/m^3 in 2022 (legal limit 40µg/m^3). Table 1 provides a summary of the diffusion tube results in the Moor Street Area which has demonstrated an improvement since 2016.
  A detailed ANPR survey of the location has been undertaken in early 2023 and is being used to develop an options appraisal in line with the principles of the Council's Clean Air Strategy.

Year	BHM40	BHM41	BHM42	BHM43	BHM44	BHM45	BHM46	BHM50	BHM53	BHM58	BHM59	BHM103	BHM109
2016	55.0	58.0	46.0	47.0	48.0	47.0	67.0	60.0	55.0	-	-	-	-
2019	47.4	50.4	39.8	39.5	39.0	35.5	50.0	44.7	50.0	36.6	37.2	-	-
2020	43.8	41.8	32.3	43.5	30.3	39.4	42.3	41.1	46.6	28.8	30.0	-	-
2021	50.0	50.9	32.8	32.7	32.4	40.7	50.3	41.1	51.2	34.4	34.0	55.1	-
2022	50.0	35.0	32.3	31.0	30.2	32.4	47.3	36.8	44.2	31.0	34.8	47.3	49.3

Table 1 Moor Street Area diffusion tube results expressed in µg/m^3.

- **A38 (St Chads)** - Exceedances have been recorded in 2021 and 2022 within the complex road layout of the A38 / A4400. This comprises of eight lanes of traffic that include slip roads, tunnels and changes in gradient. The A38 transects the city northeast to southwest with high traffic volumes. Table 2 provides a summary of the nitrogen dioxide diffusion tube results in the A38(St Chads) area, for which there has been an improvement since 2016. To understand the exceedances in this area a detailed ANPR survey has been undertaken in early 2023 which will inform an options appraisal in line with the principles of the Council's Clean Air Strategy.

Year	BHM16	BHM28	BHM86	BHM87	BHM88	BHM107	St Chads AQ Station
2016	49.0	60.0	-	-	-	-	-
2019	31.0	44.7	33.7	59.6	58.1	-	51.0
2020	23.7	38.5	28.7	46.5	50.6	-	37.1
2021	22.7	39.3	33.2	48.6	50.2	47.3	40.3
2022	24.5	35.6	32.5	46.2	48.4	43.9	43.2

Table 2 A38 (St Chads) nitrogen dioxide diffusion tube results and St Chads air quality station results expressed in µg/m^3

- **Ring Road** – Three exceedances have been recorded in 2021 and 2022 at different locations on the ring road as shown in Table 3 below. The Middleway is not covered by the Clean Air Zone however a detailed ANPR survey has been commissioned to better understand the fleet composition and Euro Class of the vehicles in these locations. The data from these surveys will inform an options appraisal in line with the principles of the Council's Clean Air Strategy.

Year	BHM21	BHM25	BHM27	BHM66	BHM67	BHM68	BHM69	BHM70	BHM71	BHM72	BHM73	BHM74	BHM75	BHM76	BHM77
2016	62.0	-	48.0	-	-	-	-	-	-	-	-	-	-	-	-
2019	48.5	38.0	34.7	33.2	31.8	32.4	37.6	25.4	25.4	22.8	-	52.6	34.0	24.8	30.6
2020	37.4	36.0	30.7	29.2	24.9	29.6	27.5	-	21.2	17.5	-	43.0	29.2	20.5	26.4
2021	39.8	37.9	32.0	30.4	28.2	33.8	30.7	-	22.3	19.3	30.3	45.2	32.1	22.9	29.6
2022	38.3	34.2	30.1	30.2	27.1	30.8	34.1	-	21.6	18.7	31.8	46.0	30.9	21.2	26.5

	BHM78	BHM79	BHM80	BHM81	BHM82	BHM83	BHM84	BHM85	BHM93	BHM102	BHM108
2016	-	-	-	-	-	-	-	-	-	-	-
2019	31.7	27.7	35.5	41.3	28.6	61.0	38.3	48.0	40.8	-	-
2020	25.3	22.0	25.9	23.7	35.1	50.6	31.9	40.6	44.5	-	-
2021	28.6	26.0	30.0	24.4	32.9	52.0	36.7	46.0	36.4	-	-
2022	26.4	24.5	30.1	-	21.3	55.5	-	38.7	36.7	55.8	30.1

Table 3 Ring Road nitrogen dioxide diffusion tube results expressed in µg/m^3.

2.0 – BACKGROUND

What is a clean air zone?

A Clean Air Zone is an area where targeted action is taken to improve air quality, by discouraging the most polluting vehicles from entering the zone.

The Government has stipulated by a Ministerial Direction that Birmingham must improve the level of nitrogen dioxide (NO_2) in the shortest possible time. As road traffic is the greatest source of nitrogen dioxide a Clean Air Zone has been introduced to reduce the level of nitrogen dioxide to the legal standard of 40µg/m^3 annual average in the shortest possible time. The area (as shown in Figure 1) to be encompassed by the scheme has been determined through an extensive technical exercise and public consultation.

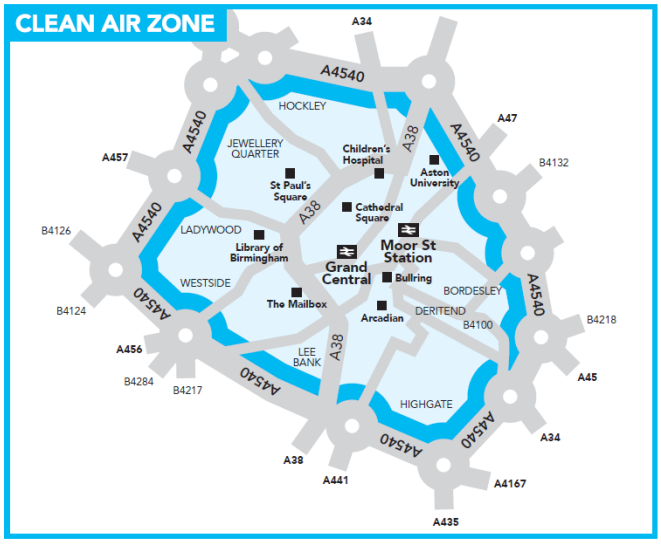


Figure 1 Map of the Birmingham Class D Clean Air Zone.

Birmingham's Class D Clean Air Zone launched on 1st June 2021 and operates in the central Birmingham area within the A4540 Middleway, but not on the ring road itself. The Clean Air Zone operates 24-hours a day, 365 days of the year. Vehicles that do not meet the emissions standards below are subject to a daily fee:

- Euro 4 or better for petrol cars and vans
- Euro 6 or better for diesel cars and vans
- Euro VI or better for lorries, buses and coaches

The fee that applies to the different vehicle types is:

- Cars and light goods vehicles (vans) - £8 per day
- Coaches and HGVs - £50 per day

Further information on the Clean Air Zone can be found at: BrumBreathes Website

The Full Business Case for the Clean Air Zone can be found at: Clean Air Zone full business case

The air quality and traffic modelling reports for the Clean Air Zone can be found at: Clean Air Zone Air Quality and Road Traffic Model

The impact of the Clean Air Zone will be assessed using a range of different metrics including:

- Air quality monitoring data (nitrogen dioxide)
- Number of vehicles and compliance rates
- Traffic flow data

Definitions:

Vehicle compliance - refers to the number of vehicles that comply with the emission standards of the Clean Air Zone as described above.

Non-compliant vehicles - are vehicles that do not meet the emission standards as described above. However, a number of exceptions were put in place at the launch of the Clean Air Zone to lessen the financial burden on residents / workers within the Zone. Commercial and worker exemptions came to an end in May 2022. The remaining exemptions for residents in the Zone came to an end in May 2023.

Unique Vehicles – every vehicle that enters the zone is identified by a network of cameras. Once a vehicle has been identified it is classed a unique vehicle irrespective of whether it is compliant or not. Once identified the vehicle can travel in and out of the zone for that particular day (midnight to midnight). Much of the data reported in here relies upon unique vehicle data rather than the volume of journeys.

Covid19

The Clean Air Zone was launched following the third national 'lockdown' due to the Covid pandemic in early 2021. Data leading up to the launch of the scheme was heavily influenced by local and national lockdowns. When the zone launched in June 2021 no restrictions were in place. However, on the 8th December 2021 the Government implemented its 'plan B', as part of its response to the spread of the Omicron variant. The implementation of 'plan B' included encouraging people to work from home once again but no business was required to close. Since March 2021 all Covid restrictions have been removed.

3.0 – HOW HAS AIR QUALITY CHANGED?

The purpose of the Clean Air Zone is to reduce the levels of the air pollutant nitrogen dioxide (NO_2) and, as per the ministerial directions placed on the Council in 2017 and 2019, to do so in the shortest possible time.

Nitrogen Dioxide is predominantly generated by the combustion of fossil fuels and in urban areas the primary source of this air pollutant is road traffic. Therefore, reducing the number of the most polluting vehicles entering the zone is expected to reduce the level of nitrogen dioxide. in the shortest possible time.

Nitrogen dioxide air pollution concentrations are also affected by many different factors including the weather and regional contributions outside of Birmingham, as well as the impact of other highway improvement schemes.

It should also be noted that there have been a number of additional highway schemes that have progressed since the introduction of the Clean Air Zone. These could have also had an influence on traffic flows and air quality.

Further details can be found at Transport Measures

Air Quality Monitoring

Nitrogen Dioxide is monitored across the city using:

- **Diffusion tubes** are small plastic test tubes that are installed on structures such as lampposts. Birmingham City Council manages a network of over 100 diffusion tubes that are changed every month and provide a monthly average of nitrogen dioxide. The monthly average is then averaged over the year to provide an annual average. Following this a correction factor known as a bias adjustment is then applied to the result in line with DEFRA guidance[2] to provide a final annual average.
- **Automatic analysers** (or Chemiluminescent analysers) provide hourly averages of nitrogen dioxide readings in real-time. Birmingham City Council manages a network of 15 analysers that have been strategically placed across the city.
- **Indicative Air Quality Sensors** bridge the gap between diffusion tubes and automatic analysers. These can be deployed on lampposts and provide real time results. However, they currently do not meet the accreditation standard set out by DEFRA for nitrogen dioxide, and as such they cannot be relied upon for formal reporting purposes. Accordingly, they have not been included in this report.

[2] https://laqm.defra.gov.uk/documents/LAQM-TG16-April-21-v1.pdf

All of the air quality data from the Council-managed network is available online via Birmingham Air Quality which provides access to the diffusion tube data and live feeds from the automatic stations. A snapshot of the website is provided in Figure 2.

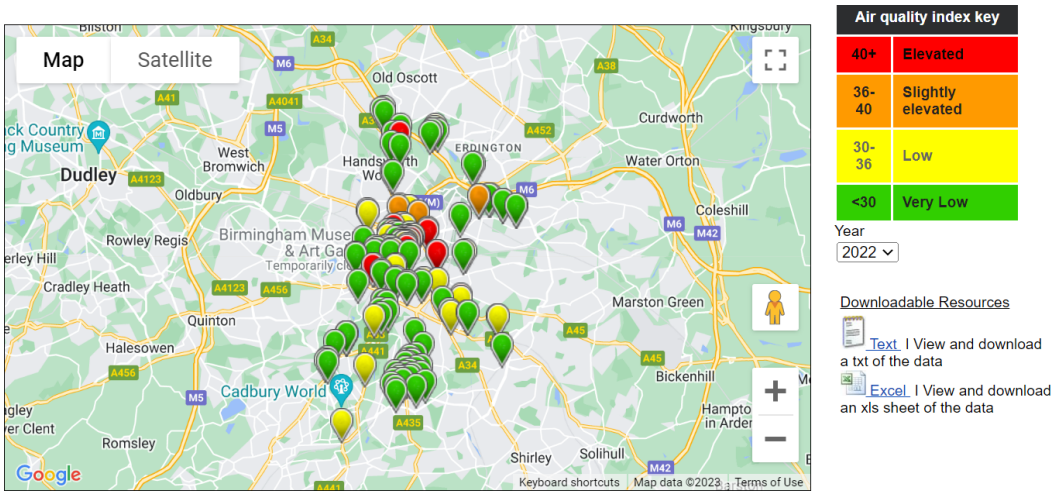


Figure 2 Snapshot of the www.Birminghamairquality.co.uk website.

UPDATE OF THE INTERIM CLEAN AIR ZONE REPORT

The diffusion tube results comprise twelve months of raw data to which a correction factor needs to be applied, this process being known as bias adjustment. The bias adjustment factor is normally provided in April of each year. Within the Interim Clean Air Zone report a provisional bias adjustment factor of 0.81 was used for the 2021 data set. This was due to the national factor not being available at the time the report was produced. The bias adjustment factor has now been adjusted to 0.84 using the national factor. The bias adjustment factor for 2022 has been confirmed as 0.83. All data used in this report makes use of the confirmed national correction factor for that year.

This report also corrects for any errors made in the interim report published in March 2022. In particular table 1-4 incorrectly processed the 2016 diffusion tube results, this in turn impacted upon table 5 of the interim report which summarised the percentage change in the Clean Air Zone, Ring Road and Wider City.

The following tables provide the annual average results for 2016, 2019, 2020, 2021 and 2022. Using 2016 as a baseline (this was the year used for the original modelling in the Clean Air Zone Full Business Case) it is evident that there has been a marked improvement in all locations across the city. However, this is based on a relatively small number of monitoring sites for 2016.

On that basis 2019 has been used as a more consistent baseline as there is less variation in monitoring locations. 2019 is also used as a baseline, rather than the immediate year before the launch of the scheme (2020) due to the impacts of the COVID-19 restrictions on travel behaviours and a significant reduction in the levels of nitrogen dioxide.

Unlike the Clean Air Zone Interim Report, the following tables provide all diffusion tube data for 2016, 2019, 2020, 2021 and 2022.

Table 4 provides the diffusion tube results for monitoring locations within the Clean Air Zone. Table 5 provides the diffusion tube results for monitoring locations on the Ring Road (A4400). Table 6 provides the diffusion tube results for monitoring locations in the wider city.

Within the tables, data that is shaded in orange is used to identify concentrations above the legal limit for the tube and year in question. Data that is shaded yellow shows an upward trend in concentrations across the years specified. An upwards trend does not always indicate concentrations above the legal limit.

Also presented are Figures 3, 4 and 5, which show the locations of tubes presenting exceedances during 2022. These have been geographically defined into three distinct areas; Moor Street, the A38 (St Chads) and the Ring Road.

Clean Air Zone	2016	2019	2020	2021	2022	2016 to 2022	2019 to 2020	2019 to 2021	2019 to 2022
BHM7	49.0	31.0	23.7	22.7	24.5	-50%	-24%	-27%	-21%
BHM8	48.0	34.8	22.2	20.2	20.6	-57%	-36%	-42%	-41%
BHM16	54.0	40.8	34.7	32.7	31.5	-42%	-15%	-20%	-23%
BHM22	33.0	-	-	-	-	-	-	-	-
BHM23	-	39.6	34.4	37.0	30.7	-	-13%	-7%	-22%
BHM24	49.0	37.8	33.0	31.8	31.0	-37%	-13%	-16%	-18%
BHM26	25.0	22.9	16.9	17.9	17.6	-30%	-26%	-22%	-23%
BHM28	60.0	44.7	38.5	39.3	35.6	-41%	-14%	-12%	-20%
BHM29	55.0	43.2	-	-	-	-	-	-	-
BHM30	-	34.4	26.7	-	-	-	-22%	-	-
BHM31	52.0	35.1	28.3	31.1	30.9	-41%	-19%	-11%	-12%
BHM33	52.0	36.1	26.9	29.2	29.3	-44%	-25%	-19%	-19%
BHM34	32.0	26.3	23.2	23.0	22.2	-31%	-12%	-12%	-16%
BHM35	36.0	28.3	24.2	26.1	24.0	-33%	-14%	-8%	-15%
BHM36	47.0	31.9	28.6	29.0	22.4	-52%	-10%	-9%	-30%
BHM39	47.0	36.8	30.5	33.6	-	-	-17%	-9%	-
BHM40	55.0	47.4	43.8	50.0	50.0	-9%	-7%	+6%	+6%
BHM41	58.0	50.4	41.8	50.9	35.0	-40%	-17%	+1%	-31%
BHM42	46.0	39.8	32.3	32.8	32.3	-30%	-19%	-17%	-19%
BHM43	47.0	39.5	32.5	32.7	31.0	-34%	-18%	-17%	-22%
BHM44	48.0	39.0	30.3	32.4	30.2	-37%	-22%	-17%	-23%
BHM45	47.0	35.5	39.4	40.7	32.4	-31%	+11%	+15%	-9%
BHM46	67.0	50.0	42.3	50.3	47.3	-29%	-15%	+1%	-5%
BHM48	50.0	-	-	-	-	-	-	-	-
BHM49	47.0	-	-	-	-	-	-	-	-
BHM50	60.0	44.7	41.1	41.1	36.8	-39%	-8%	-8%	-18%
BHM51	-	35.4	27.6	31.2	30.7	-	-22%	-12%	-13%
BHM52	62.0	-	-	-	-	-	-	-	-
BHM53	55.0	50.0	46.6	51.5	44.2	-20%	-7%	+3%	-12%
BHM54	59.0	-	-	-	-	-	-	-	-
BHM55	65.0	52.0	51.9	51.8	-	-	-0.2%	-0.5%	-
BHM56	48.0	33.3	27.1	28.9	28.9	-40%	-19%	-13%	-13%
BHM58	-	36.6	28.8	34.4	31.0	-	-21%	-6%	-15%
BHM59	-	37.2	30.0	34.0	34.8	-	-19%	-9%	-6%
BHM60	46.0	-	-	-	-	-	-	-	-
BHM61	38.0	29.7	25.8	23.5	23.0	-39%	-13%	-21%	-23%
BHM62	43.0	33.4	26.4	27.2	27.5	-36%	-21%	-19%	-18%
BHM63	36.0	28.4	25.0	25.5	24.0	-33%	-12%	-10%	-16%
BHM64	51.0	33.6	32.9	34.8	-	-	-2%	+3%	-
BHM65	56.0	37.0	29.7	31.9	28.8	-49%	-20%	-14%	-22%

Clean Air Zone	2016	2019	2020	2021	2022	2016 to 2022	2019 to 2020	2019 to 2021	2019 to 2022
BHM86	-	33.7	28.7	33.2	32.4	-	-15%	-2%	-4%
BHM87	-	59.6	46.5	48.6	46.2	-	-22%	-18%	-23%
BHM88	-	58.1	50.6	50.2	48.4	-	-13%	-14%	-17%
BHM89	-	39.4	32.7	33.2	32.6	-	-17%	-16%	-17%
BHM90	-	27.2	21.4	24.4	21.9	-	-21%	-10%	-19%
BHM92	-	40.2	31.4	35.4	34.9	-	-22%	-12%	-13%
BHM100	-	-	-	36.3	37.2	-	-	-	-
BHM103	-	-	-	55.1	47.3	-	-	-	-
BHM104	-	-	-	33.9	32.6	-	-	-	-
BHM106	-	-	-	30.8	28.3	-	-	-	-
BHM107	-	-	-	47.3	43.9	-	-	-	-
BHM109	-	-	-	-	49.3	-	-	-	-

Table 4 Nitrogen dioxide diffusion tube results 2016, 2019, 2020, 2021 and 2022 for the Clean Air Zone with the percentage change compared to 2016 and 2019 baseline.

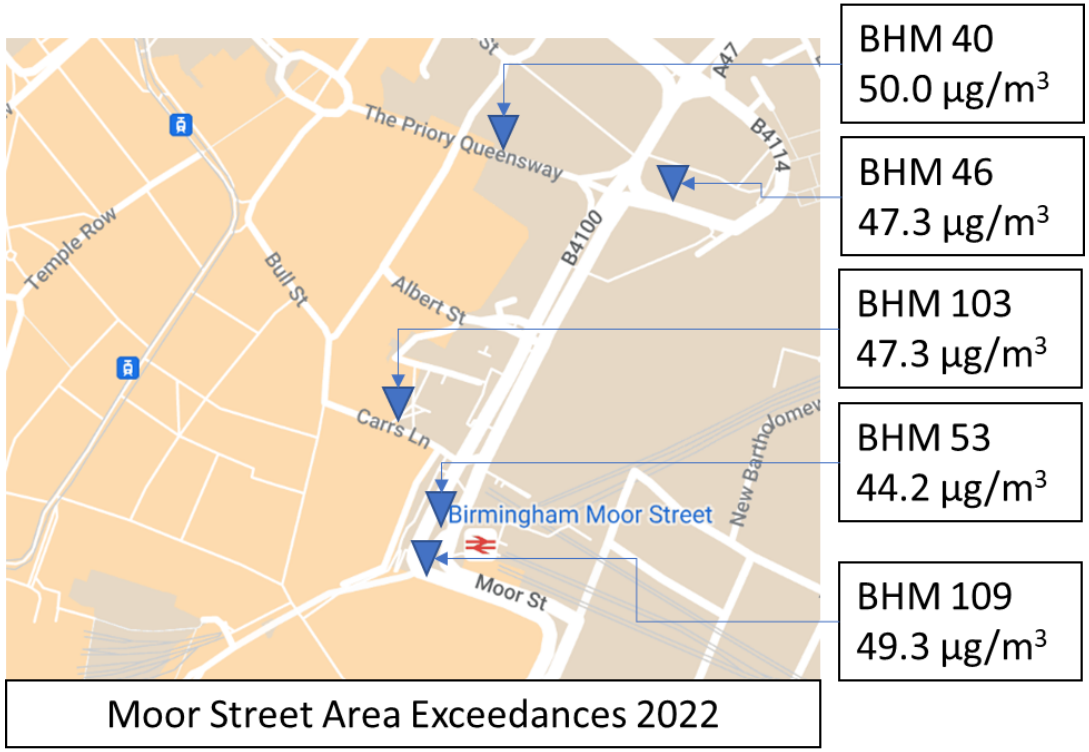


Figure 3 2022 Exceedances within the Clean Air Zone - Moor Street Area.

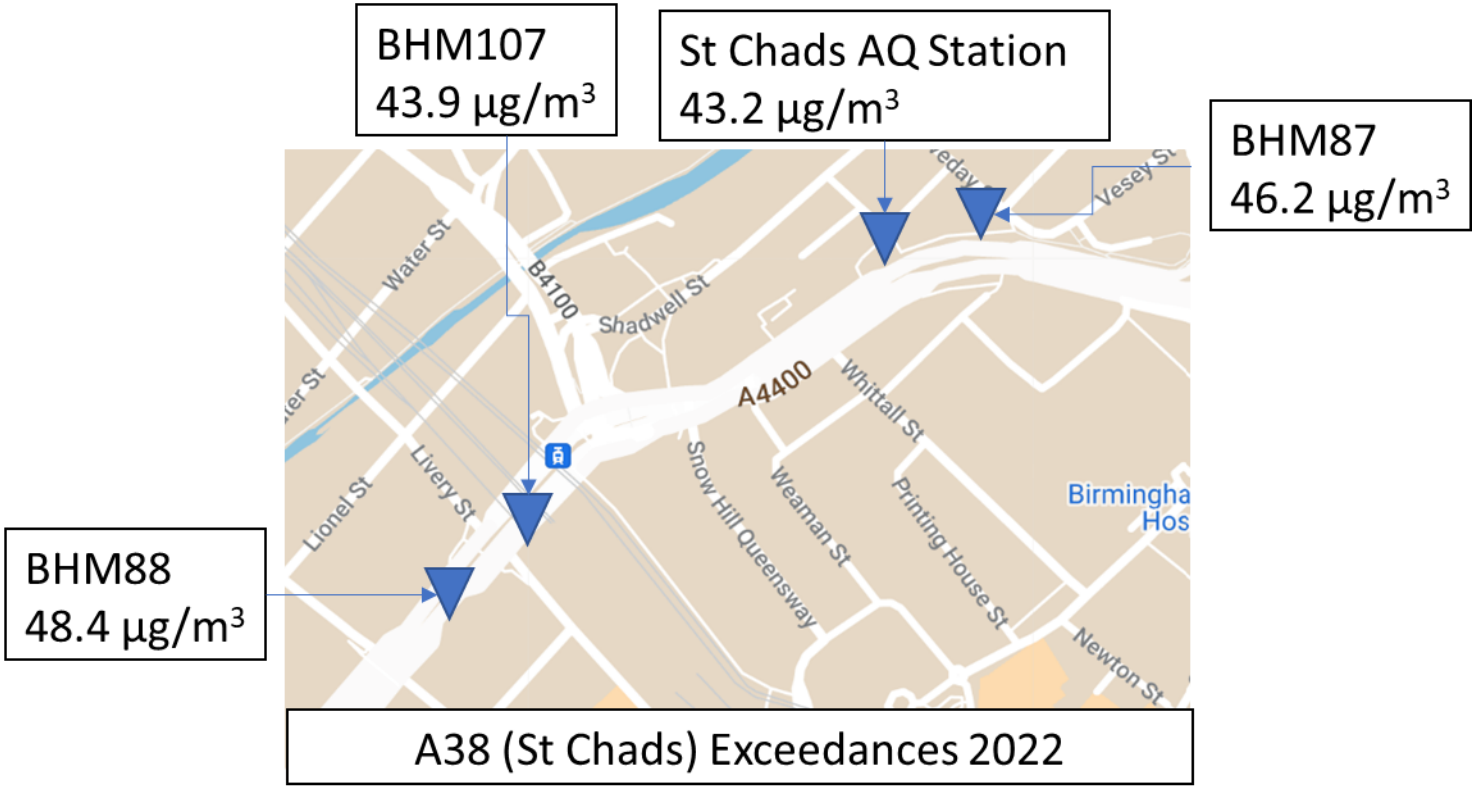


Figure 4 2022 Exceedances within the Clean Air Zone - A38 (St Chads).

Ring Road	2016	2019	2020	2021	2022	2016 to 2022	2019 to 2020	2019 to 2021	2019 to 2022
BHM21	62.0	48.5	37.4	39.8	38.3	-38%	-23%	-18%	-21%
BHM25	-	38.0	36.0	37.9	34.2	-	-5%	-0.2%	-10%
BHM27	48.0	34.7	30.7	32.0	30.1	-37%	-11%	-8%	-13%
BHM66	-	33.2	29.2	30.4	30.2	-	-12%	-8%	-9%
BHM67	-	31.8	24.9	28.2	27.1	-	-22%	-11%	-15%
BHM68	-	32.4	29.6	33.8	30.8	-	-9%	+4%	-5%
BHM69	-	37.6	27.5	30.7	34.1	-	-27%	-18%	-9%
BHM70	-	25.4	-	-	-	-	-	-	-
BHM71	-	25.4	21.2	22.3	21.6	-	-16%	-12%	-15%
BHM72	-	22.8	17.5	19.3	18.7	-	-23%	-16%	-18%
BHM73	-	-	-	30.3	31.8	-	-	-	-
BHM74	-	52.6	43.0	45.2	46.0	-	-18%	-14%	-13%
BHM75	-	34.0	29.2	32.1	30.9	-	-14%	-6%	-9%
BHM76	-	24.8	20.5	22.9	21.2	-	-17%	-8%	-15%
BHM77	-	30.6	26.4	29.6	26.5	-	-14%	-3%	-13%
BHM78	-	31.7	25.3	28.6	26.4	-	-20%	-10%	-17%
BHM79	-	27.7	22.0	26.0	24.5	-	-20%	-6%	-11%
BHM80	-	35.5	25.9	30.0	30.1	-	-27%	-16%	-15%
BHM81	-	41.3	23.7	24.4	-	-	-43%	-41%	-
BHM82	-	28.6	35.1	32.9	21.3	-	+23%	+15%	-25%
BHM83	-	61.0	50.6	52.0	55.5	-	-17%	-15%	-9%
BHM84	-	38.3	31.9	36.7	-	-	-17%	-4%	-
BHM85	-	48.0	40.6	46.0	38.7	-	-15%	-4%	-19%
BHM93	-	40.8	44.5	36.4	36.7	-	+9%	-11%	-10%
BHM102	-	-	-	-	55.8	-	-	-	-
BHM108	-	-	-	-	30.1	-	-	-	-

Table 5 Nitrogen dioxide diffusion tube results 2016, 2019, 2020, 2021 and 2022 for the ring road with the percentage change compared to 2016 and 2019 baseline.

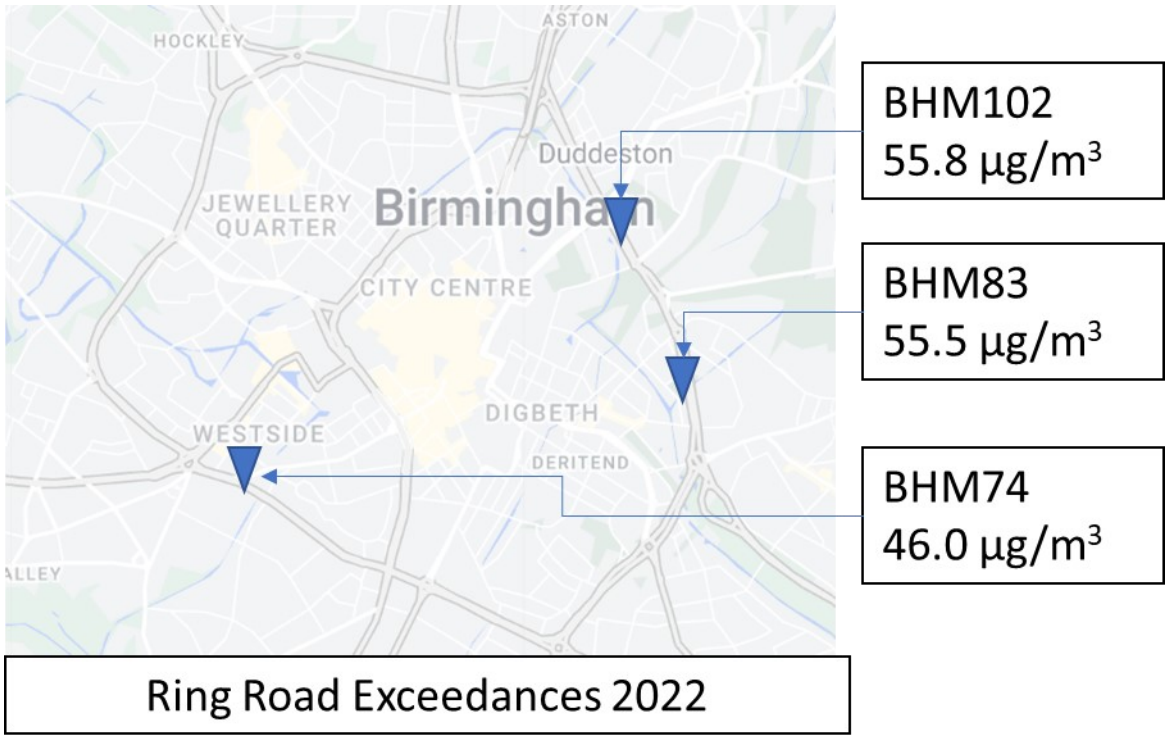


Figure 5 2022 Diffusion tube exceedances on the Ring Road.

Wider City	2016	2019	2020	2021	2022	2016 to 2022	2019 to 2020	2019 to 2021	2019 to 2022
BHM1	15.0	15.1	12.7	14.7	14.3	-5%	-16%	-3%	-6%
BHM2	17.0	14.4	12.0	12.9	11.8	-31%	-17%	-10%	-18%
BHM3	39.0	28.8	26.4	29.2	27.5	-29%	-8%	+1%	-4%
BHM4	41.0	32.8	27.8	27.9	27.8	-32%	-15%	-15%	-15%
BHM5	41.0	34.0	29.3	31.3	29.2	-29%	-14%	-8%	-14%
BHM6	56.0	39.2	34.5	34.7	33.7	-40%	-12%	-12%	-14%
BHM9	40.0	32.3	28.6	29.1	28.4	-29%	-11%	-10%	-12%
BHM10	37.0	31.9	26.1	27.3	26.7	-28%	-18%	-14%	-16%
BHM11	36.0	31.2	26.1	27.3	26.7	-26%	-16%	-12%	-14%
BHM12	37.0	31.5	26.1	27.3	26.7	-28%	-17%	-13%	-15%
BHM13	29.0	-	-	-	-	-	-	-	-
BHM14	30.0	-	-	-	-	-	-	-	-
BHM15	29.0	-	-	-	-	-	-	-	-
BHM17	48.0	34.0	30.4	30.5	29.1	-39%	-10%	-10%	-14%
BHM18	47.0	35.3	31.3	32.5	30.9	-34%	-11%	-8%	-13%
BHM19	-	38.2	32.9	34.3	32.7	-	-14%	-10%	-14%
BHM20	39.0	30.4	22.2	23.8	23.9	-39%	-27%	-22%	-21%
BHM37	-	26.3	20.4	23.7	21.0	-	-23%	-10%	-20%
BHM38	54.0	-	-	-	-	-	-	-	-
BHM57	-	28.1	20.5	22.1	21.3	-	-27%	-21%	-24%
BHM91	-	27.1	24.4	27.4	26.2	-	-10%	+1%	-3%
BHM99	-	40.0	32.1	36.1	32.4	-	-20%	-10%	-19%
LTNKH001S	-	-	-	14.5	13.5	-	-	-	-
LTNKH002S	-	-	-	14.4	13.7	-	-	-	-
LTNKH003S	-	-	-	16.5	16.0	-	-	-	-
LTNKH004S	-	-	-	12.6	12.2	-	-	-	
LTNKH005S	-	-	-	13.8	13.4	-	-	-	-
LTNKH006S	-	-	-	13.8	12.9	-	-	-	-
LTNKH007S	-	-	-	12.7	12.2	-	-	-	-
LTNKH008	-	-	-	13.3	12.5	-	-	-	-
LTNKH009	-	-	-	12.6	12.2	-	-	-	-
LTNKH010	-	-	-	19.7	18.3	-	-	-	-
LTNKH011	-	-	-	16.0	14.9	-	-	-	-
LTNKH012	-	-	-	27.2	25.8	-	-	-	-
LTNKH013	-	-	-	17.5	16.3	-	-	-	-
LTNKH014	-	-	-	15.0	15.0	-	-	-	-
LTNKH015	-	-	-	14.3	13.7	-	-	-	-
LTNKH016	-	-	-	16.3	17.4	-	-	-	-
LTNKH017	-	-	-	14.9	13.8	-	-	-	-

Wider City	2016	2019	2020	2021	2022	2016 to 2022	2019 to 2020	2019 to 2021	2019 to 2022
LTNKH018	-	-	-	26.1	25.1	-	-	-	-
LTNKH019	-	-	-	15.8	15.4	-	-	-	-
LTNKH020	-	-	-	16.5	16.4	-	-	-	-
LTNKH021	-	-	-	17.2	17.2	-	-	-	-
LTNKH022	-	-	-	16.1	16.2	-	-	-	-
LTNKH023	-	-	-	18.8	17.8	-	-	-	-
LTNKH024	-	-	-	18.5	18.5	-	-	-	-
LTNKH025	-	-	-	18.7	19.3	-	-	-	-
BHMPB1	-	-	25.6	28.0	25.0	-	-	-	-
BHMPB2	-	-	19.4	21.3	19.9	-	-	-	-
BHMPB3	-	-	26.0	32.6	34.9	-	-	-	-
BHMPB4	-	-	32.5	35.5	41.1	-	-	-	-
BHMPB6	-	-	30.8	32.1	29.7	-	-	-	-
BHMPB7	-	-	-	28.3	26.4	-	-	-	-
BHM200	-	-	-	-	34.2	-	-	-	-
BHM201	-	-	-	-	29.0	-	-	-	-
BHM202	-	-	-	-	30.2	-	-	-	-
BHM203	-	-	-	-	32.5	-	-	-	-
BHM204	-	-	-	-	29.7	-	-	-	-
BHM205	-	-	-	-	33.4	-	-	-	-
BHM206	-	-	-	-	25.2	-	-	-	-
BHM207	-	-	-	-	32.2	-	-	-	-
BHM208	-	-	-	-	20.2	-	-	-	-
BHM209	-	-	-	-	21.6	-	-	-	-
BHM210	-	-	-	-	30.5	-	-	-	-
BHM211	-	-	-	-	22.8	-	-	-	-
BHM212	-	-	-	-	25.5	-	-	-	-
BHM213	-	-	-	-	21.3	-	-	-	-
BHM214	-	-	-	-	21.8	-	-	-	-
BHM215	-	-	-	-	25.9	-	-	-	-
BHM216	-	-	-	-	28.2	-	-	-	-
BHM217	-	-	-	-	28.9	-	-	-	-
BHM218	-	-	-	-	27.4	-	-	-	-
BHM219	-	-	-	-	40.2	-	-	-	-
BHM220	-	-	-	-	34.8	-	-	-	-
BHM221	-	-	-	-	22.5	-	-	-	-
BHM222	-	-	-	-	26.5	-	-	-	-
BHM223	-	-	-	-	27.5	-	-	-	-
BHM224	-	-	-	-	28.9	-	-	-	-
BHM225	-	-	-	-	24.3	-	-	-	-

Wider City	2016	2019	2020	2021	2022	2016 to 2022	2019 to 2020	2019 to 2021	2019 to 2022
BHM226	-	-	-	-	37.9	-	-	-	-
BHM227	-	-	-	-	33.1	-	-	-	-
BHM228	-	-	-	-	29.6	-	-	-	-
BHM229	-	-	-	-	36.9	-	-	-	-
BHM230	-	-	-	-	27.9	-	-	-	-
BHM231	-	-	-	-	24.2	-	-	-	-
BHM232	-	-	-	-	26.3	-	-	-	-
BHM233	-	-	-	-	30.4	-	-	-	-
BHM234	-	-	-	-	31.1	-	-	-	-
BHM236	-	-	-	-	22.1	-	-	-	-
BHM240	-	-	-	-	30.7	-	-	-	-
BHM241	-	-	-	-	24.9	-	-	-	-
BHM242	-	-	-	-	26.1	-	-	-	-
BHM243	-	-	-	-	28.3	-	-	-	-

Table 6 Nitrogen dioxide diffusion tube results 2016, 2019, 2020, 2021 and 2022 for the wider city with the percentage change compared to 2016 and 2019 baseline.

Table 7 below presents the average percentage change in the levels of nitrogen dioxide in three broad areas, the Clean Air Zone, the Ring Road and the Wider City. When using 2016 as a baseline compared to 2022 there has been a 37% reduction in the levels of nitrogen dioxide within the Clean Air Zone, however this is based on a smaller set of monitoring locations. By comparison 2019 to 2020, 2019 to 2021 and 2019 to 2022 indicate an improvement in all three areas.

It should be noted that the Interim Report suggested a provisional improvement of 13% between 2019 to 2021 within the Clean Air Zone. Now that the data has been ratified and the confirmed national bias adjustment correction factor for 2021 has been applied the average reduction in nitrogen dioxide is 11%. Between 2019 to 2022 for the Clean Air Zone a 17% reduction in nitrogen dioxide has been recorded based on ratified results. It should be noted that between 2019 and 2022 the greatest change in nitrogen dioxide has been recorded in the Clean Air Zone compared to the ring road and the wider city.

	2016 to 2022	2019 to 2020	2019 to 2021	2019 to 2022
Clean Air Zone	-37%	-16%	-11%	-17%
Ring Road	-38%	-15%	-10%	-14%
Wider City	-30%	-16%	-10%	-14%

Table 7 Average reduction in Nitrogen Dioxide for the Clean Air Zone, Ring Road and Wider City.

AIR QUALITY AUTOMATIC ANALYSERS

From the launch of the Clean Air Zone in June to December 2021 five automatic air quality units were operational within the zone. These include Lower Severn Street, Moor Street, St Chads, Colmore Row and Ladywood. A further unit, run by third parties on behalf of Defra, is located on the ring road (A4540). Four Council run stations are also operating in the wider city. Data from the stations is available at Birmingham Air Quality. In November 2021 a further six additional stations were installed within the zone and on the ring road, specifically to help inform the impact from the CAZ.

Table 8 provides the nitrogen dioxide annual averages of the stations within the zone and the ring road and the wider city. In 2020 there were no recorded exceedances primarily due to the impact of Covid. In 2021 and 2022 one station at St Chads has recorded a level above the legal limit (nitrogen dioxide 40µg/m^3), although it should be noted this was returning a higher concentration in the pre-Covid years and before the launch of the CAZ than presently.

Station ID			Station Name	2019	2020	2021	2022
BCA2	CAZ	Kerbside	St Chads	51.0	37.1	40.3	43.2
BCA1	CAZ	Roadside	Colmore Row	35.0	31.9	26.7	27.6
BAF1	CAZ	Background	Ladywood	-	15.0	16.0	17.0
BCA3	CAZ	Roadside	Lower Severn St	43.0	23.7	26.2	29.2
BCA7	CAZ	Roadside	Moor Street	-	-	32.0	33.4
BCA13	CAZ	Roadside	Bristol Street (A38)	-	-	23.9	18.9
BAU2	Ring Road	Roadside	A4540	32.0	29.0	32.0	32.0
BCA11	Ring Road	Roadside	New John Street West	-	-	34.2	28.6
BCA8	Ring Road	Roadside	Dartmouth Middleway	-	-	26.2	25.2
BCA12	Ring Road	Roadside	Ravenhurst Street	-	-	37.2	29.6
BCA9	Ring Road	Roadside	Lee Bank Middleway	-	-	34.3	32.9
BCA10	Ring Road	Roadside	Ladywood Middleway	-	-	28.7	33.4
BCA5	Wider City	Roadside	Selly Oak	28.0	19.0	21.3	22.1
BAU1	Wider City	Background	Acocks Green	19.0	14.0	14.0	-
BCA6	Wider City	Roadside	Stratford Road	36.0	18.3	24.0	23.1
BCA4	Wider City	Background	New Hall	19.0	11.3	12.9	16.8

Table 8 Nitrogen dioxide annual averages from the automatic air quality stations within the Clean Air Zone, ring road and wider city expressed in units of µg/m^3.

4.0 – HOW HAS FLEET COMPOSITION CHANGED?

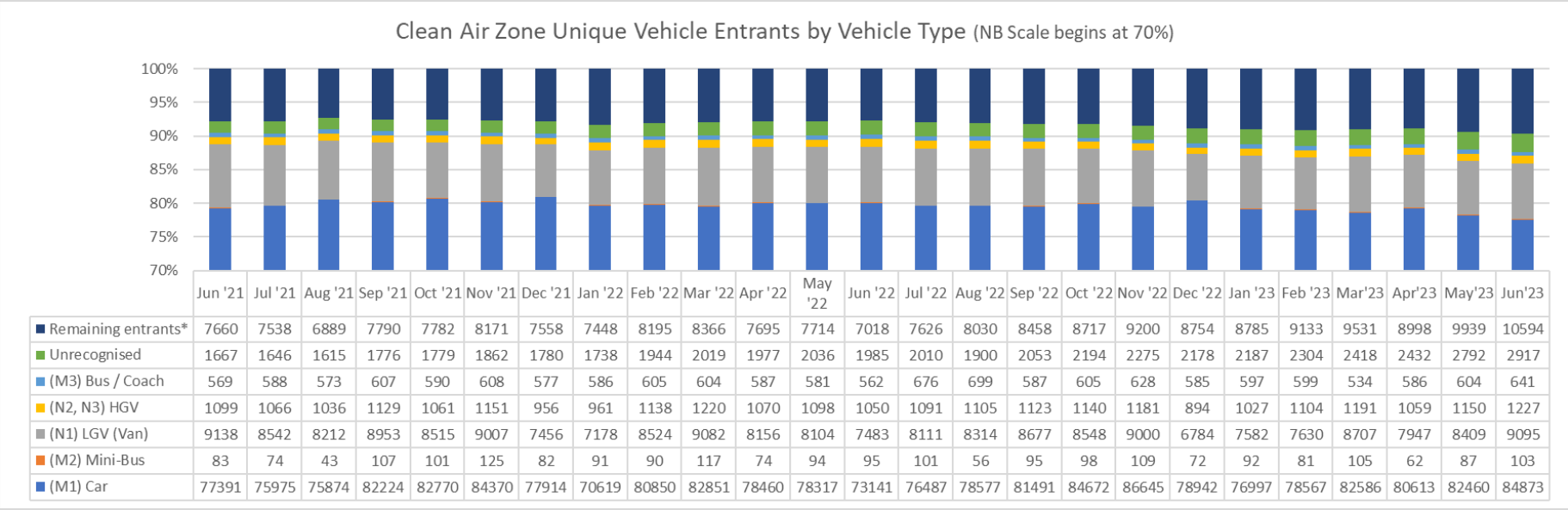
The fleet mix within the Clean Air Zone indicates that cars dominate the fleet composition, which account on average 79.6% of all unique vehicles entering the zone.

The next largest group of vehicles within the zone are Light Goods Vehicles (LGV), which account for approximately 8.3% of the fleet, Heavy Goods Vehicles (HGVs) comprise of approximately 1.1% and bus/coach comprise of 0.6% as shown in Tables 9 and 10.

Fleet composition for HGVs and Buses / Coaches is stable at 1.1% and 0.6% respectively, Whereas the LGV fleet appears to have decreased from 8.6% down to 8.0%. The proportion of private cars has also decreased from 80.2% down to 78.6%. During the same period the number of remaining entrants which comprise of non-chargeable, exempt and undetermined has risen from 7.7% to 9.2%, the reason for this change is unclear.

	2021 (Jun - Dec)	2022 (Jan - Dec)	2023 (Jan - Jun)	Average
(M1) Car	80.2%	79.8%	78.6%	79.6%
(M2) Mini-Bus	0.1%	0.1%	0.1%	0.1%
(N1) LGV (Van)	8.6%	8.2%	8.0%	8.3%
(N2, N3) HGV	1.1%	1.1%	1.1%	1.1%
(M3) Bus / Coach	0.6%	0.6%	0.6%	0.6%
Unrecognised	1.7%	2.0%	2.4%	2.1%
Remaining entrants*	7.7%	8.2%	9.2%	8.3%
(M1) Car	79503	79254	103058	100177
(M2) Mini-Bus	88	91	81016	79747
(N1) LGV (Van)	8546	8163	88	89
(N2, N3) HGV	1071	1089	8228	8286
(M3) Bus / Coach	587	609	1126	1093
Unrecognised	1732	2026	594	599
Remaining entrants*	7627	8102	2508	2059
Total Unique Entrants	99154	99334	9497	8304

Table 9 Unique vehicle average fleet composition June to December 2021, January to December 2022 and January - June 2023.
***Remaining entrants comprise of non-chargeable, exempt and undetermined.**



	Jun '21	Jul '21	Aug '21	Sep '21	Oct '21	Nov '21	Dec '21	Jan '22	Feb '22	Mar '22	Apr '22	May '22	Jun '22	Jul '22	Aug '22	Sep '22	Oct '22	Nov '22	Dec '22	Jan '23	Feb '23	Mar'23	Apr'23	May'23	Jun'23
Remaining entrants*	7660	7538	6889	7790	7782	8171	7558	7448	8195	8366	7695	7714	7018	7626	8030	8458	8717	9200	8754	8785	9133	9531	8998	9939	10594
Unrecognised	1667	1646	1615	1776	1779	1862	1780	1738	1944	2019	1977	2036	1985	2010	1900	2053	2194	2275	2178	2187	2304	2418	2432	2792	2917
(M3) Bus / Coach	569	588	573	607	590	608	577	586	605	604	587	581	562	676	699	587	605	628	585	597	599	534	586	604	641
(N2, N3) HGV	1099	1066	1036	1129	1061	1151	956	961	1138	1220	1070	1098	1050	1091	1105	1123	1140	1181	894	1027	1104	1191	1059	1150	1227
(N1) LGV (Van)	9138	8542	8212	8953	8515	9007	7456	7178	8524	9082	8156	8104	7483	8111	8314	8677	8548	9000	6784	7582	7630	8707	7947	8409	9095
(M2) Mini-Bus	83	74	43	107	101	125	82	91	90	117	74	94	95	101	56	95	98	109	72	92	81	105	62	87	103
(M1) Car	77391	75975	75874	82224	82770	84370	77914	70619	80850	82851	78460	78317	73141	76487	78577	81491	84672	86645	78942	76997	78567	82586	80613	82460	84873

Table 10 Unique vehicle fleet composition by month from June 2021 to June 2023 NB scale begins at 70% *Remaining entrants comprise of non-chargeable, exempt and undetermined.

5.0 – HOW HAS TRAFFIC VOLUME AND COMPLIANCE RATES CHANGED?

ROAD TRAFFIC VOLUME

Figure 6 provides the monthly average unique vehicles entering the Clean Air Zone. The overall volume of unique entrants has fluctuated from a low of 88,609 daily unique vehicle entrants in January 2022 to a max of 109,438 daily unique entrants in June 2023. On average 100,166 unique vehicles enter the zone every day. In 2021 (June - December) the average unique vehicle entrants was recorded at 99,154, in 2022 (January - December) this stood at 99,316, 2023 (January - June) recorded a level of 103,047 unique vehicle entrants. By years of operation of the Clean Air Zone - June 2021 to June 2022 the number of unique entrants stood at 98,112 average per day, for June 2022 to June 2023 this stood at 102,392 daily average unique entrants.

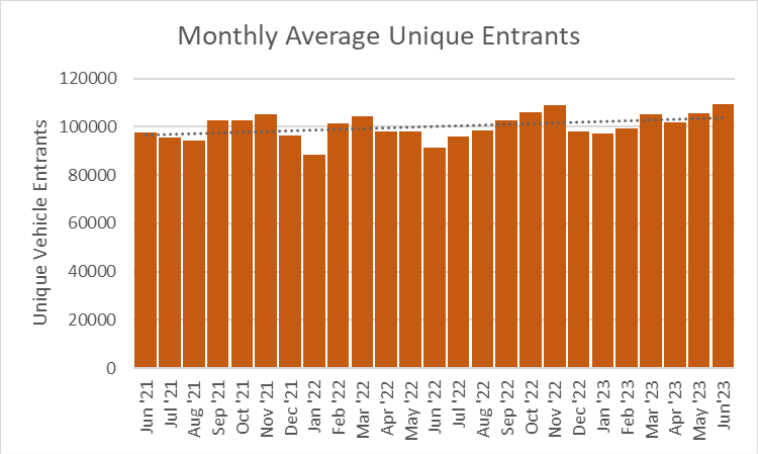


Figure 6 Monthly Average Unique Entrants into the Clean Air Zone.

During Covid road traffic volumes decreased significantly compared to pre-Covid levels. Figure 7 provides a comparison of Clean Air Zone vs Ring Road annotated with the various lockdowns and the launch of the Clean Air Zone. Since the end of the Covid pandemic restrictions have been lifted (March 2021) with road traffic volumes appearing to have settled to pre-pandemic levels.

When the Clean Air Zone launched there was a reduction in vehicle numbers detected in the inner city. However, this was not reflected by a corresponding increase on the ring road which suggests that a significant displacement of traffic from the Clean Air Zone to the ring road did not occur.

A year on there still does not appear to be a significant level of displacement from the Clean Air Zone to the Ring Road with the overall current vehicle numbers being comparable to pre-pandemic levels.

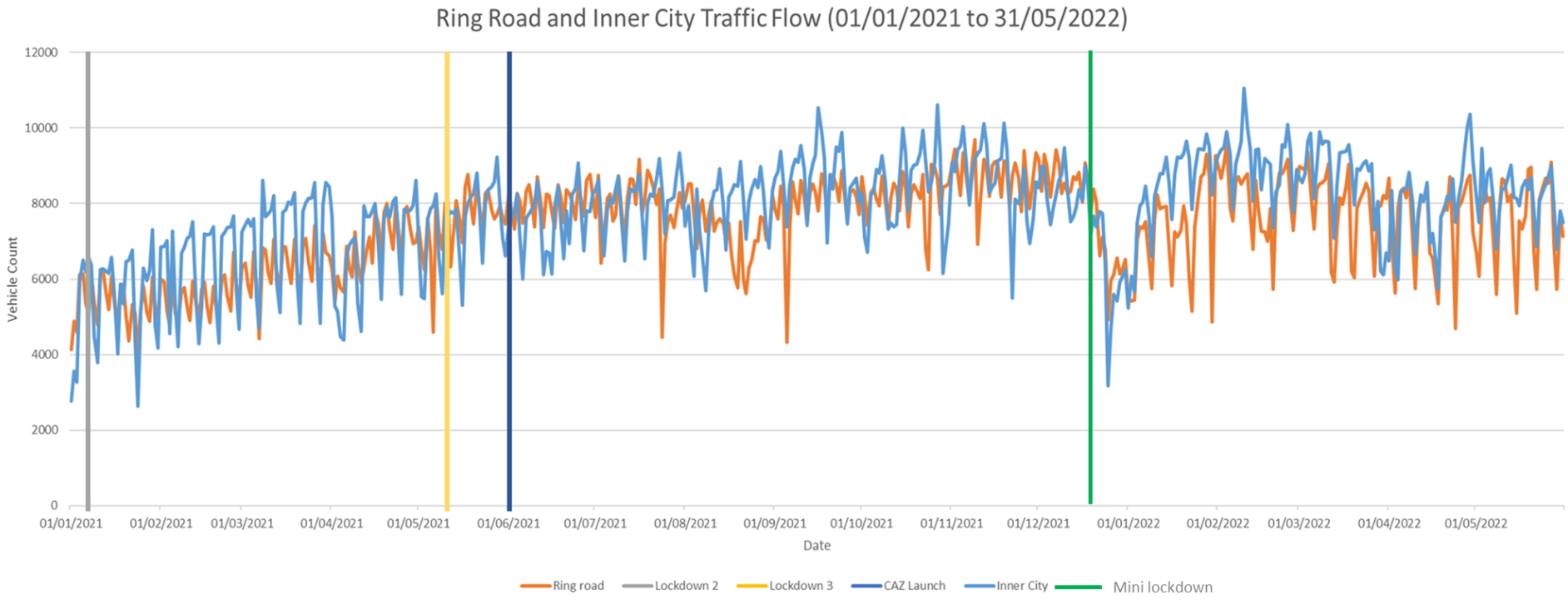


Figure 7 Ring Road and Inner City (Clean Air Zone) traffic flows from January 2021 to May 2022.

OVERALL COMPLIANCE RATES

The Clean Air Zone is enforced via a network of Automatic Number Plate Recognition Cameras (ANPR) which capture the registration number of the vehicles that pass by. Vehicles that enter the zone are checked against the DVLA database to determine whether they comply with the relevant emission standard, along with the vehicle category (Car, Van, Bus, HGV etc).

As of June 2021, the underlying overall rate of compliance was 77.2% which has steadily increased to 84.5% in June 2023, an improvement of 9.5% as shown in Figure 8. Over the same period the rate of non-compliance in June 2021 was recorded at 15.2% which has since reduced to 6.0% as of June 2023, a change of 60.5%.

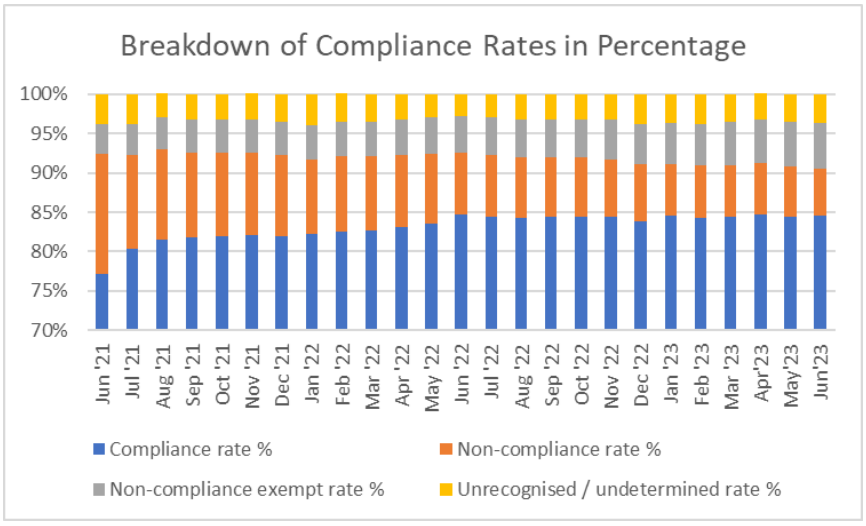


Figure 8 Overall vehicle compliance rates. It should be noted that for June 1-13th June the Clean Air Zone was launched but non-charging. Charging came into force on the 14th June 2021.

The Clean Air Zone full business case outlined a targets for vehicle compliance for 2022, on the basis of a launch date of 1 January 2020.

Due to delays in the implementation of the Clean Air Zone the originally modelled year of compliance (2022) is unlikely to be achieved, however the target values are still valid, and will continue to be used as a guide for when compliance with the legal limit for nitrogen dioxide (40µg/m^3 annual average) might be achieved. Significant progress towards compliance appears to be taking place, albeit that there are three areas where we have exceedance points (Moor Street Area, A38 (St Chads) and the ring road).

The following sections will discuss each vehicle category to better understand the nuances of the traffic composition and the rates of compliance.

Assuming the rate of change continues at a constant rate Table 11 below provides an estimate of when modelled vehicle compliance levels that were set out in the Clean Air Zone Business Case may be realised. It should be noted that modelled vehicle compliance may not directly correlate to compliance of the air quality standard for nitrogen dioxide. Therefore, the table below should be seen as an indication that the desired change is taking place, but the absolute test of compliance or success is achieving the desired reduction in the levels of nitrogen dioxide.

Vehicle Category	Modelled Target	Compliance June 2021	Percentage between compliance June 2021 and modelled target	Percentage point difference between compliance June 2021 and modelled target	Compliance June 2023	Percentage between compliance June 2023 and modelled target	Percentage point difference between compliance June 2023 and modelled target	Percentage difference between compliance June 2023 and June 2021	Percentage point difference between June 2023 and June 2021	Average monthly rate of change over 24 months June 2021 – June 2023	Average monthly rate of percentage point change over 24 months June 2021 to June 2023
Cars (M1)	98.0%	85.3%	13.0%	12.7%	94.2%	3.9%	3.8%	10.4%	8.9%	0.4%	0.4%
Bus / Coach (M3)	100%	99.3%	0.7%	0.7%	99.4%	0.6%	0.6%	0.1%	0.1%	0.0%	0.0%
LGV (N1)	82.7%	68.6%	17.1%	14.1%	85.7%	+3.6%	+3.0%	+24.9%	17.1%	1.0%	0.7%
Lorry (N2) & HGV (N3)	98.5%	92.2%	6.4%	6.3%	97.8%	0.7%	0.7%	6.1%	5.6%	0.3%	0.2%

Table 11 Trends of compliance rates from June 2021 to June 2023 compared to modelled target.

CARS (M1) COMPLIANCE RATE

Figure 9 provides the average daily unique passenger car entrants into the zone from June 2021 to June 2023. Compliance rates for passenger cars has steadily increased from 85.3% in June 2021 to 94.2% in June 2023, with the target rate of compliance of 98%. There is also a variation in weekday vs. weekend compliance rate for passenger vehicles as shown in Figures 9 and 10.

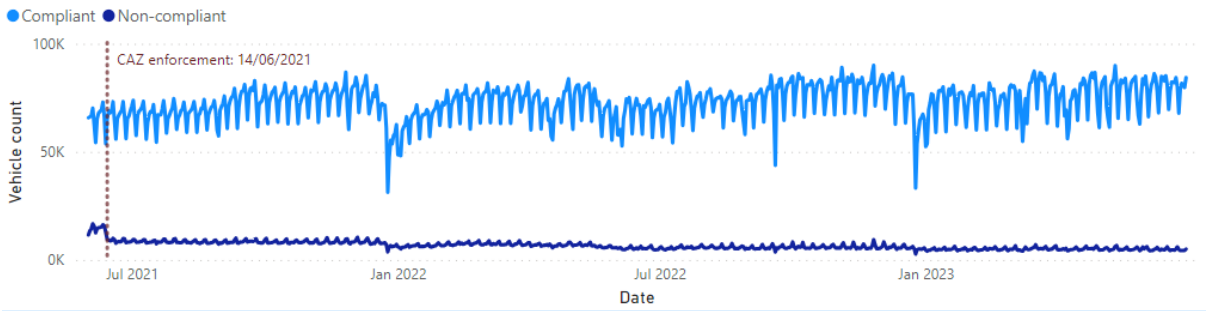


Figure 9 Unique Daily car entrants into the Clean Air Zone, compliant vs non-compliant.

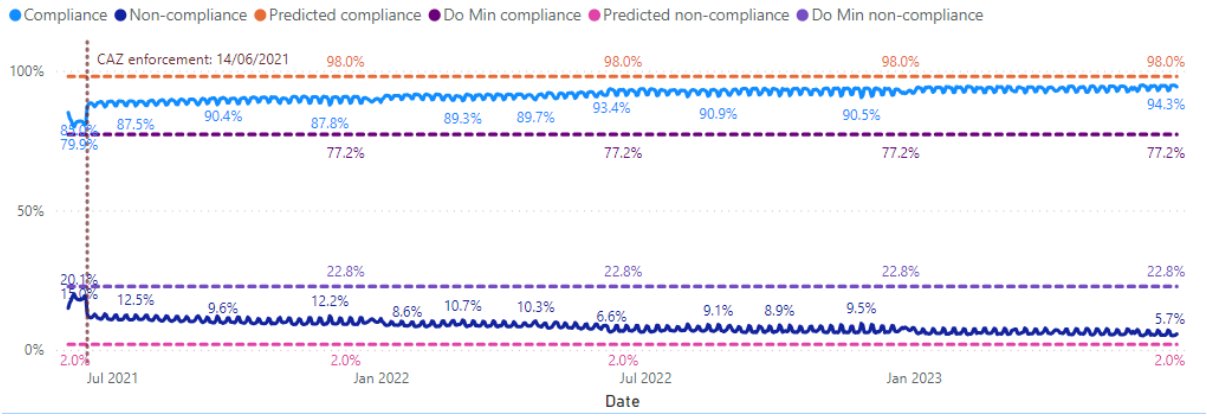


Figure 10 Daily car percentage compliant and non-compliant vs predicted (excluding exempt and unrecognised).

CAR EURO CLASS

Quarterly snapshots have been taken from the Clean Air Zone ANPR cameras. This data is then processed to provide Euro Class split. Unlike the compliance rates which are based on unique vehicles, the ANPR snapshots are based on vehicle trips. For both petrol and diesel cars there has been a marked uptake of Euro 6 vehicles, which is more pronounced in the diesel car fleet. During the same period there has been a decline in Euro 5 and 4 vehicles as shown in Figures 11 and Figure 12.

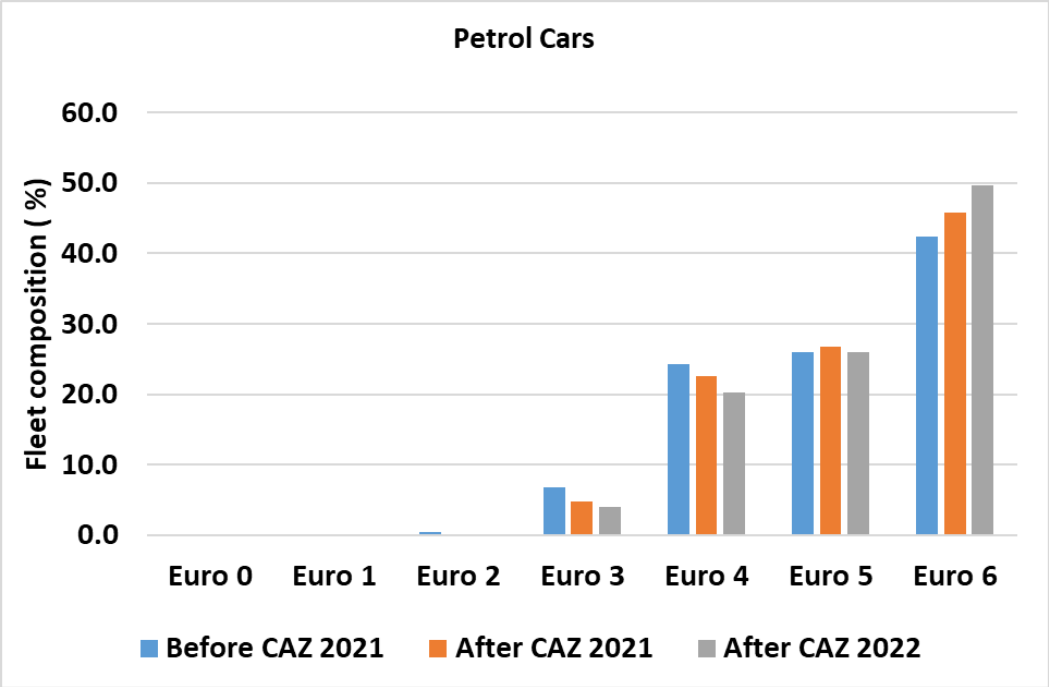


Figure 11 Petrol car Euro Class change over time (Thanks to WM-Air for processing the data)

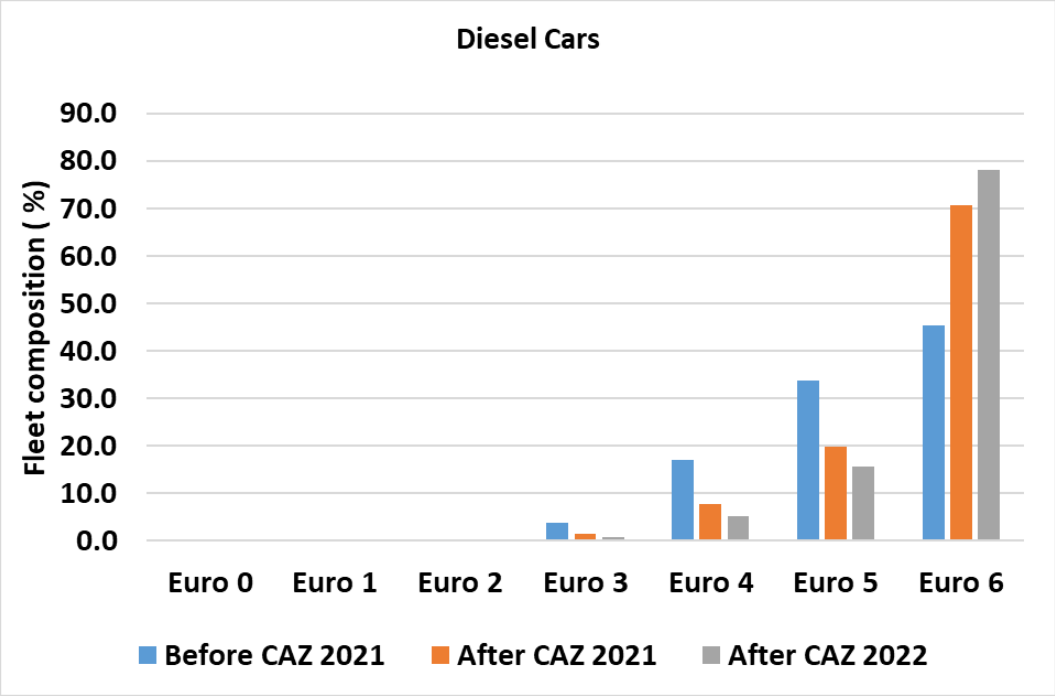


Figure 12 Diesel car Euro Class change over time (Thanks to WM-Air for processing the data).

LIGHT GOODS VEHICLES (LGV [N1])

Figure 13 below covers Light Goods Vehicles (LGV) [N1] and shows a significant variation of weekday vs. weekend in vehicle volume. This is also reflected in the compliance rates with the weekends seeing a greater percentage of non-compliant vehicles compared to weekdays. At the launch of the Clean Air Zone LGV compliance rates stood at 68.6% which has increased to 85.7% as of June 2023. The business case for the Clean Air Zone aim for LGVs is a compliance rate of 82.7%, as shown in Figure 14. If the variation in weekday/weekend compliance rates is discounted the compliance rates for LGVs has met the target.

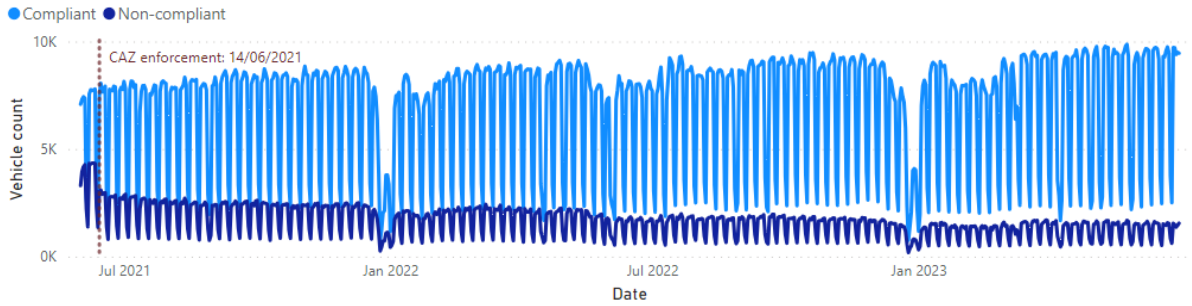


Figure 13 Light Goods Vehicles (LGV) daily unique entrants, compliant vs non-compliant.

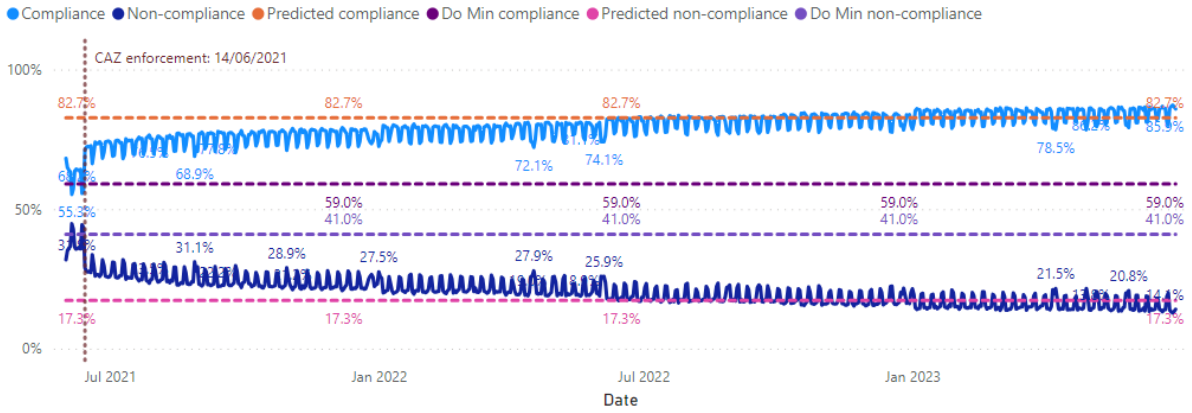


Figure 14 Daily percentage compliant, non-compliant Light Goods Vehicles (LGV) vs predicted (excluding exempt and unrecognised).

LGV EURO CLASS

Quarterly snapshots have been taken from the Clean Air Zone ANPR cameras. This data is then processed to provide Euro Class split. Unlike the compliance rates which are based on unique vehicles, the ANPR snapshots are based on vehicle trips. For LGVs there has been a marked uptake of Euro 6 vehicles. During the same period there has been a decline in Euro 5 and 4 vehicles as shown in Figure 15.

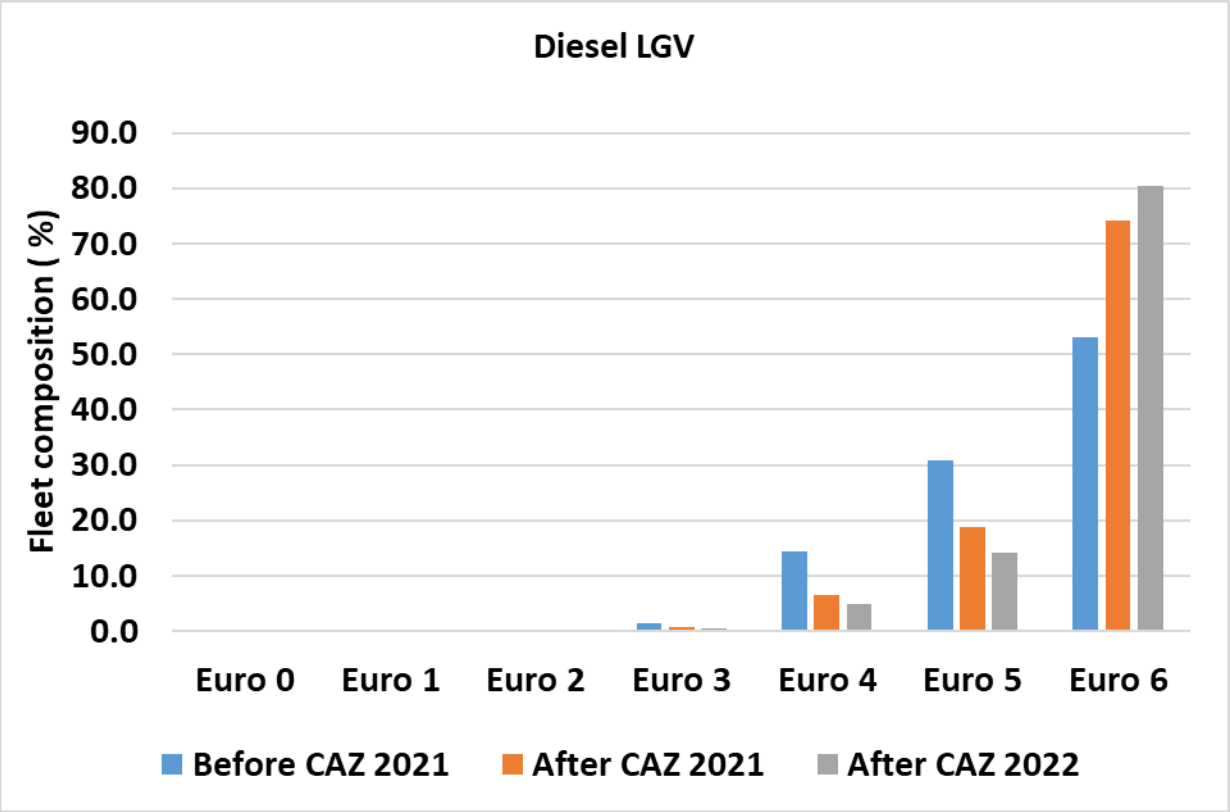


Figure 15 Diesel LGV Euro Class change over time (Thanks to WM-Air for processing the data)

HEAVY GOODS VEHICLES (HGVS [N2, N3])

Figure 16 provides the unique daily entrants of Heavy Goods Vehicles (HGV) which indicates a significant variation in the volume of HGVs during the weekday compared to the weekend. Compliance rates have shown a steady improvement in since the introduction of the Clean Air Zone, in June 2021 compliance stood at 92.2%, which has improved to 97.8% in June 2023 as shown in Figure 17, which is close to the target rate of compliance at 98.5%

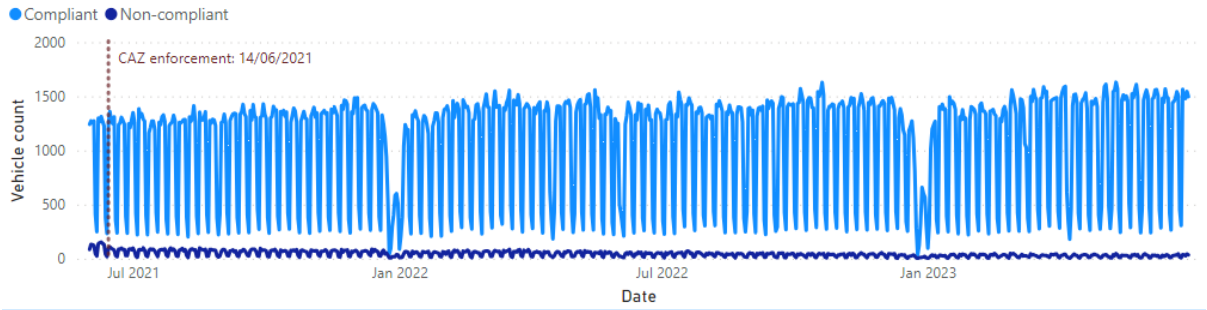


Figure 16 Heavy Goods Vehicles (HGV) daily unique entrants, compliant vs non-compliant.

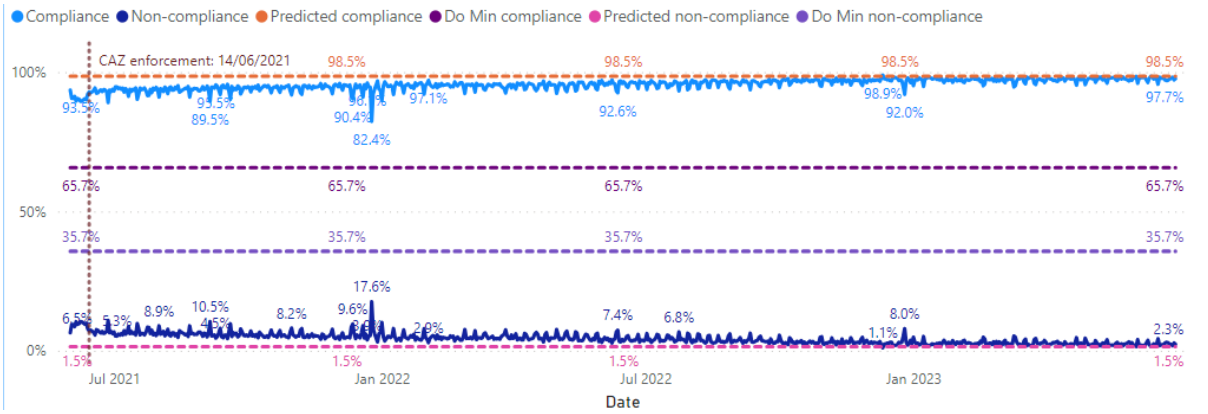


Figure 17 Heavy Goods Vehicles (HGV) compliant, non-compliant percentage vs predicted (excluding exempt and unrecognised)

HGV EURO CLASS

Quarterly snapshots have been taken from the Clean Air Zone ANPR cameras. This data is then processed to provide Euro Class split. Unlike the compliance rates which are based on unique vehicles, the ANPR snapshots are based on vehicle trips. For HGVs there has been a marked uptake of Euro VI vehicles. During the same period there has been a decline in Euro V and IV vehicles. Analysis of the subset of HGVs (articulate vs rigid) indicates the improvement is more pronounced in rigid HGVs compared to articulated as shown in Figures 18 and 19.

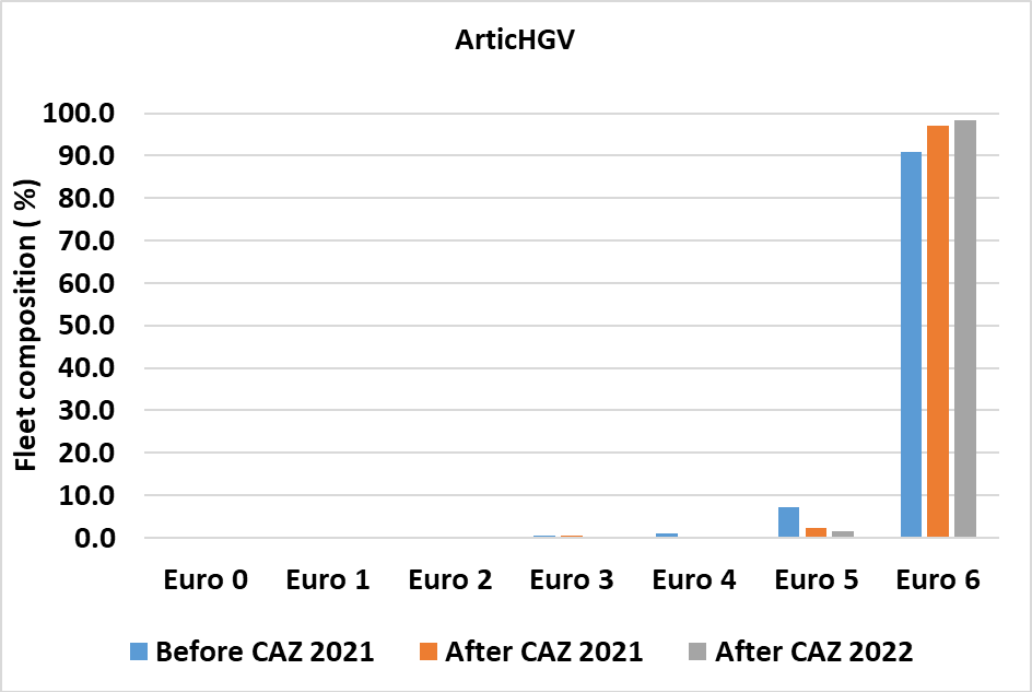


Figure 18 Articulated HGV Euro Class change over time (Thanks to WM-Air for processing the data).

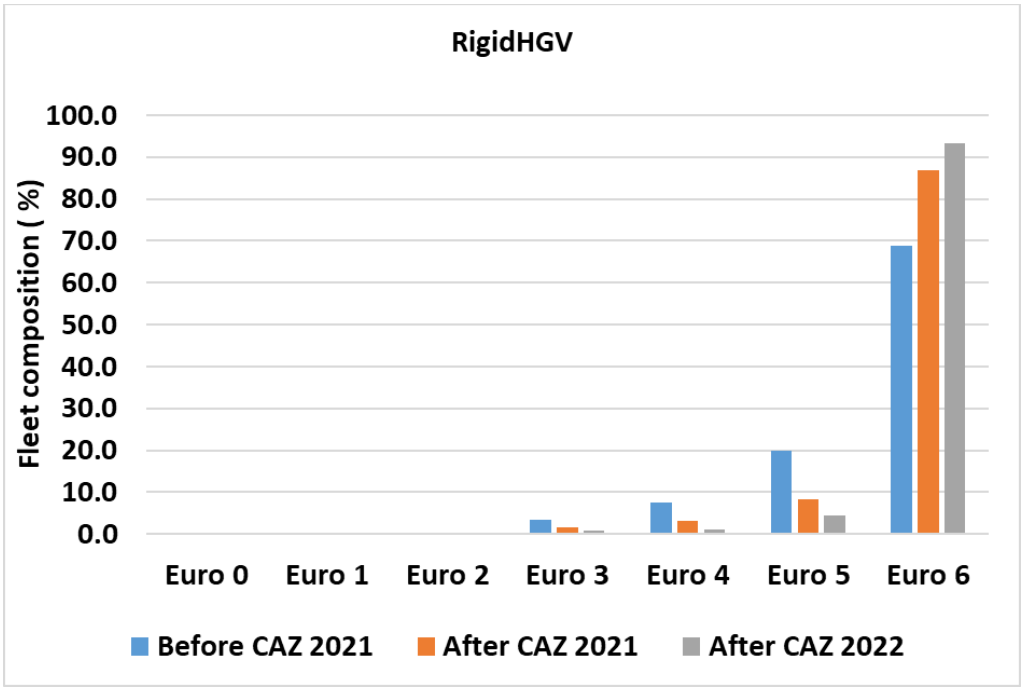


Figure 19 Rigid HGV Euro Class change over time (Thanks to WM-Air for processing the data).

BUSES / COACHES [M3]

The bus / coaches fleet indicates a fluctuation between weekdays and weekends as shown in Figure 20. Figure 20 also indicates a peak in unique bus/coaches in July/August 2022, which is likely caused by the Commonwealth Games, doubling the number of unique vehicles to approximately 1,000. A dip has also been recorded in March 2023 due to the industrial action that impacted the operation of the bus network.

Figures 21 shows the compliance rates of bus / coaches which has indicated little change since the launch of the Clean Air Zone in June 2021. The compliance target for the bus / coach fleet is 100%, which is virtually met with the compliance rate in June 2023 being recorded as 99.4%.

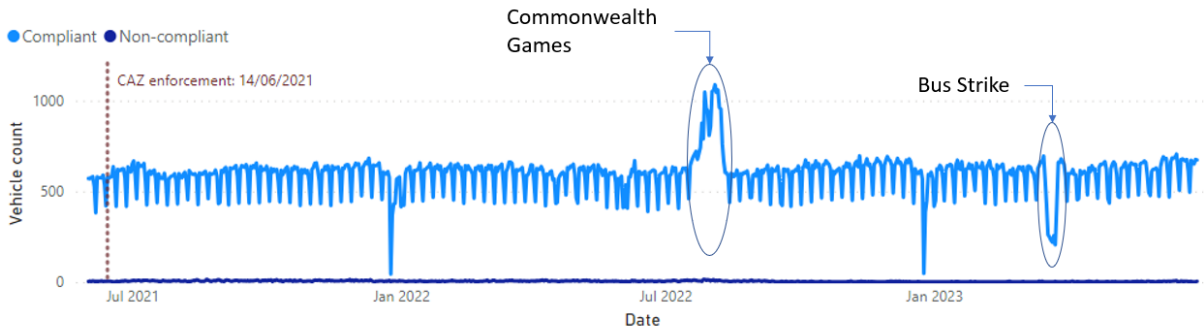


Figure 20 Bus / Coach daily unique entrants, compliant vs non-compliant. The peak observed in July/August 2022 can be attributed to the Commonwealth Games and the dip in late March 2023 can be attributed to industrial action that impacted the bus network.

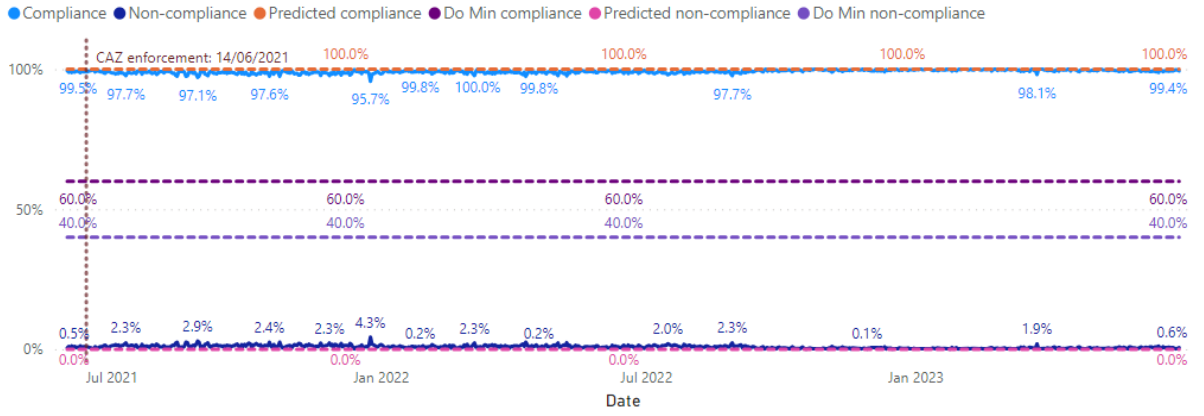


Figure 21 Bus / Coach compliant, non-compliant percentage vs predicted (excluding exempt and unrecognised).

BUSES / COACHES EURO CLASS

Quarterly snapshots have been taken from the Clean Air Zone ANPR cameras. This data is then processed to provide Euro Class split. Unlike the compliance rates which are based on unique vehicles, the ANPR snapshots are based on vehicle trips. For buses / coaches there has been an improvement to Euro VI as shown in Figure 22. It should be noted that a proportion of the bus/coach fleet has been retrofitted to be compliant with the Clean Air Zone. Figure 22 indicates a range of Euro Classes; it is assumed that vehicles which are sub-Euro 6 have been retrofitted to be compliant with the Clean Air Zone.

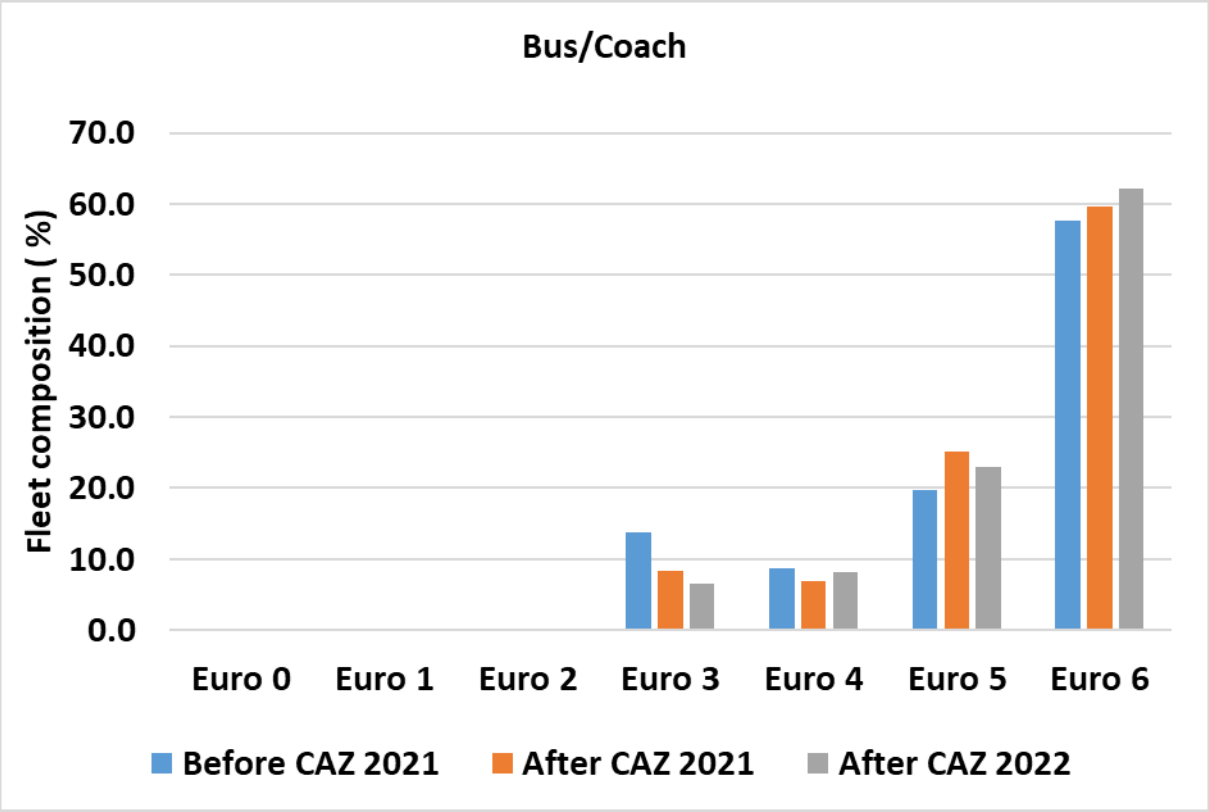


Figure 22 Bus / Coach Euro Class change over time. (Thanks to WM-Air for processing the data)

5.0 – DISCUSSION

The air quality data suggests there has been an improvement since 2019. Road traffic compliance rates have improved since the lauch of the Clean Air Zone. However, it is evident from the air quality data there are locations which continue to be exceed the legal limit for nitrogen dioxide. With regards to the Clean Air Zone these can be grouped into three general areas:

1. Moor Street Area
2. A38 / A4400
3. Ring Road

Each area will be discussed in turn to determine what factors may influence the recorded concentrations.

1 – MOOR STREET AREA

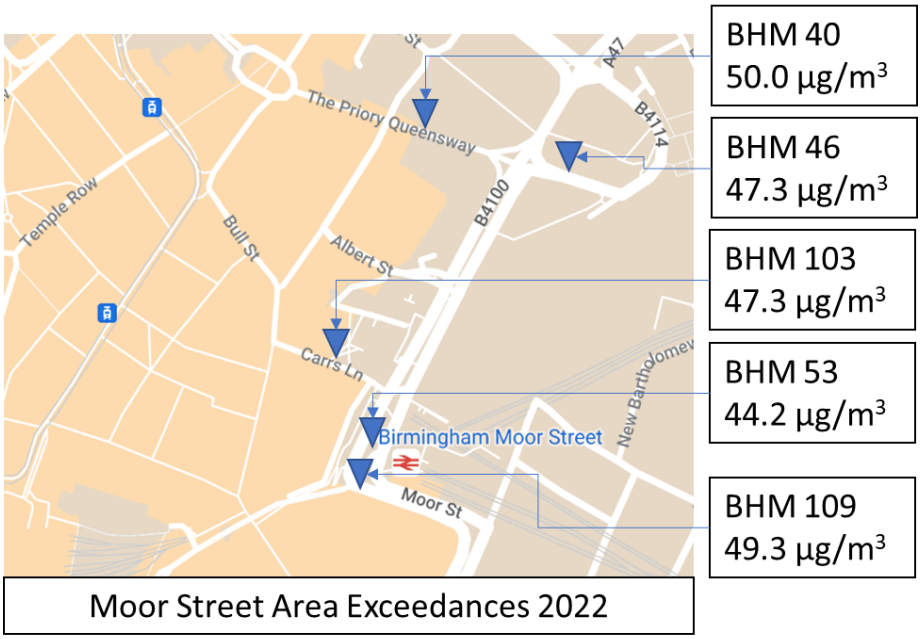


Figure 23 Moor Street Area Exceedances 2022

The Moor Street area shown in Figure 23 is dominated by high volumes of bus traffic. Carrs Lane, Bull Street, and Priory Queensway are bus and taxi routes only, with Moor Street having a bus gate that limits private vehicle access through the area.

Carrs Lane can be defined as a street 'canyon' due to the relatively narrow width of the street flanked on both sides by high buildings that have a height that is greater than the

road width. This leads to vortices and re-circulation of air flow that can trap pollutants and restrict dispersion.

It is clear that a number of these exceedances of 40µg/m^3 are being generated via the high volume of bus traffic, with other vehicle categories (cars, HGVs, LGVs) being relativley small.

From the vehicle compliance rates bus /coach compliance stand at 99.4% as of June 2023 which is based on unique vehicles that enter the Clean Air Zone. As mentioned earlier in this report compliance of buses / coaches is based on Euro VI engines. However the Clean Air Zone also allows for retrofitting of older Euro Class vehicles to a Euro VI equivalent. The Euro Class results indicate the bus fleet comprise of a range of Euro Classes. Therefore it is assumed that the majority of sub Euro V vehicles have been retrofitted.

A detailed study of the area is underway to fully understand the reasons for the exceedances in the area which will help develop options for further improvements to air quality in this area.

2 – A38 (ST CHADS) / A4400

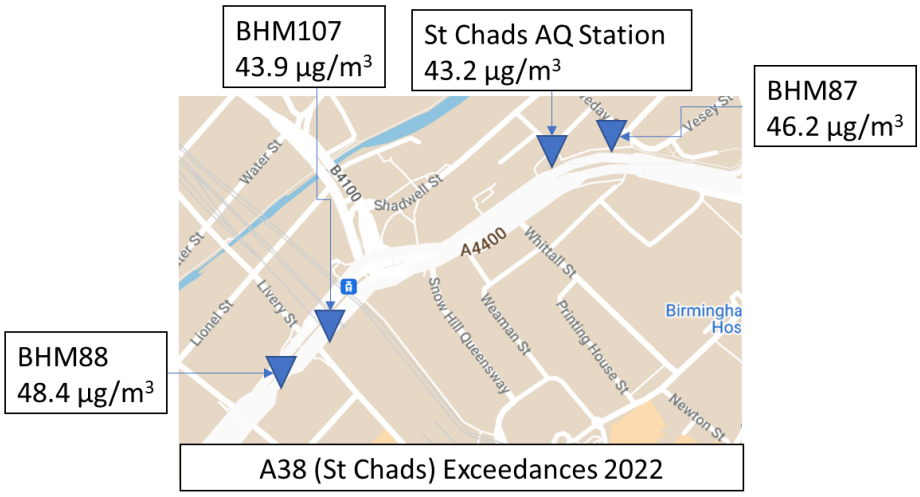


Figure 24 A38(St Chads) exceedances of nitrogen dioxide in 2022.

The A38 (St Chads) exceedances surround the complex road system between the A38 and the A4400 which is formed of eight lanes of traffic, sliproads and tunnels. BHM88 and BHM107 are both located at the entrances / exit of the A38 tunnels. St Chads Air quality station and BHM87 are located adjacent to a bend in the road system.

It should also be noted that in this section of the A38 (St Chads) a signficant gradient is present which would put additional pressure on vehicle engines. Furthermore there are a

number of large buildings along the road length that may contribute to a street canyon effect, thereby preventing the ready dispersal of pollutants.

All of these factors play a part in causing the elevated levels of nitrogen dioxide and the ultimate exceedence in this area. A detailed study of the area is underway with the use of ANPR cameras to assertain the reasons for the exceedances which will help inform an options appraisal.

3 – RING ROAD

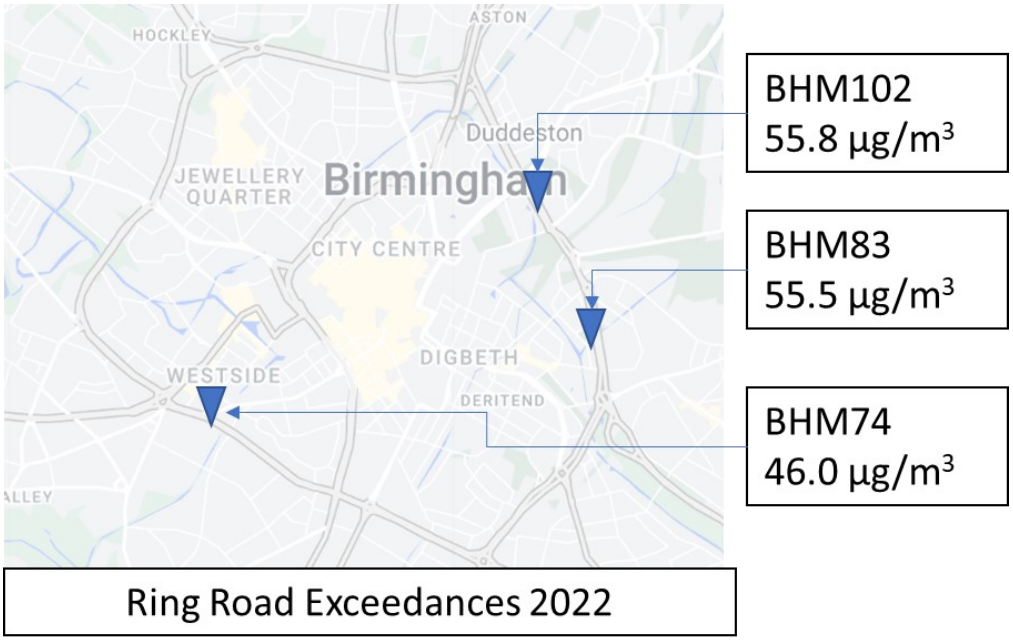


Figure 25 Ring Road exceedances of nitrogen dioxide in 2022.

There are three recorded exceedances on the ring road as shown in Figure 25 all of which are outside of the Clean Air Zone. The Clean Air Zone ANPR cameras only detect vehicles that enter the zone. There are no cameras on the ring road, therefore it is unknown if the ring road has a higher proportion of non-compliant vehicles compared to the Clean Air Zone.

A detailed study of the cause of these exceedances is underway, which includes an ANPR survey to better understand vehicle split and Euro class, and ultimately the comparsion of Euro Class of the Clean Air Zone to the Ring Road. This data will be used to inform an options appraisal.

APPENDIX A

April 2021	Petrol Cars	Diesel Cars	Diesel LGV	Rigid HGV	Artic HGV	Bus / Coach
Euro 0	0.1	0.0	0.0	0.0	0.0	0.0
Euro 1	0.1	0.0	0.1	0.1	0.0	0.0
Euro 2	0.4	0.1	0.1	0.2	0.1	0.1
Euro 3	6.7	3.8	1.4	3.5	0.6	13.8
Euro 4	24.3	17.1	14.4	7.7	1.1	8.6
Euro 5	25.9	33.7	30.9	19.8	7.2	19.8
Euro 6	42.4	45.3	53.1	68.7	91.0	57.7

Clean Air Zone - Euro Class breakdown in percentage April 2021

October 2021	Petrol Cars	Diesel Cars	Diesel LGV	Rigid HGV	Artic HGV	Bus / Coach
Euro 0	0.0	0.0	0.0	0.0	0.0	0.0
Euro 1	0.0	0.0	0.0	0.0	0.0	0.0
Euro 2	0.1	0.0	0.0	0.0	0.0	0.1
Euro 3	4.8	1.5	0.7	1.5	0.4	8.3
Euro 4	22.5	7.8	6.4	3.1	0.1	6.8
Euro 5	26.8	19.9	18.7	8.4	2.4	25.2
Euro 6	45.7	70.7	74.1	87.0	97.0	59.6

Clean Air Zone - Euro Class breakdown in percentage October 2021

October 2022	Petrol Cars	Diesel Cars	Diesel LGV	Rigid HGV	Artic HGV	Bus / Coach
Euro 0	0.1	0.0	0.0	0.1	0.0	0.0
Euro 1	0.0	0.0	0.0	0.0	0.0	0.0
Euro 2	0.1	0.0	0.0	0.1	0.2	0.1
Euro 3	3.9	0.9	0.4	1.0	0.0	6.6
Euro 4	20.2	5.3	4.8	1.1	0.1	8.1
Euro 5	26.0	15.6	14.2	4.6	1.4	23.0
Euro 6	49.7	78.2	80.5	93.3	98.3	62.1

Clean Air Zone – Euro Class breakdown in percentage October 2022

Air quality data can be sourced from Birmingham Air Quality