Birmingham City Council

Clean Air Zone

Six Month Report

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WCAG

Birmingham City Council launched a Category D Clean Air Zone on the 1st June 2021. This report covers the first six months of operation (June 2021 to December 2021).

The changes to travel behaviours brought about by Covid has reduced the volume of road traffic across the whole of Birmingham's road network, including the city centre. Therefore, it has been difficult to make a direct correlation between the introduction of the Clean Air Zone and any expected or modelled reductions in traffic volumes. For that reason, this interim report on the Clean Air Zone focuses on changes in the rates of compliance within the vehicle fleet and overall trends in air quality. Key findings include:

- **Early indications are that there has been a reduction in the levels of Nitrogen Dioxide within the Clean Air Zone (when comparing 2019 (pre Covid) to 2021 results) by an average of 13%.** NB – this is based on part year data.

- **Based upon Unique Vehicle Traffic Data around 98% of the vehicles that pass through the zone daily are passenger cars (88%) or vans (LGVs) (10%).**

- From the launch of the Clean Air Zone the average rate of compliance for all vehicle categories has **improved from 79.8% in June to 88.8% in December 2021.**

- **Compliance for passenger vehicles has improved from 81.8% in June to 89.9%** in **December 2021**. The total compliant and non-compliant unique passenger vehicles is around 90,000 on a weekday and around 70,000 per day on the weekend.

- **Compliance for Light Goods Vehicles (LGV) has improved from 63.3% in June to 77.4% in December 2021.** The total complaint and non-compliant unique LGVs is around 11,000 on a weekday and around 3,000 per day on the weekend.

- **Compliance for Heavy Goods Vehicles (HGV) has improved from 90.6% in June to 94.8% in December 2021.** The total compliant and non-compliant unique HGVs is around 1,400 on a weekday and around 250 per day on the weekend.

- **Bus and Coach compliance rates are consistently high at 98.8%.** The total compliant and non-compliant unique bus and coach is around 600 on a weekday and around 400 per day on the weekend.

1.0 – SUMMARY

There has been a reduction in the levels of NO_2 within the Clean Air Zone (on average 13%) when comparing the baseline year (2019) to the first six months of operation for the Clean Air Zone (i.e. June 2021 – December 2021). However, due to the relatively short duration that the Clean Air Zone has been in operation and the ongoing impacts of the restrictions put in place in response to Covid, it has been difficult to entirely disaggregate the impact of either factor on improvements in air quality.

Overall since the launch of the Clean Air Zone in June 2021 there has been a steady improvement in compliance rates in all vehicle categories that are subject to the charge.

Displacement of traffic from the launch of the zone from the city centre to the ring road does not appear to have occurred. The Clean Air Zone does not appear to have caused an unintentional reduction in compliant vehicles, meaning that compliant vehicles have not been dissuaded from the Clean Air Zone. Instead the zone has been successful in discouraging non-compliant vehicles from entering the zone.

Reporting on changes to the rates of compliance within the vehicle fleet will continue to take place on a monthly basis. Any changes to compliance act as 'lead indicators' to changes in the levels of NO_2. However, additional air quality data will need to be captured and assessed over the next six months in order to be able to provide a robust assessment of the impact of the Clean Air Zone.

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 NO_2 a Clean Air Zone has been introduced to reduce the level of NO_2 to the legal standard of $40\mu g/m^3$ 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.
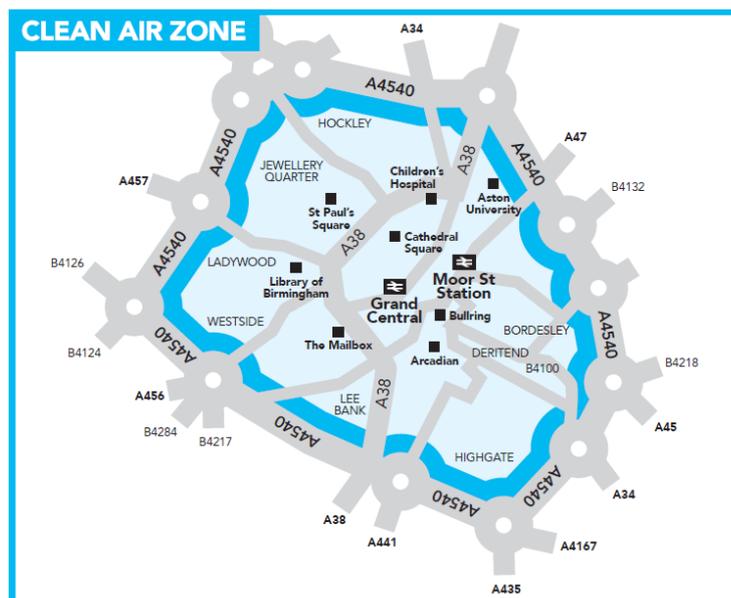

Figure 1 Map of the Birmingham Class D Clean Air Zone

Birmingham's 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. It should be noted that while the Clean Air Zone became operational on the 1st June the application of the daily fee was paused for the first two weeks of the scheme and came into effect on 14th June 2021. 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 on the Brum Breathes website

The Full Business Case for the Clean Air Zone can be found on the Birmingham City Council website.

The air quality and traffic modelling reports for the Clean Air Zone can be found on the Birmingham City Council website.

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, there are a number of exemptions currently in place to lessen the financial burden on owners / operators.

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' 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. At the time of writing these restrictions have now been relaxed.

3.0 – HOW HAS AIR QUALITY CHANGED?

The purpose of the Clean Air Zone is to reduce the levels of the air pollutant NO_2, which is predominantly generated by road traffic, by reducing the number of the most polluting vehicles from entering the zone. This will bring Birmingham closer to compliance with the legal limits in the shortest possible time.

Air pollution concentrations are affected by many different factors including the weather and regional contributions outside of Birmingham, as well as the impact of other highway improvement schemes. Therefore, the analysis of air quality monitoring data is an important factor and will need to be continued.

It should also be noted that there have been a number of additional highway schemes that have been progressed since the introduction of the Clean Air Zone and that these could have an influence on traffic flows and air quality. Further details can be found on the Commonplace website for Birmingham City Council.

Air Quality Monitoring

Nitrogen Dioxide (NO_2) 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 NO_2. 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[1] to provide a final annual average.

- A**utomatic analysers** (or Chemiluminescent analysers) provide hourly averages of NO_2 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 they do not meet the accreditation standard set out by DEFRA for NO_2, as such they cannot be relied upon for formal reporting purposes. As such they have not been included in this report.

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

All of the air quality data is available online via the Birmingham Air Quality website which provides all of the diffusion tube data and live feeds from the automatic stations.
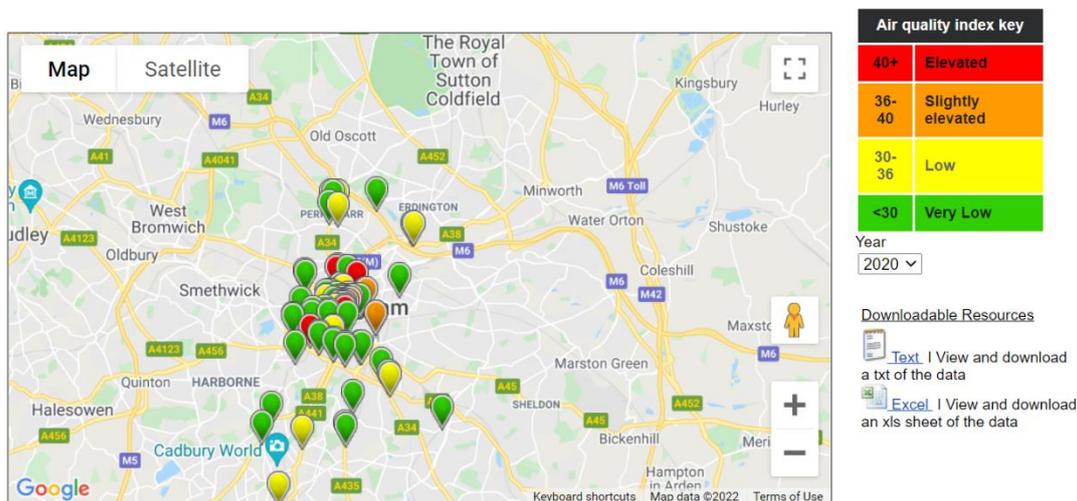

Figure 2 Birminghamairquality.co.uk website snapshot - Diffusion Tubes

Air Quality: Diffusion Tube Results

The Clean Air Zone launched in June 2021 resulting in data for the 2021 calendar year comprising 6 months' worth of Clean Air Zone operational data. The diffusion tube results for 2021 comprise 12 months of 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. Accordingly, the figures quoted in the table for 2021 are ***provisional*** based on a bias adjustment of 0.81 the same as 2020.

The following tables provide the annual average results for 2016, 2019, 2020 and 2021. Using 2016 as a baseline 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. Therefore 2019 has been used as a more consistent baseline as there is less variation in monitoring locations.

It is clear from the tables that there was a marked and expected improvement in NO_2 in 2020 due to the Covid lockdowns and associated reduction in road traffic.

Comparing 2019 to 2021 shows a similar trend of improvement. However, if you compare 2020 to 2021 there appears to be a slight reduction in improvement, which indicates that, in the short term, Covid and the significant reductions in the volumes of road traffic, has had a significant impact on the levels of NO2, compared with the introduction of the Clean Air Zone.

Tube ID (within the Clean Air Zone)	2016	2019	2020	2021 (provisional)	2016 to 2021	2019 to 2020	2019 to 2021	2020 to 2021
BHM63	41.0	28.4	25.0	24.6	-40%	-12%	-13%	-1%
BHM90	-	27.2	23.5	23.6	-	-14%	-13%	0%
BHM26	-	22.9	16.9	17.3	-	-26%	-24%	+2%
BHM62	49.0	33.4	26.4	26.2	-47%	-21%	-21%	-1%
BHM61	44.0	29.7	25.8	22.7	-48%	-13%	-24%	-12%
BHM92	-	40.2	31.4	34.1	-	-22%	-15%	+9%
BHM51	-	35.4	27.6	30.1	-	-22%	-15%	+9%
BHM35	-	28.3	24.2	25.2	-	-14%	-11%	+4%
BHM16	61.5	40.8	34.7	31.5	-49%	-15%	-23%	-9%
BHM39	54.0	36.8	31.1	32.4	-40%	-16%	-12%	+4%
BHM34	38.0	26.3	23.2	22.2	-42%	-12%	-16%	-5%
BHM36	54.0	31.9	28.6	27.9	-48%	-10%	-13%	-2%
BHM30	-	34.4	26.7	35.3	-	-22%	+3%	+32%
BHM59	-	37.2	30.0	32.8	-	-19%	-12%	+9%
BHM65	-	37.0	29.7	30.7	-	-20%	-17%	+3%
BHM24	-	37.8	33.0	35.3	-	-13%	-7%	+7%
BHM28	-	44.7	38.4	37.9	-	-14%	-15%	-1%
BHM88	-	58.1	50.6	48.4	-	-13%	-17%	-4%
BHM89	-	39.4	32.7	32.0	-	-17%	-19%	-2%
BHM58	-	36.6	28.8	33.2	-	-21%	-9%	+15%
BHM45 (2)	-	35.5	39.4	39.3	-	+11%	+11%	0%
BHM23	-	39.6	34.4	35.3	-	-13%	-11%	+3%
BHM46 (2)	-	50.0	49.7	48.1	-	-1%	-4%	-3%
BHM43	54.0	39.5	32.5	31.5	-42%	-18%	-20%	-3%
BHM44	55.0	39.0	30.3	31.3	-43%	-22%	-20%	+3%
BHM42	52.6	39.8	32.3	31.7	-40%	-19%	-20%	-2%
BHM53	64.0	50.0	44.3	49.7	-22%	-11%	-1%	+12%
BHM55	-	52.0	51.9	45.5	-	0%	-12%	-12%
BHM56	55.0	33.3	27.1	27.9	-49%	-19%	-16%	+3%
BHM08	55.7	34.8	22.2	23.7	-57%	-36%	-32%	+7%

Table 1 Nitrogen Dioxide Diffusion Tube Results 2016, 2019, 2020 and 2021 (Provisional using a bias adjustment figure of 0.81) for the Clean Air Zone with the Percentage change compared to 2016 and 2019 baseline where possible.

Tube ID (within the Clean Air Zone)	2016	2019	2020	2021 (provisional)	2016 to 2021	2019 to 2020	2019 to 2021	2020 to 2021
BHM41	66.3	50.4	41.8	49.1	-26%	-17%	-3%	+18%
BHM40	62.8	47.4	43.8	48.3	-23%	-7%	+2%	+10%
BHM86	-	33.7	28.7	32.0	-	-15%	-5%	+12%
BHM33	-	36.1	26.9	28.1	-	-25%	-22%	+4%
BHM87	-	59.6	46.5	46.9	-	-22%	-21%	+1%
BHM64	-	33.6	38.0	33.6	-	+13%	0%	-12%
BHM07	56.7	31.0	23.7	21.9	-61%	-24%	-29%	-7%
BHMCL	-	-	-	53.2	-	-	-	-
BHMWL	-	-	-	26.6	-	-	-	-
BHMNS	-	-	-	29.7	-	-	-	-
BHMSH	-	-	-	45.6	-	-	-	-
BHMWL	-	-	-	26.6	-	-	-	-

Table 2 Continued Nitrogen Dioxide Diffusion Tube Results 2016, 2019, 2020 and 2021 (Provisional using a bias adjustment figure of 0.81) for the Clean Air Zone with the Percentage change compared to 2016 and 2019 baseline where possible.

BHMSH 45.6 ug/m^3 Located at the junction of Livery Street and the A4400

BHM88 48.4 ug/m^3 A4400

BHMCL 53.2 ug/m^3 Carrs Lane

BHM53 49.7 ug/m^3 Moor Street Queensway

BHM87 46.9 ug/m^3 A4400

BHM41 48.3 ug/m^3 BHM40 49.1ug/m^3 Either side of Priory Queensway

BHM46(2) 48.1 ug/m^3 Masshouse Lane

BHM55 45.5 ug/m^3 Moor Street

Figure 3 Provisional 2021 Diffusion tube exceedances within the Clean Air Zone (City Centre).

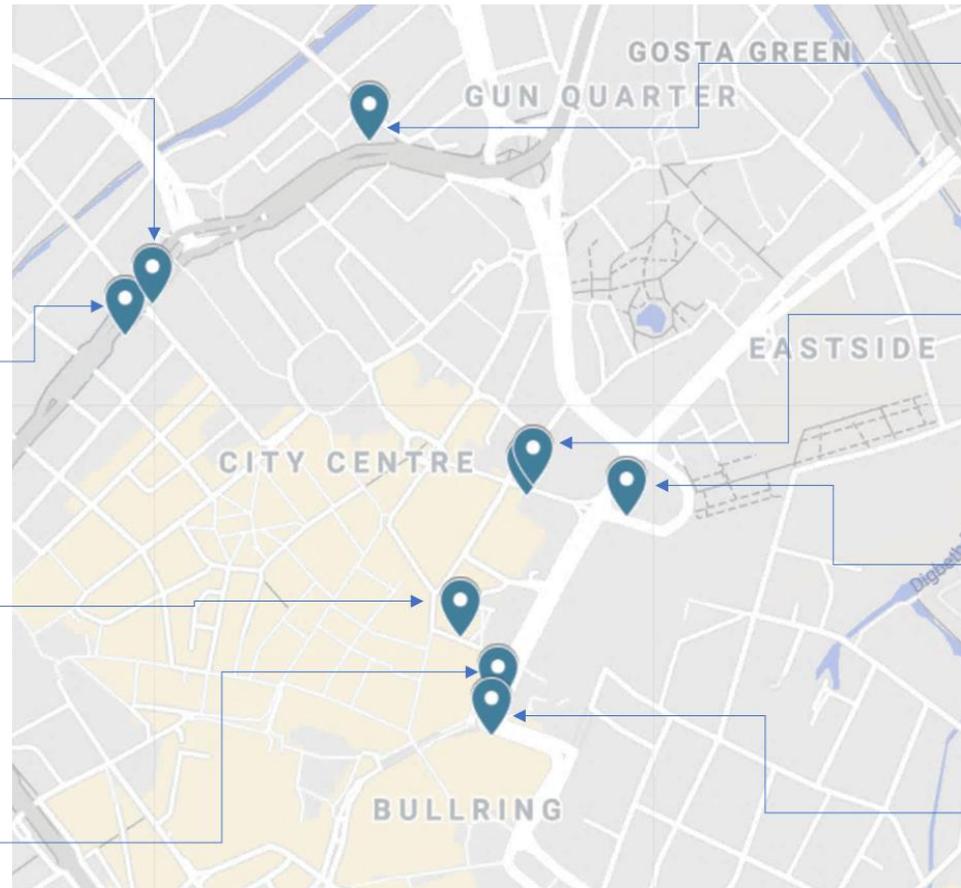| Tube ID (within the ring road)	2016	2019	2020	2021 (provisional)	2016 to 2021	2019 to 2020	2019 to 2021	2020 to 2021
BHM79	-	27.7	22.0	23.7	-	-20%	-14%	+8%
BHM80	-	35.5	29.6	28.9	-	-17%	-19%	-2%
BHM85	-	48.0	40.6	44.4	-	-15%	-8%	+9%
BHM82	-	28.6	35.1	31.7	-	+23%	+11%	-10%
BHM68	-	43.9	29.6	32.6	-	-33%	-26%	+10%
BHM69	-	37.6	27.5	29.6	-	-27%	-21%	+7%
BHM74	-	52.6	43.0	43.6	-	-18%	-17%	+1%
BHM21	-	48.5	37.5	38.4	-	-23%	-21%	+2%
BHM84	-	38.3	31.9	35.4	-	-17%	-8%	+11%
BHM78	-	31.7	25.3	27.5	-	-20%	-13%	+9%
BHM77	-	30.6	26.4	28.6	-	-14%	-7%	+8%
BHM75	-	34.0	29.2	31.0	-	-14%	-9%	+6%
BHM76	-	24.8	20.5	22.1	-	-17%	-11%	+8%
BHM72	-	22.8	17.5	18.6	-	-23%	-19%	+6%
BHM81	-	41.3	23.7	22.2	-	-43%	-46%	-6%
BHM67	-	31.8	24.9	27.2	-	-22%	-14%	+9%
BHM66	-	33.2	29.2	29.3	-	-12%	-12%	0%
BHM71	-	25.4	21.2	21.5	-	-16%	-15%	+1%
BHM27	-	34.7	30.7	30.9	-	-11%	-11%	+1%
BHM83	-	61.0	50.6	50.1	-	-17%	-18%	-1%
BHM25	-	38.0	36.0	36.5	-	-5%	-4%	+2%

Table 3 Nitrogen Dioxide Diffusion Tube Results 2016, 2019, 2020 and 2021 (Provisional using a bias adjustment figure of 0.81) for the ring road with the Percentage change compared to 2016 and 2019 baseline.
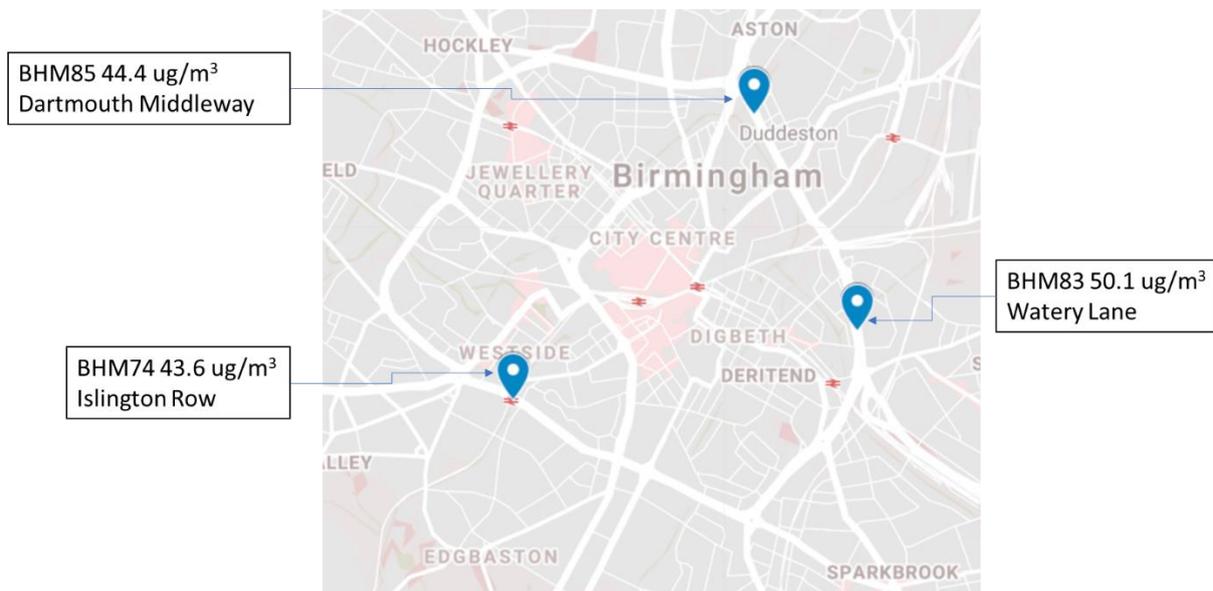
BHM85 44.4 ug/m³
Dartmouth Middleway

BHM83 50.1 ug/m³
Watery Lane

BHM74 43.6 ug/m³
Islington Row

Figure 4 Provisional 2021 diffusion tube exceedances on the ring road

Tube ID (wider city)	2016	2019	2020	2021 (provisional)	2016 to 2021	2019 to 2020	2019 to 2021	2020 to 2021
BHM03	44.7	28.8	26.4	28.2	-37%	-8%	-2%	+7%
BHM09	46.3	32.3	28.6	28.0	-40%	-11%	-13%	-2%
BHM5(2)	-	34.0	29.3	30.2	-	-14%	-11%	+3%
BHM20	44.6	30.4	22.2	22.9	-49%	-27%	-25%	+3%
BHM4 (2)	-	32.8	27.8	26.9	-	-15%	-18%	-3%
BHM57	-	28.1	20.5	21.4	-	-27%	-24%	+4%
BHM37	-	26.3	20.4	22.9	-	-23%	-13%	+12%
BHM19	-	38.2	32.9	33.1	-	-14%	-13%	+1%
BHM99	-	40.0	32.1	34.8	-	-20%	-13%	+8%
BHM11	41.7	31.2	26.1	26.5	-36%	-16%	-15%	+1%
BHM12	42.9	31.5	26.0	26.6	-38%	-17%	-15%	+2%
BHM17 (2)	-	34.0	30.4	29.4	-	-10%	-13%	-3%
BHM18 (2)	-	35.3	31.3	31.3	-	-11%	-11%	0%
BHM01	18.8	15.1	12.7	14.2	-25%	-16%	-6%	+12%
BHM91	-	27.1	24.4	26.5	-	-10%	-3%	+8%
BHM02	20.2	14.4	12.0	12.4	-38%	-17%	-14%	+4%
BHM10	42.8	32.0	26.1	26.2	-39%	-19%	-18%	+1%

Table 4 Nitrogen Dioxide Diffusion Tube Results 2016, 2019, 2020 and 2021 (Provisional using a bias adjustment figure of 0.81) for the wider city with the Percentage change compared to 2016 and 2019 baseline.

Table 4 below presents the average percentage change in the levels of NO₂ in three areas of interest, the Clean Air Zone, the Ring Road and the Wider City where monitoring has been continuous. When using 2016 as a baseline compared to 2021 there has been a substantial

improvement in NO$_2$ of -42% however this is based on a smaller set of monitoring locations. By comparison 2019 to 2020 and 2019 to 2021 both indicate an improvement in all three areas. However, comparing 2020 to 2021 there is a slight degrading of NO$_2$ likely due to the effect of the various national Covid lockdowns.

	2016 to 2021	2019 to 2020	2019 to 2021	2020 to 2021
Clean Air Zone	-42%	-15%	-13%	+2%
Ring Road	No data	-17%	-14%	+4%
Wider City	-38%	-16%	-13%	+3%

Table 5 Comparison of Nitrogen Dioxide Average Percentage Change for the Clean Air Zone, Ring Road and wider city areas.

Where there has been an increase or decrease in NO$_2$ within the Clean Air Zone when comparing 2020 to 2021 it has generally been confined to the central core of the city centre as shown in Figures 3 and 4.

Air Quality Automatic Analysers

From the launch of the Clean Air Zone in June to December 2021 six automatic air quality units were operational within the zone or just outside. These include: Lower Severn Street, Moor Street, St Chads, Colmore Row, Ladywood and the A4540 just outside of the zone on the ring road. Data from the stations is available on the Birmingham Air Quality website.

In November 2021 six additional stations have been installed within the zone and on the ring road. As these have only been operational for one month (December) they will not be reported here but will be included in future analysis. Data from these new stations is also available on the Birmingham Air Quality website.

Table 5 provides the NO$_2$ annual averages of the stations within the zone and the ring road. In 2020 there were no recorded exceedances primarily due to the impact of Covid. In 2021 the year in which the zone went live one station at St Chads has recorded an exceedance.

Station	Environment	2019	2020	2021
St Chads	Kerbside	51	37.1	40.3
Colmore Row	Roadside	35	31.9	26.7
Ladywood	Urban Background	-	15	16.5
Lower Severn St	Roadside	43	23.7	26.2
Moor Street	Roadside	-	-	32.7
A4540	Roadside	32	29	31.5

Table 6 Nitrogen Dioxide annual averages from the automatic air quality stations within the Clean Air Zone and ring road.

A further analysis of 2021 data from St Chads has been undertaken to better understand the breakdown of when the pollution occurred both in terms of month and hour of the day. The daily hours are averaged across each month and used to present a 'heat map' showing in which months the pollution levels peaked and across which hours in those months. The data presented is as a percentage reduction from 2019 to 2021.

On average there appears to be a 20% improvement between 2019 and 2021. It is difficult to determine how much of this improvement is a result of the reductions in road traffic due to COVID, the introduction of the Clean Air Zone, or, more likely, a combination of both factors.

Elevated results appear to be confined to March which may be a result of a regional pollution event that may have elevated levels of NO_2 and may also reflect the easing of lockdown restrictions.

ate - Mont	January	February	March	April	May	June	July	August	September	October	November	December
00:00	-27%	-46%	-24%	-4%	-17%	-22%	0%	-35%	-15%	-34%	-35%	-19%
01:00	-31%	-47%	-20%	-4%	-16%	-22%	7%	-28%	-3%	-34%	-36%	-11%
02:00	-29%	-44%	-13%	-2%	-23%	-25%	-4%	-33%	-1%	-38%	-39%	-15%
03:00	-23%	-42%	3%	4%	-26%	-28%	-11%	-33%	-3%	-37%	-41%	-20%
04:00	-23%	-43%	13%	5%	-24%	-28%	-12%	-31%	-13%	-41%	-41%	-16%
05:00	-23%	-34%	18%	0%	-27%	-28%	-17%	-43%	-26%	-42%	-40%	-17%
06:00	-6%	-29%	20%	-5%	-26%	-28%	-23%	-46%	-24%	-37%	-42%	-19%
07:00	-9%	-28%	13%	-10%	-22%	-25%	-19%	-43%	-16%	-32%	-37%	-17%
08:00	-16%	-25%	12%	-7%	-15%	-24%	-13%	-43%	-12%	-27%	-33%	-18%
09:00	-24%	-32%	6%	-7%	-15%	-25%	-10%	-45%	-13%	-30%	-27%	-10%
10:00	-30%	-36%	-2%	-7%	-15%	-23%	-7%	-44%	-16%	-30%	-27%	-16%
11:00	-32%	-34%	0%	-12%	-17%	-19%	-4%	-41%	-18%	-27%	-30%	-14%
12:00	-26%	-30%	4%	-9%	-13%	-22%	-12%	-43%	-15%	-24%	-35%	-12%
13:00	-24%	-27%	-2%	-8%	-12%	-22%	-7%	-40%	-16%	-20%	-35%	-9%
14:00	-21%	-24%	1%	-11%	-14%	-21%	-8%	-37%	-16%	-20%	-34%	-6%
15:00	-23%	-25%	-2%	-10%	-18%	-19%	-9%	-39%	-13%	-19%	-32%	-5%
16:00	-16%	-27%	6%	-13%	-17%	-21%	-15%	-40%	-14%	-17%	-29%	-4%
17:00	-23%	-29%	3%	-17%	-16%	-26%	-18%	-42%	-13%	-19%	-23%	-5%
18:00	-29%	-30%	3%	-15%	-9%	-22%	-14%	-42%	-17%	-21%	-24%	-8%
19:00	-32%	-35%	0%	-17%	-15%	-25%	-18%	-45%	-18%	-21%	-25%	-13%
20:00	-35%	-36%	-6%	-13%	-6%	-20%	-15%	-43%	-8%	-22%	-28%	-15%
21:00	-34%	-36%	-12%	-13%	2%	-21%	-10%	-43%	-6%	-25%	-29%	-11%
22:00	-30%	-36%	-17%	-16%	-13%	-22%	-3%	-45%	-5%	-23%	-30%	-16%
23:00	-28%	-42%	-19%	-13%	-19%	-24%	-3%	-39%	-6%	-27%	-37%	-20%

Table 7 St Chads Heatmap table percentage change 2019 to 2021

Figure 5 on the following page provides heatmap tables for the air quality units within the zone and the ring road for 2021. St Chads continues to have the highest levels of NO_2 within the Clean Air Zone. These heat maps are replicated in detail in Appendix B.
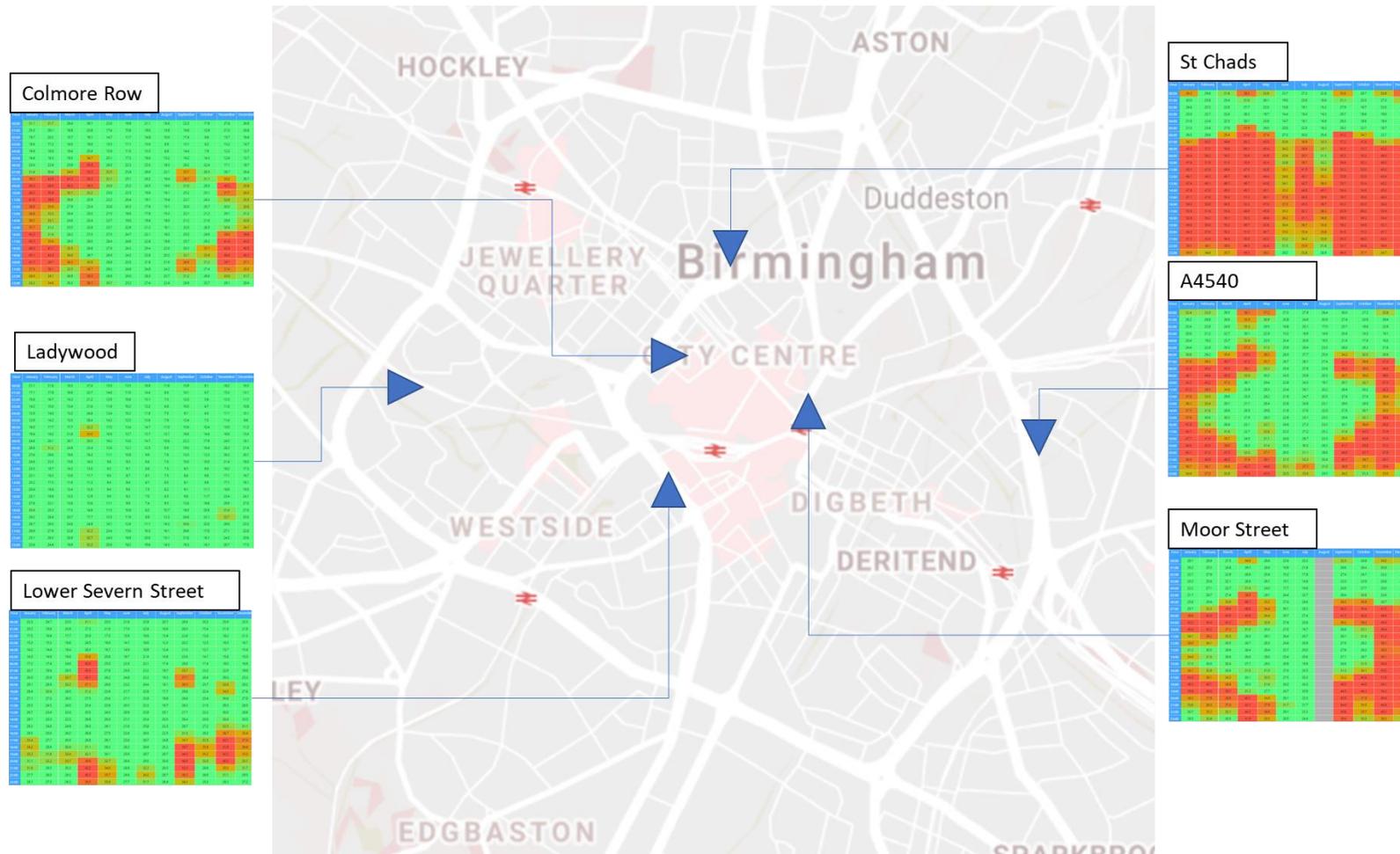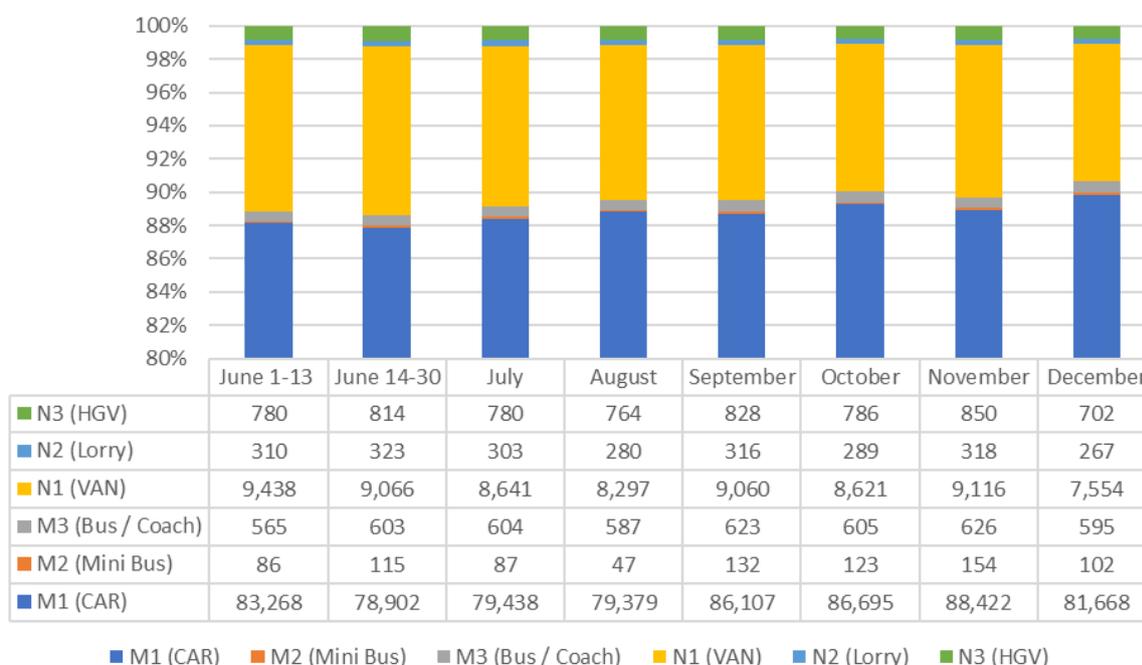
Figure 5 Automatic air quality units, Nitrogen Dioxide heat map tables. The vertical column provides hours vs months horizontally. The colour range is set to 30 - 40. Meaning anything above 30 is coloured a shade of orange, anything above 40 is shaded red. Full Details of the heatmap tables are provided in Appendix B.

4.0 – HOW HAS FLEET COMPOSITION CHANGED?

The fleet mix within the Clean Air Zone is dominated by cars, which account for 88% of all unique vehicles entering the zone. The next largest group of vehicles within the zone are Light Goods Vehicles (Vans [N1]), which account for approximately 10% of the fleet as shown in Table 7 below.

Table 8 below provides a breakdown of the various vehicle categories. Whilst there has been some fluctuation over the months it is unclear if the Clean Air Zone has driven a change in fleet composition.

Fleet Composition Unique Entrants % Mix
[NB - Axis begins at 80%]

	June 1-13	June 14-30	July	August	September	October	November	December
N3 (HGV)	780	814	780	764	828	786	850	702
N2 (Lorry)	310	323	303	280	316	289	318	267
N1 (VAN)	9,438	9,066	8,641	8,297	9,060	8,621	9,116	7,554
M3 (Bus / Coach)	565	603	604	587	623	605	626	595
M2 (Mini Bus)	86	115	87	47	132	123	154	102
M1 (CAR)	83,268	78,902	79,438	79,379	86,107	86,695	88,422	81,668

■ M1 (CAR)   ■ M2 (Mini Bus)   ■ M3 (Bus / Coach)   ■ N1 (VAN)   ■ N2 (Lorry)   ■ N3 (HGV)

	Jun 1-13	Jun 14-30	Jul	Aug	Sep	Oct	Nov	Dec
Total (excluding unrecognised)	94,446	89,822	89,852	89,355	97,067	97,120	99,485	90,888
M1 (CAR)	88.2%	87.8%	88.4%	88.8%	88.7%	89.3%	88.9%	89.9%
M2 (Mini-Bus)	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.2%	0.1%
M3 (Bus / Coach)	0.6%	0.7%	0.7%	0.7%	0.6%	0.6%	0.6%	0.7%
N1 (VAN)	10.0%	10.1%	9.6%	9.3%	9.3%	8.9%	9.2%	8.3%
N2 (Lorry)	0.3%	0.4%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%
N3 (HGV)	0.8%	0.9%	0.9%	0.9%	0.9%	0.8%	0.9%	0.8%

Table 7 Clean Air Zone fleet composition June to December 2021

5.0 – HOW HAS TRAFFIC VOLUME AND COMPLIANCE RATES CHANGED?

ROAD TRAFFIC VOLUME

Covid has had a significant impact on road traffic volumes over the last two years. Figure 6 provides a profile of road traffic at the A38(M) that is based on road traffic loop counters. The graph is annotated with the various lockdown restrictions that Birmingham was under due to Covid. During the first lockdown in March 2020 road traffic dropped to one sixth of the levels compared to pre Covid. The second and third lockdowns also had an impact on road traffic but at a much more reduced rate compared to the first lockdown.

Whilst the restrictions are now easing road traffic across the network appears to be approximately three quarters of pre-Covid levels. At the same time, the Clean Air Zone appears to have had a negligible impact on road traffic flows on the A38M.

Figure 6 provides a comparison of road traffic flows of the inner city (Clean Air Zone) vs the ring road.

When the Clean Air Zone launched there was a reduction 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.

It should also be noted that the zone launched in June when schools had or were due to finish for the summer and the holiday season was just beginning.

Therefore, whilst the graph appears to show a reduction in road traffic in the inner city when the scheme became operational, other factors may have played a part. Since the introduction of the Clean Air Zone the volume of road traffic was steadily increasing, which suggests that the Clean Air Zone has not been a significant influence on decisions to cancel or re-route journeys through the zone.

A38(M) Daily Traffic Flows

Traffic Flows - A38(M) Dartmouth Circus - Daily Flows 01-06-2019 to 10-11-2021
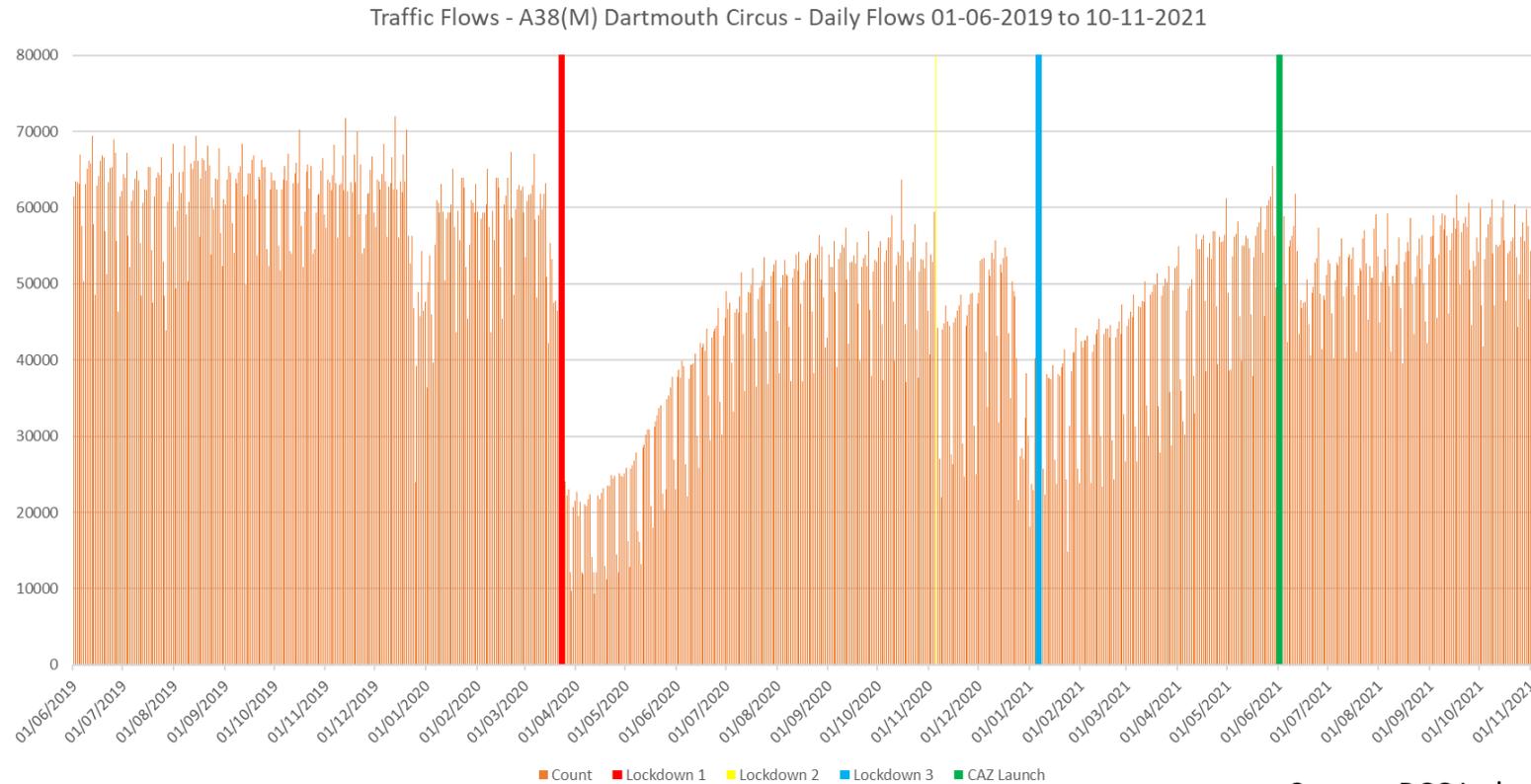
Source: BCC Induction loops

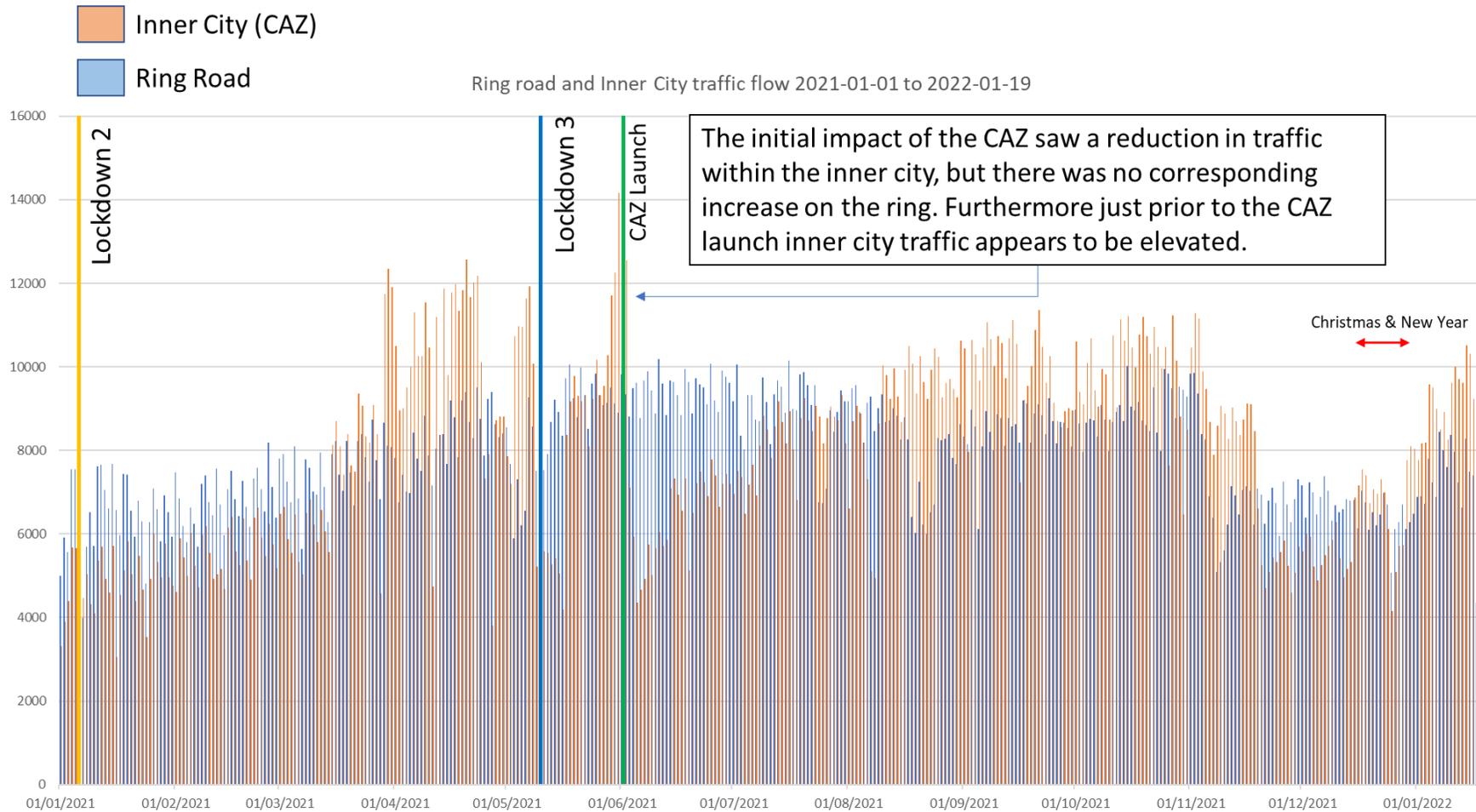**Figure 6 A38M Road Traffic Counts annotated with the various Covid19 lockdown events from June 2019 to November 2021**

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

OVERALL COMPLIANCE RATES

To enforce the Clean Air Zone there is 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).

Figure 8 provides the daily unique entrants into the Clean Air Zone from June to December 2021. Since the charging of the Clean Air Zone came into effect on 14th June 2021, there was a marked change in compliance rates.

The volume of non-compliant vehicles reduced by almost 10,000 unique vehicles from approximately 21,000 to 11,000. However, there was not a corresponding increase in compliant vehicles. It could therefore be assumed that the reduction in inner city traffic evidenced in Figure 8 was primarily driven by a reduction in non-compliant vehicles, which is the desired effect of the scheme.

Furthermore, as discussed in the previous section in Figure 7 there was not a marked increase in traffic on the ring road, therefore it could be concluded that the Clean Air Zone began to achieve its desired effect of reducing the volume of non-compliant vehicles without significant displacement occurring.

Further work is required to understand if these journeys were cancelled, or alternative methods of travel were employed such as car sharing or public transport.
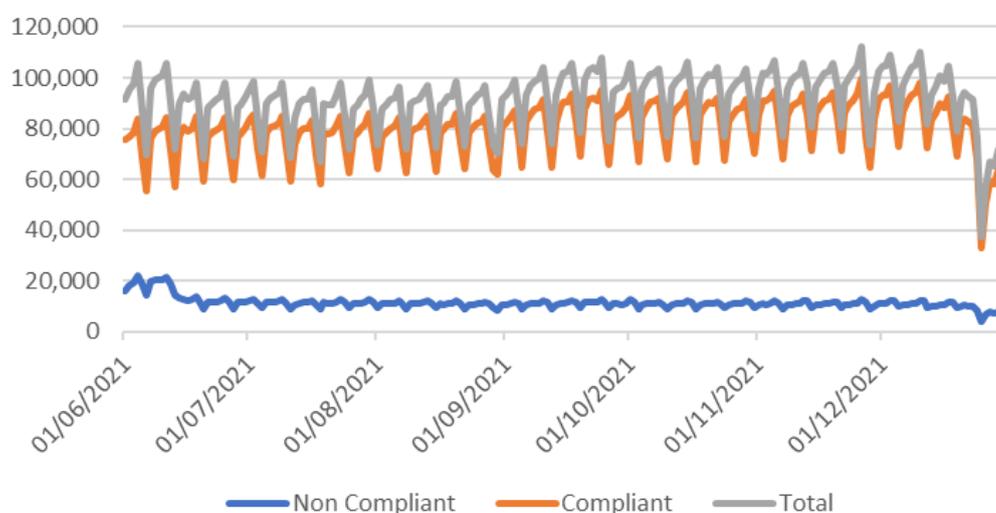
All Vehicles Unique Entrants

Figure 8 Daily unique entrants into the Clean Air Zone

There is also a clear fluctuation from weekday vs weekend traffic, as expected. The volume of unique vehicles shows some variation of the last six months, which may be due to holiday season, school return, easing of Covid restrictions and the introduction of the Clean Air Zone. A longer data set is required to determine what factors are influencing traffic post the removal of Covid restrictions.

Table 8 below compares Thursday 10th June 2021 pre-Clean Air Zone daily fee, to the following Thursday, 17th June 2021, when the Clean Air Zone daily fee was applied to vehicles. Thursday has been chosen as a 'normal weekday'. It should be noted that this data does not include exempt or unrecognised vehicles.

As shown, there is little impact on compliant vehicles, which is encouraging. The greatest change is within the car and van non-compliance rates over this period, which reduced by -7,728 unique vehicles.

	Compliant	Compliant	Compliant	Non - Compliant	Non - Compliant	Non - Compliant
	10 June	17 June	Difference	10 June	17 June	Difference
Cars	69,382	69,028	-354	15,289	9,003	-6,286
Vans	7,720	7,688	-32	4,345	2,951	-1,394
HGVs	1,269	1,247	-22	140	88	-52
Bus/Coach	575	583	-8	7	3	-4
TOTAL	78,946	78,546	-416	19,781	12,045	-7,728

Table 8 Compliant and Non-Compliant vehicle rates 10th June vs 17th June 2021

The Clean Air Zone full business case outlined target rates of compliance for 2022 in a 'do nothing' scenario and a compliance 'target'.

Due to delays in the implementation of the Clean Air Zone the originally modelled year of compliance (2022) is not likely to be achieved, however the target values themselves are still valid and will continue to be used as a guide for when compliance with the legal limit for NO_2 ($40\mu g/m^3$ annual average) can be achieved.

Figure 9 provides the daily compliance rate in percentage compared to that predicted and Figure 10 provides a monthly average.

The full business case outlined a target of 96.5% overall compliance in the Clean Air Zone D scenario. At the beginning of June 2021, the overall rate of compliance was 79.8%, which has steadily increased to 88.8% in December 2021. This implies there is a difference of 7.7 percentage points between the actual rate of compliance and the target. The following sections will discuss each vehicle category to better understand the nuances of the traffic composition and the rates of compliance.
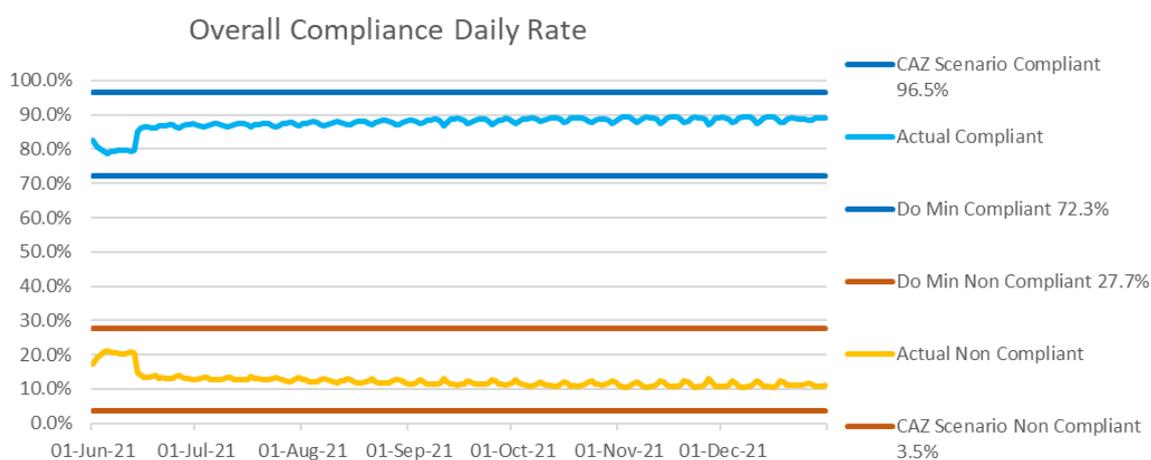
Figure 9 Overall Daily Compliance Rates vs Predicted

Birmingham
City Council

Overall Compliance Rate Monthly (excluding Exempt)
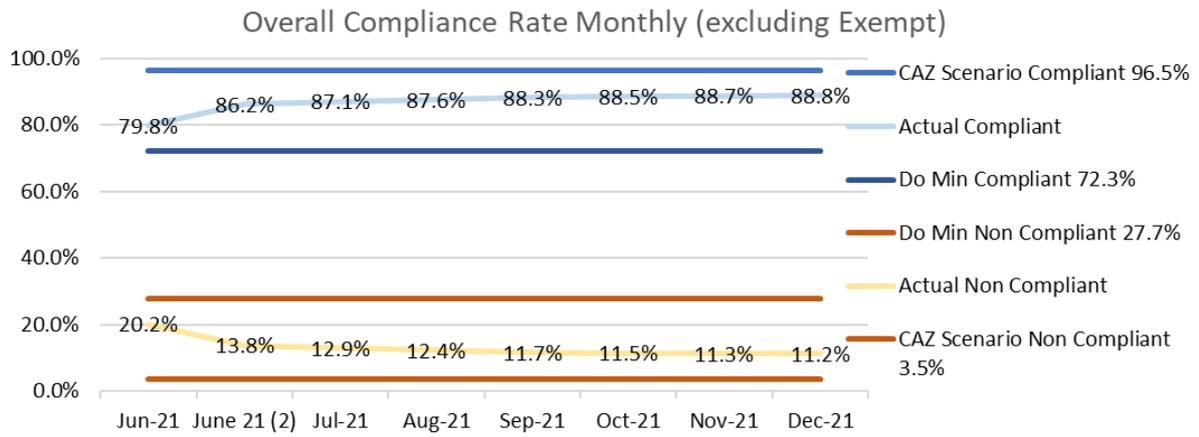
Figure 10 Overall Monthly Compliance Rates vs Predicted

CARS (M1) COMPLIANCE RATE

Figure 11 provides the numbers of average daily unique vehicle entrants (passenger cars) into the zone from June 2021 to December 2021.

When the daily fee came into effect on 14th June 2021 the volume of unique non-compliant vehicles dropped from approximately 15,000 to 9,000. Compliance rates for this category has steadily increased from 81.8% in June 2021 to 89.0% in December 2021 as shown in Figure 12 and 13. The targeted rate of compliance was 98%. The weekday vs. weekend variations are visible within the unique entrants, whereas the percentage variation is less pronounced.
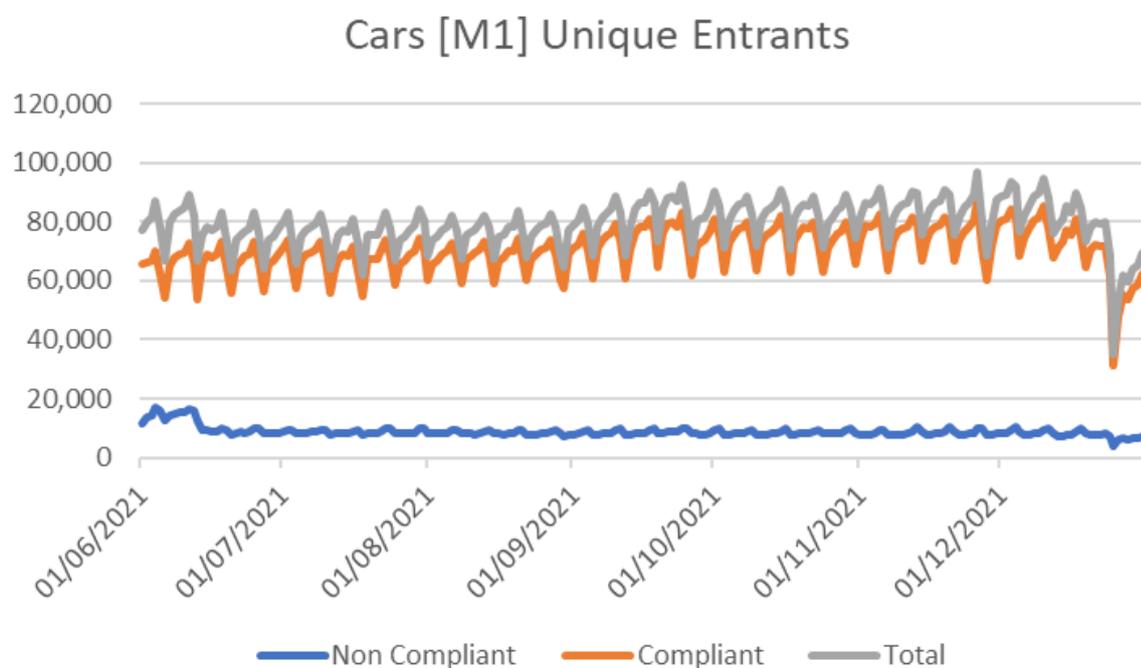
Figure 11 Unique Daily Car Entrants into the Clean Air Zone

Cars [M1] Daily
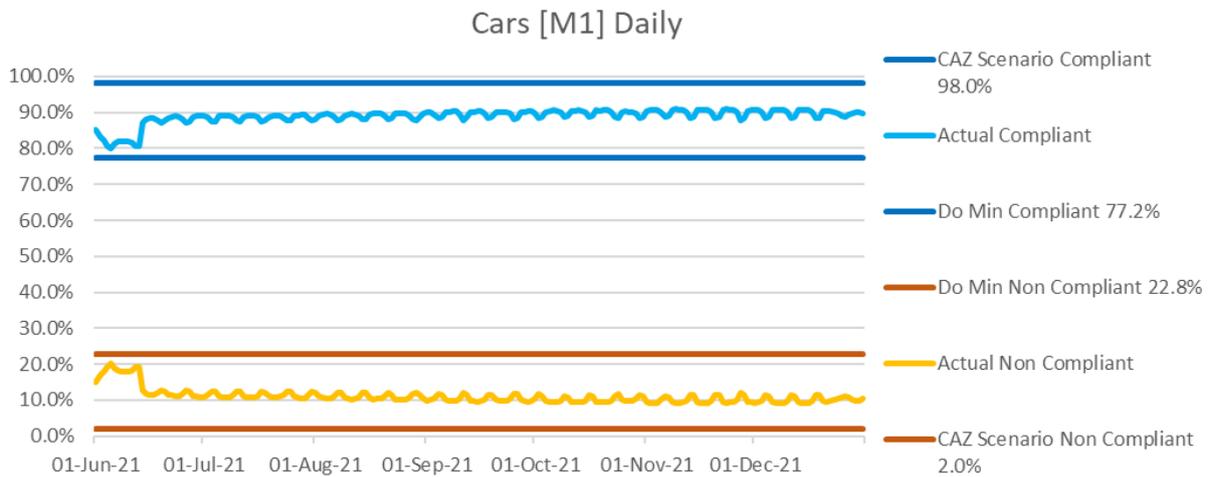
Figure 12 Daily Car Percentage Compliant and Non-Compliant vs predicted.

Cars [M1] Monthly
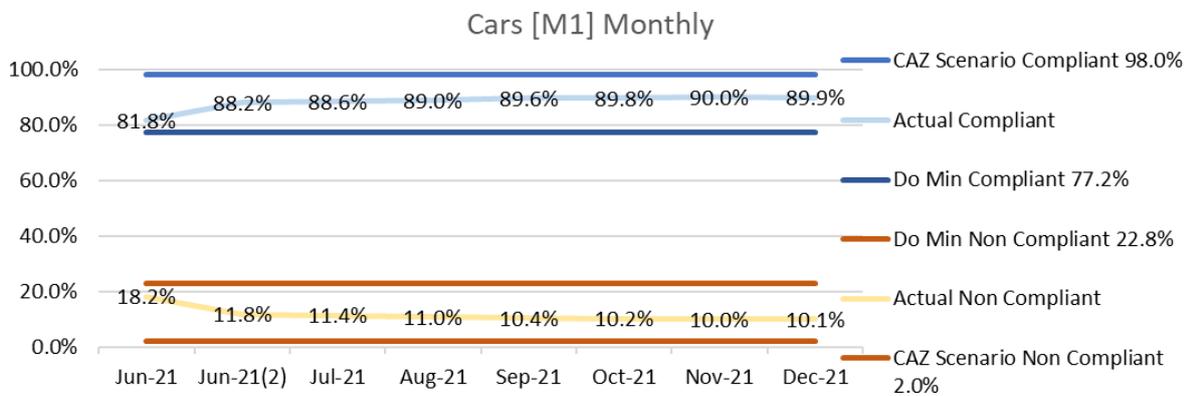
Figure 13 Monthly Car Compliance Rates vs Predicted

LIGHT GOODS VEHICLES (LGV [N1])

Figure 14 Light Goods Vehicles (LGV) [N1] show a significant variation of weekday vs. weekend with regards to volume of vehicle. This is also reflected in the compliance rates with the weekends seeing a greater percentage of non-compliant vehicles compared to weekdays. The business case for the scheme set out an aim of being 82.7% compliant which currently stands at 77.4% on the monthly average as shown in Figures 15 and 16.
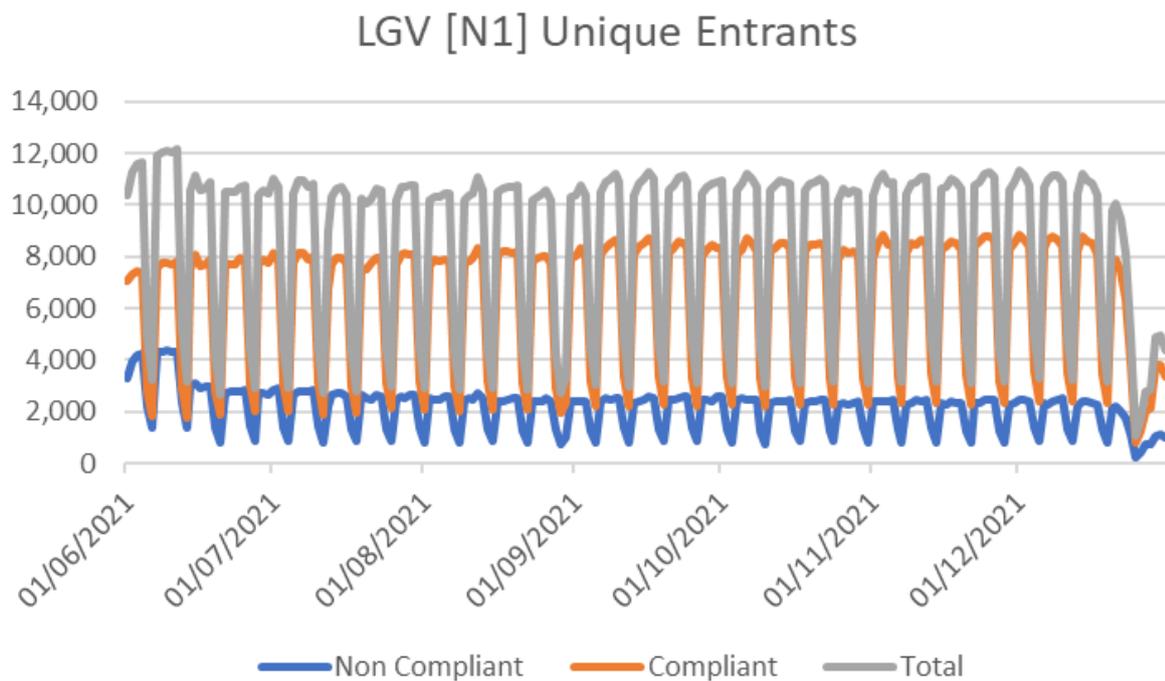
Figure 14 Light Goods Vehicles Daily Unique Entrants
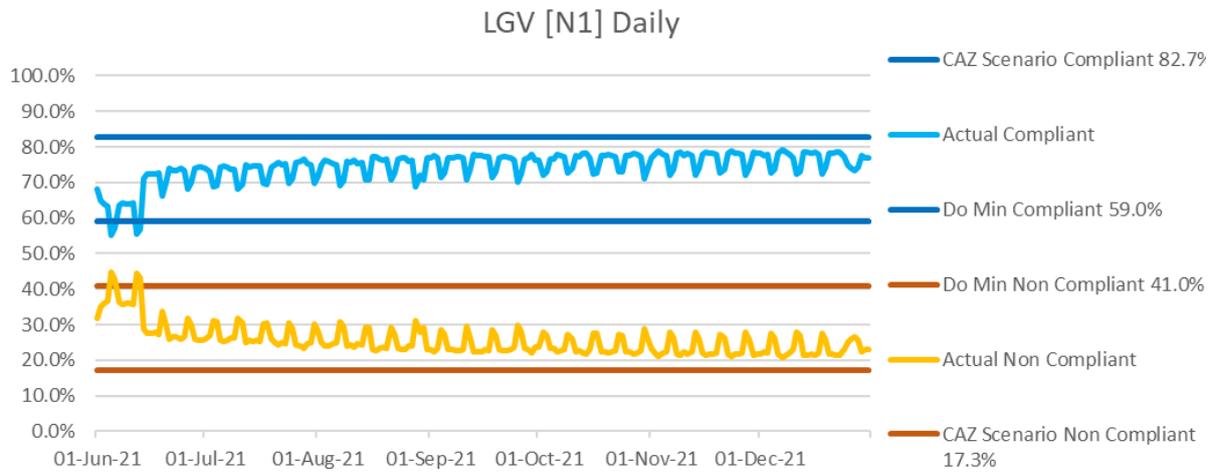
Figure 15 Daily percentage compliant, non-compliant Light Goods Vehicles vs predicted
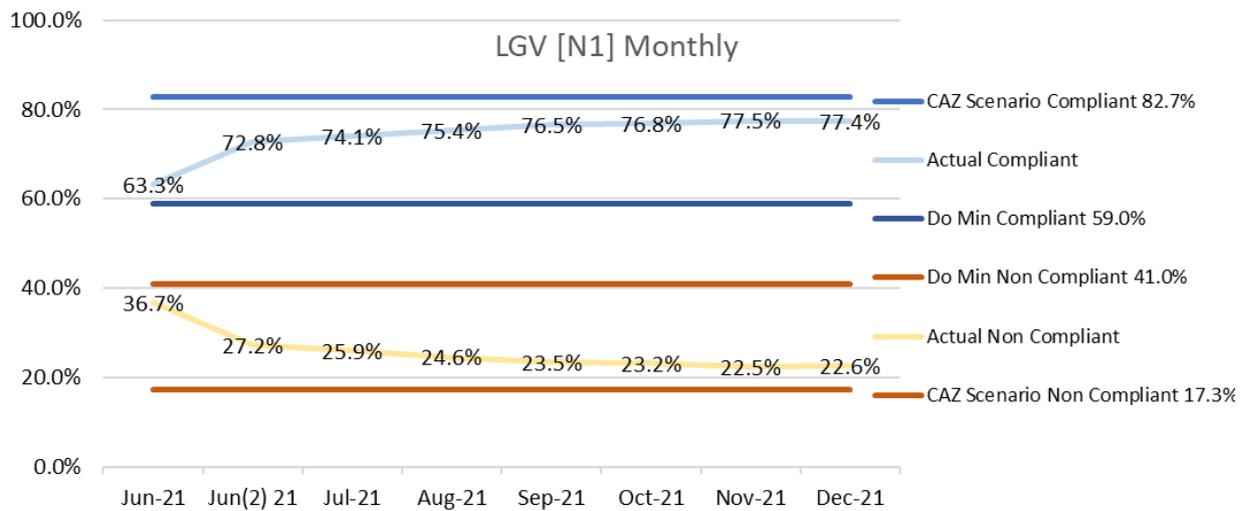
Figure 16 Monthly percentage compliant, non-compliant Light Goods vehicles vs predicted

HEAVY GOODS VEHICLES (HGVS [N2, N3])

Figure 17 provides the daily entrants of unique Heavy Goods Vehicles (HGV) entrants. Compliance rates have shown a steady improvement in compliance rates since the introduction of the scheme. Compliance rates at the launch of the zone were 90.4% in June 2021, which has improved to 94.8% in December 2021.

Figure 18 provides the daily compliance rates which show a significant fluctuation between weekday vs weekends. On weekdays there are on average 1,400 unique vehicles entering the zone, whereas on Sundays, there are approximately 280 unique HGVs entering the city centre. Overall HGV compliance rate is on track with the predicted rate of compliance. Figure 19 provides the monthly compliance rates compared to the predicted which indicates a gradual improvement.
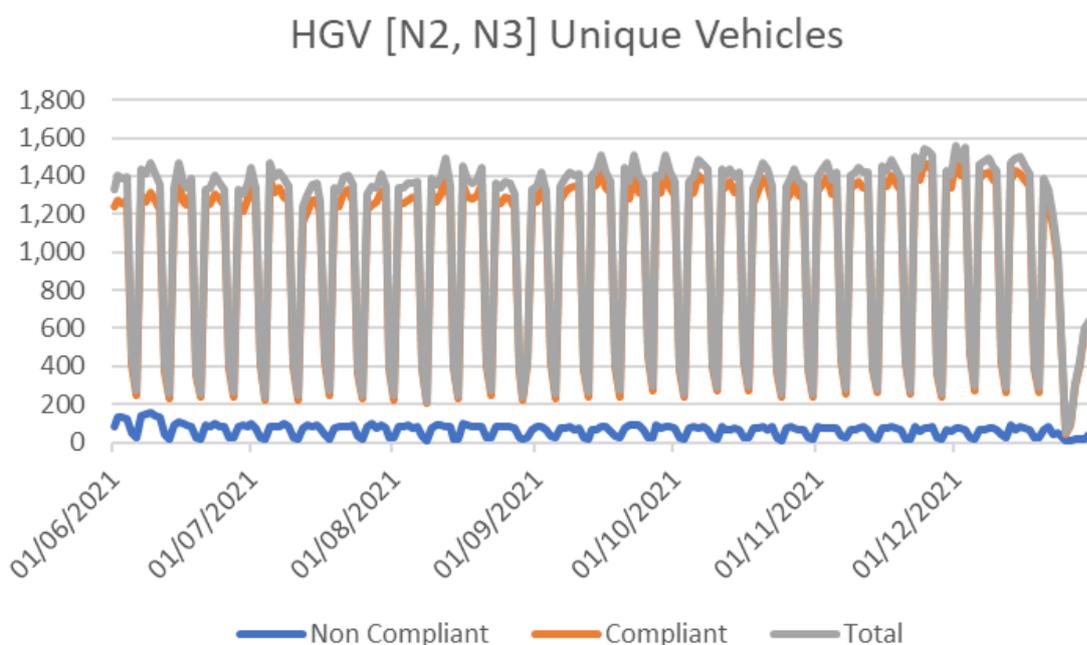
Figure 17 Heavy Goods Vehicles daily unique entrants

HGV [N2,N3] Daily
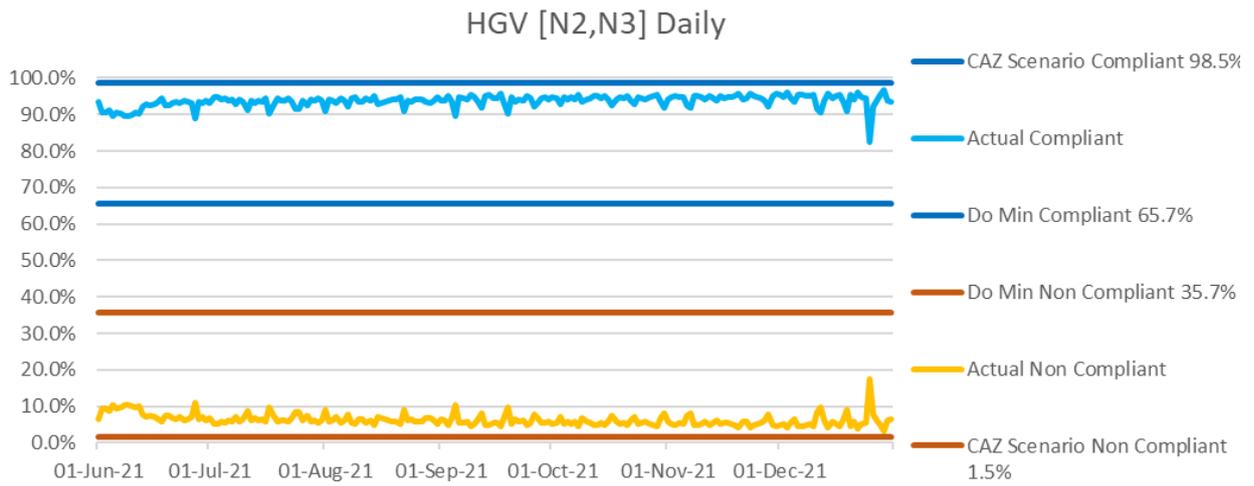
Figure 18 Heavy Goods Vehicles (HGV) compliant, non-compliant percentage vs predicted

HGV [N2,N3] Monthly
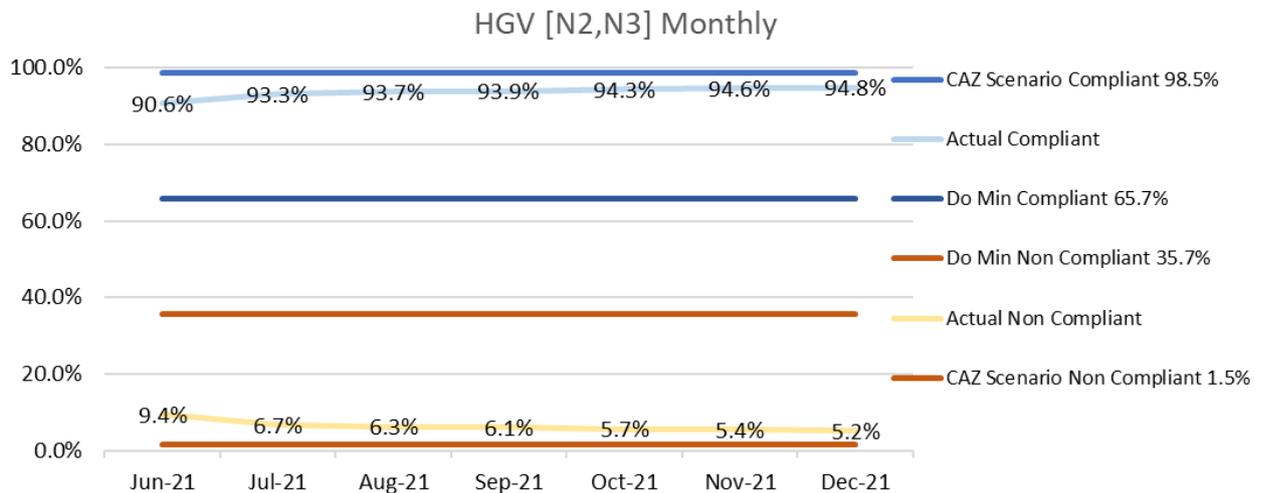
Figure 19 Heavy Goods Vehicles (HGV) Monthly compliant, Non-compliant vs predicted.

BUSES / COACHES [M3]

Figure 20 for bus / coaches shows there is significant fluctuation between weekdays and weekends. This is likely driven by less buses operating on the weekends.

Figures 21 and 22 demonstrate that bus and coach compliance is very high at 98.8%, which is slightly less than the aim of 100% compliant. However, it should be noted that the introduction of hydrogen buses will provide greater benefits to the level of NO_2
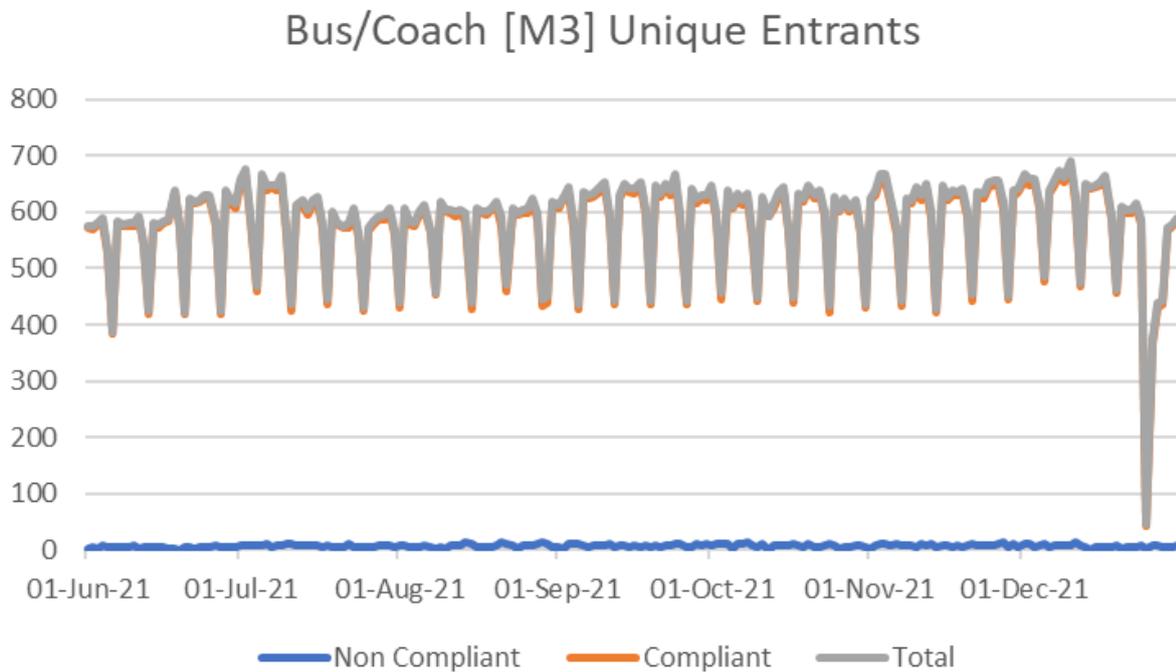
Figure 20 Bus / Coach daily unique entrants

Bus / Coach [M3] Daily
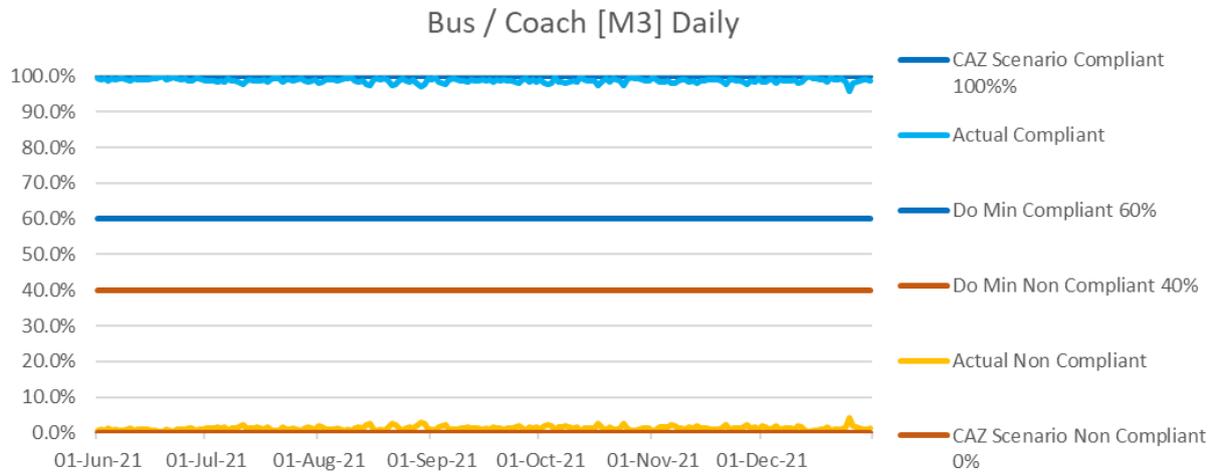
Figure 21 Bus / Coach compliant, non-compliant percentage vs predicted

Bus / Coach [M3] Monthly
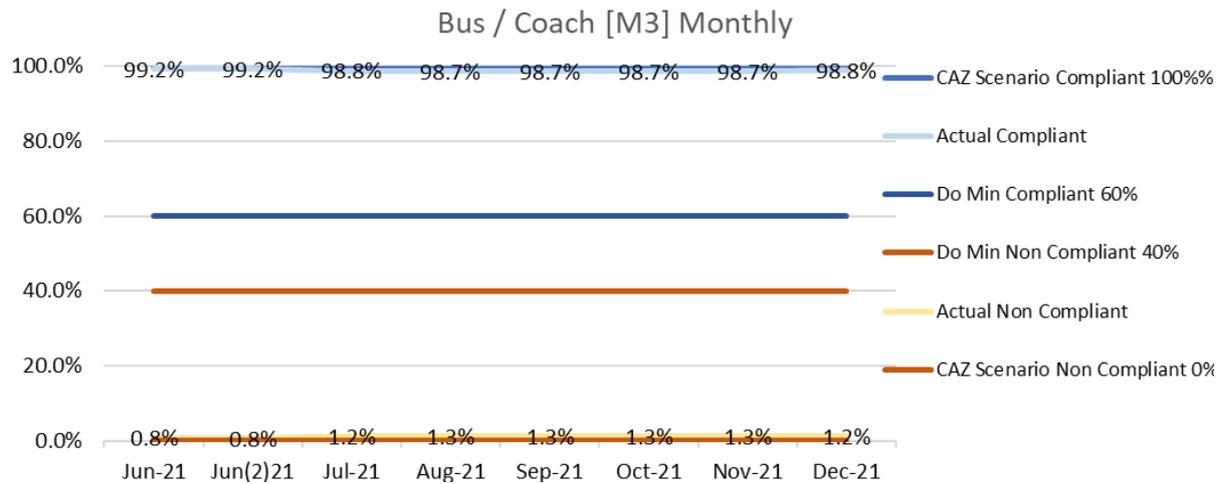
Figure 22 Bus / Coach compliant, non-compliant percentage vs predicted monthly average

APPENDIX A

Diffusion Tube Group, ID, Name and Grid Reference.

ID	Diffusion Tube Name (within the clean air zone)	Lat	Long
BHM63	Chapel Lane (Aston University Post)	52.48291	-1.89086
BHM90	Lionel Street	52.48362	-1.90386
BHM26	Nelson JI	52.48127	-1.91826
BHM62	Snow Hill Station Courtyard	52.48264	-1.89787
BHM61	St Phillips Churchyard	52.48121	-1.89955
BHM92	Bristol Street (2)	52.47114	-1.90010
BHM51	Bristol Street Monaco House	52.47133	-1.89954
BHM35	Cafe Nero	52.48084	-1.89575
BHM16	Children's Hospital	52.48565	-1.89362
BHM39	Corporation St LP corner Old Square	52.48187	-1.89454
BHM34	Corporation St SuperDrug	52.48003	-1.89668
BHM36	Corporation St Taxi rank sign	52.48146	-1.89534
BHM30	Curzon Street	52.48223	-1.88412
BHM59	Dale End Corner of Lower Bull St	52.48026	-1.89427
BHM65	Digbeth	52.47618	-1.89180
BHM24	Great Charles Street (1)	52.48186	-1.90394
BHM28	Great Charles Street (2)	52.48384	-1.90186
BHM88	Great Charles Street (3)	52.48371	-1.90131
BHM89	Great Charles Street (4)	52.48194	-1.90433
BHM58	High St Corner of Carrs Lane	52.47964	-1.89461
BHM45 (2)	Hotel La Tour - LP	52.48105	-1.88979
BHM23	Lower Severn Street	52.47676	-1.90215
BHM46 (2)	Masshouse Lane	52.48130	-1.89030
BHM43	Masshouse Lane post adjacent Masshouse	52.48186	-1.88936
BHM44	Masshouse Lanepost lighting shop	52.48196	-1.88911
BHM42	Moor St Queensway Post adjacent Masshouse	52.48184	-1.89029
BHM53	Moor St Queensway	52.47880	-1.89314
BHM55	Moor Street	52.47880	-1.89314
BHM56	New Meeting St lampost adjacent Church	52.47994	-1.89281
BHM8	O' Neills Broad Street **	52.47612	-1.91289
BHM41	Priory Queensway	52.48158	-1.89248
BHM40	Priory Queensway	52.48170	-1.89236
BHM86	Ronald McDonald House	52.48592	-1.89595
BHM33	Severn Street	52.47650	-1.90277
BHM87	St Chads (2)	52.48628	-1.89596
BHM64	Stephenson Street	52.47864	-1.89876

ID	Diffusion Tube Name (within the clean air zone)	Lat	Long
BHM07	The Brasshouse, Broad Street	52.47759	-1.91143
BHMCL	Carrs Lane	52.479708	-1.894017
BHMHS	Hill Street	52.477089	-1.900605
BHMNS	Navigation Street	52.477693	-1.902385
BHMSN	Snow Hill Bridge	52.485737	-1.900703
BHMWL	Wheeley's Lane	52.471218	-1.911453

ID	Tube Name (within the ring road)	Lat	Long
BHM79	Alexandra Road	52.46479	-1.8929047
BHM80	Belgrave Middleway	52.46505	-1.8927274
BHM85	Dartmouth MW (2)	52.49028	-1.8865248
BHM82	Highgate MW	52.46572	-1.8839531
BHM68	Icknield Street (1)	52.49106	-1.9162877
BHM69	Icknield Street (2)	52.49093	-1.9159197
BHM74	Islington Row (2)	52.47133	-1.912895
BHM21	Lawley Middleway	52.48441	-1.8807233
BHM84	Lawley Middleway (2)	52.48425	-1.8811065
BHM78	Lee Bank MW - opposite St Lukes	52.46666	-1.8996859
BHM77	Lee Bank MW - St Lukes	52.46705	-1.8993317
BHM75	Lee Bank MW by School	52.46946	-1.9078789
BHM76	Lee Bank MW opposite School	52.46899	-1.9078946
BHM72	Leyburn Road	52.47546	-1.9236196
BHM81	Moseley Road	52.46563	-1.8834676
BHM67	New John Street West (1)	52.49273	-1.8975059
BHM66	Newtown Middleway	52.49253	-1.8916739
BHM71	Rann close	52.47578	-1.9233982
BHM27	Waterlinks	52.49027	-1.8860683
BHM83	Watery Lane (2)	52.47593	-1.8754312
BHM25	Watery Lane Middleway	52.47596	-1.8750189

ID	Tube Name (wider city)	Lat	Long
BHM03	28 High Street	52.4371	-1.8927804
BHM09	37 Shelley Drive **	52.51997	-1.8744227
BHM5(2)	448 Stratford Road	52.4553	-1.8673956
BHM20	641 Bristol Road	52.44396	-1.9359879
BHM4 (2)	75 High Street	52.43621	-1.8925619
BHM57	Chantry Road	52.44824	-1.8883247
BHM37	Church Road	52.46575	-1.9221938
BHM19	Middleton Hall Road	52.41529	-1.9317508
BHM99	Pershore Road	52.43536	-1.9180109
BHM11	Stratford Road outside Aldi 2	52.45921	-1.8716371
BHM12	Stratford Road outside Aldi 3	52.45921	-1.8716371
BHM17 (2)	Tyburn (39)	52.50776	-1.8539486
BHM18 (2)	Tyburn (40)	52.50779	-1.853035
BHM01	11 Fox Green Crescent	52.44266	-1.8364949
BHM91	Adderley Street	52.48928	-1.8615795
BHM02	Langleys Road	52.43711	-1.9413816
BHM10	Stratford Road outside Aldi 1	52.45921	-1.8716371

APPENDIX B

Automatic Air Quality Units Heatmap Tables, range set at 30 – 40. Anything above 30 is shaded in orange anything above 40 is shaded in red. For details of the air quality stations please see the Birmingham Air Quality website.

Colmore Row 2021 Roadside Lat 52.481789 Long -1.8987386 (Range set at 30-40)

Hour	January	February	March	April	May	June	July	August	September	October	November	December
00:00	31.1	31.7	26.4	30.1	22.6	19.9	21.1	16.6	22.3	17.9	27.8	26.9
01:00	25.3	26.1	18.6	23.8	17.4	15.8	19.0	13.6	19.8	12.9	21.0	20.8
02:00	19.7	20.2	15.7	19.1	14.7	11.7	14.9	10.0	17.4	9.8	15.7	16.4
03:00	18.6	17.2	14.0	19.0	13.3	11.1	13.0	8.9	13.1	8.2	13.2	14.7
04:00	16.9	18.0	16.4	25.8	13.9	11.5	13.3	8.8	14.4	7.9	12.2	12.7
05:00	16.6	18.5	19.5	34.7	20.1	17.3	18.0	13.2	19.2	14.3	12.8	12.7
06:00	23.6	23.8	25.9	45.8	28.0	22.3	23.5	18.5	28.2	22.4	17.1	18.7
07:00	31.4	30.8	34.0	53.3	32.5	25.8	26.6	22.1	35.7	30.5	26.7	26.4
08:00	38.2	42.9	41.3	50.2	32.1	25.1	26.2	19.4	36.7	31.1	35.2	30.1
09:00	45.3	49.9	40.3	39.5	30.9	25.2	24.5	19.0	31.0	28.5	40.3	33.9
10:00	44.2	50.4	33.1	32.2	25.0	23.5	19.6	16.1	25.2	25.1	37.7	34.3
11:00	41.9	39.9	30.8	25.9	23.3	20.4	19.1	15.4	22.1	24.3	32.8	33.5
12:00	38.8	35.9	27.9	23.4	20.8	20.3	17.9	15.1	20.0	20.7	30.5	33.0
13:00	36.8	33.3	26.4	23.0	21.5	18.6	17.8	15.3	22.1	21.2	29.1	31.2
14:00	36.5	33.1	24.8	23.4	22.7	19.0	19.8	18.0	21.2	21.6	28.9	33.0
15:00	37.7	31.2	25.5	23.8	23.7	22.9	21.2	19.1	23.5	26.5	30.9	34.1
16:00	42.3	31.6	28.2	27.0	27.5	24.7	22.1	19.3	25.3	24.9	38.0	39.8
17:00	45.5	35.6	29.5	29.0	28.4	24.9	22.8	19.6	25.7	29.2	41.6	43.2
18:00	46.0	41.1	33.5	28.8	27.8	24.3	25.4	22.0	29.3	35.1	42.9	40.5
19:00	45.1	42.4	34.0	29.7	26.9	24.3	22.8	20.2	32.1	33.8	44.8	40.1
20:00	41.7	39.7	36.3	33.8	26.8	23.5	21.8	21.6	36.9	31.2	39.7	37.1
21:00	37.8	39.1	32.5	36.7	29.3	24.8	24.9	24.2	36.3	27.4	37.4	35.5
22:00	34.9	34.1	30.9	38.5	28.9	26.0	28.5	23.7	31.2	26.6	33.0	31.7
23:00	33.2	34.6	30.3	38.1	30.7	25.3	27.4	22.4	29.9	25.7	29.1	29.4

Ladywood 2021 Urban Background Lat 52.476648 Long -1.9250898 (range set at 30-40)

Hour	January	February	March	April	May	June	July	August	September	October	November	December
00:00	21.1	21.8	18.5	27.4	15.9	13.5	16.9	11.8	15.9	9.1	18.2	16.5
01:00	17.1	17.9	16.6	22.7	14.6	11.0	14.4	8.6	14.1	6.7	15.3	13.1
02:00	15.6	16.7	14.3	21.2	12.9	10.8	13.1	7.3	12.0	5.9	12.5	11.7
03:00	14.2	15.0	13.4	21.8	11.9	10.2	12.2	6.8	10.0	4.7	11.8	10.9
04:00	12.9	14.0	13.2	24.8	12.4	10.2	11.8	7.5	9.1	4.5	11.1	10.1
05:00	12.9	14.2	13.5	28.4	14.2	12.5	13.6	7.9	12.4	7.3	11.4	9.6
06:00	16.0	17.7	17.7	32.2	17.0	13.4	14.7	11.0	15.6	10.4	15.0	11.2
07:00	19.4	19.2	21.8	35.0	16.9	13.7	13.7	12.1	19.6	14.6	18.6	13.4
08:00	24.6	26.1	26.7	30.5	16.3	13.0	14.7	10.6	22.2	17.9	24.5	18.1
09:00	28.6	31.2	24.9	23.4	13.8	12.1	12.5	8.9	19.0	16.4	28.3	21.4
10:00	27.6	29.6	18.6	18.2	11.1	10.6	9.9	7.9	13.0	12.3	26.3	20.1
11:00	24.6	23.5	15.6	14.3	9.8	9.5	9.4	7.6	10.0	10.0	21.4	18.5
12:00	23.5	19.7	14.2	13.0	9.3	9.1	8.6	7.0	8.5	9.0	18.2	17.5
13:00	22.1	18.2	12.6	11.7	9.6	8.7	8.1	7.5	8.8	9.8	17.1	16.7
14:00	20.2	17.5	11.9	11.3	9.4	8.4	8.1	8.0	8.1	9.9	17.1	18.1
15:00	20.4	18.4	12.4	12.0	9.4	9.6	7.5	8.2	9.1	11.1	18.6	19.5
16:00	23.1	19.9	13.3	12.9	9.9	9.2	7.0	8.5	9.8	11.7	23.4	24.1
17:00	27.8	22.1	13.8	13.6	11.1	9.9	7.4	9.5	12.6	16.6	29.9	27.0
18:00	30.4	25.3	17.3	14.6	11.5	10.8	8.2	10.7	16.0	20.8	31.4	27.0
19:00	29.2	28.4	23.7	17.7	12.5	11.9	8.9	12.3	24.6	22.1	32.7	25.5
20:00	26.7	29.5	24.6	24.9	16.1	12.6	11.1	16.3	30.6	20.0	29.6	23.3
21:00	26.9	27.9	22.8	32.2	23.4	15.0	16.3	16.1	26.6	17.0	27.1	22.8
22:00	25.1	26.5	20.9	32.7	24.9	18.9	20.0	15.1	21.8	16.1	24.3	20.6
23:00	22.6	24.4	18.9	32.2	20.6	18.2	19.6	14.3	19.3	14.1	20.7	17.5

Lower Severn Street 2021 Roadside Lat 52.476749 Long -1.9021365 (range set at 30-40)

Hour	January	February	March	April	May	June	July	August	September	October	November	December
00:00	23.3	24.7	23.0	31.1	25.0	21.8	25.9	20.7	28.8	20.3	25.9	25.5
01:00	20.2	19.6	20.9	27.3	21.6	17.6	22.8	16.6	26.0	15.4	21.9	21.9
02:00	17.5	16.4	17.7	25.9	17.5	15.9	19.6	13.4	22.8	13.0	18.3	21.3
03:00	15.3	15.3	16.8	24.5	16.9	14.1	18.0	12.5	20.2	12.5	16.5	16.7
04:00	14.2	14.4	18.4	28.3	16.7	14.9	18.9	12.4	21.0	12.1	15.7	15.4
05:00	14.3	14.6	19.8	35.6	20.8	19.7	21.4	14.9	23.6	14.1	15.8	15.0
06:00	17.2	17.4	24.6	40.6	25.0	22.6	22.1	17.4	28.8	17.4	18.0	16.6
07:00	20.7	19.6	29.5	45.0	27.9	25.6	23.2	19.7	33.7	23.2	22.9	19.9
08:00	26.0	25.9	33.7	42.7	26.2	24.8	25.3	19.5	37.7	26.4	29.3	25.3
09:00	29.1	29.9	32.2	37.1	26.8	23.2	24.4	18.1	36.5	25.7	33.6	29.2
10:00	28.4	30.6	28.5	31.2	23.9	21.7	22.9	17.7	29.8	22.4	34.5	27.6
11:00	27.1	27.0	26.3	27.5	25.6	21.1	23.8	18.9	26.6	23.4	30.6	27.0
12:00	25.5	24.5	24.5	25.4	22.9	20.5	23.3	18.7	26.3	21.5	29.5	28.5
13:00	26.7	23.4	22.6	25.5	24.5	20.9	23.8	20.1	27.7	22.2	30.0	28.8
14:00	29.1	23.0	22.5	26.8	26.0	21.1	25.4	20.5	28.4	25.0	30.6	30.0
15:00	29.2	24.8	24.6	26.0	26.1	21.6	25.8	22.3	28.7	27.2	32.5	31.1
16:00	29.5	25.0	26.2	28.8	27.5	22.6	26.5	22.5	31.5	29.2	36.7	35.4
17:00	33.4	27.7	30.0	28.8	28.1	23.8	26.7	24.8	34.7	32.5	42.1	37.4
18:00	34.2	29.9	30.9	31.1	29.2	26.2	28.9	25.2	39.7	35.8	41.8	36.6
19:00	33.2	31.8	33.4	32.1	30.1	25.6	28.7	26.7	44.5	35.2	42.3	35.5
20:00	31.1	32.2	33.7	38.6	32.7	26.8	29.5	30.0	46.8	32.0	40.0	33.1
21:00	31.8	29.5	30.3	42.2	34.8	28.9	32.3	29.5	43.4	28.6	35.5	31.7
22:00	27.7	28.0	28.3	40.3	35.7	29.8	34.2	28.7	38.3	28.0	31.1	29.5
23:00	26.1	27.5	26.3	38.5	33.6	27.7	31.7	26.4	34.2	25.2	28.2	27.2

St Chads 2021 Kerbside Lat 52.486067 Long -1.8967703 (range set at 30-40)

Hour	January	February	March	April	May	June	July	August	September	October	November	December
00:00	36.2	29.8	31.8	38.2	32.8	23.7	27.3	22.8	35.6	28.7	33.8	38.7
01:00	30.0	25.8	25.4	31.0	26.1	19.0	23.0	18.6	31.1	23.5	27.3	32.9
02:00	24.6	23.5	22.6	27.7	22.0	15.8	19.1	15.2	27.9	19.7	22.0	26.8
03:00	23.0	22.7	22.4	28.3	19.7	14.4	18.4	14.2	26.7	18.6	19.0	22.6
04:00	21.0	22.6	22.5	30.1	20.8	14.7	18.1	14.8	26.3	18.6	18.4	22.1
05:00	21.3	23.4	27.6	37.9	26.0	20.6	22.5	18.3	29.2	23.7	19.7	22.0
06:00	26.5	29.8	35.4	51.4	37.4	27.3	30.0	25.6	41.2	34.7	23.7	26.3
07:00	36.1	43.3	49.6	60.3	45.0	33.6	36.9	33.3	57.2	47.8	33.5	36.3
08:00	45.8	57.3	58.8	60.1	45.4	34.2	38.8	33.1	62.5	53.7	43.2	45.8
09:00	48.4	56.2	56.2	54.6	43.9	33.9	39.1	31.5	62.3	53.2	48.5	51.9
10:00	47.6	51.8	51.5	50.6	42.4	32.8	38.7	32.2	56.6	50.1	48.3	51.2
11:00	45.3	47.8	49.6	47.5	42.8	35.1	41.5	33.8	55.2	52.0	45.3	52.8
12:00	46.1	46.5	49.7	48.3	44.4	34.6	40.1	35.2	55.6	52.0	43.6	53.6
13:00	47.4	46.1	48.7	49.7	43.8	34.1	42.7	36.5	55.7	53.4	43.2	54.6
14:00	47.8	47.0	49.3	49.1	45.1	35.2	44.5	40.1	56.4	54.6	45.0	55.5
15:00	47.1	47.6	50.4	51.3	46.1	37.8	46.6	39.6	59.7	56.0	46.6	58.7
16:00	54.0	50.8	56.5	52.2	47.0	37.3	45.3	39.7	62.2	61.0	50.6	62.3
17:00	53.9	51.9	55.4	49.9	45.9	35.3	42.1	38.3	62.9	60.0	55.9	65.7
18:00	52.8	54.2	56.1	50.2	46.8	36.2	41.1	36.9	59.0	58.3	54.4	61.5
19:00	48.8	50.6	55.2	49.7	42.6	34.4	36.7	35.8	58.2	54.9	52.1	56.8
20:00	44.5	47.6	50.2	51.0	45.7	35.0	35.4	35.8	61.6	51.2	47.1	52.4
21:00	41.5	43.4	44.4	50.8	45.3	33.2	34.2	33.9	56.3	44.5	43.3	49.9
22:00	39.3	38.1	39.0	49.5	42.8	31.5	35.9	31.8	52.1	43.6	39.4	44.6
23:00	36.9	34.4	35.7	45.3	38.3	29.2	33.8	28.9	46.5	37.7	34.7	41.5

A4540 2021 Roadside Lat 52.476094 Long -1.8749891 (range set at 30-40)

Hour	January	February	March	April	May	June	July	August	September	October	November	December
00:00	32.4	32.0	29.5	38.1	37.2	27.3	27.9	26.4	30.0	27.2	32.8	28.0
01:00	28.2	28.8	26.8	35.9	30.9	20.8	24.6	20.8	27.4	20.9	29.4	26.6
02:00	22.4	22.8	24.0	33.3	26.5	16.8	20.1	17.0	23.7	16.6	22.6	22.0
03:00	20.6	21.2	22.7	30.1	22.9	15.2	18.9	14.9	20.4	14.5	19.1	19.7
04:00	20.4	19.2	23.7	32.6	23.5	20.4	20.6	16.5	21.6	17.8	18.3	19.3
05:00	24.4	22.9	29.3	37.3	31.5	25.9	26.4	23.0	28.0	26.3	21.8	21.4
06:00	30.8	29.2	35.4	45.0	36.2	28.5	27.7	25.9	34.2	32.0	30.8	27.3
07:00	37.6	36.3	40.7	47.2	35.7	26.7	28.1	27.4	40.4	36.8	41.3	31.1
08:00	41.8	45.0	45.5	39.1	32.2	25.4	27.9	23.6	40.3	38.0	44.0	34.5
09:00	46.1	44.6	43.5	33.0	30.3	24.5	25.9	20.3	36.7	36.0	48.0	38.5
10:00	42.2	43.2	37.2	26.1	29.4	22.9	24.3	19.7	30.7	32.7	47.5	36.9
11:00	41.2	38.5	34.9	23.9	28.3	23.4	26.1	20.2	28.4	30.2	42.2	35.3
12:00	37.8	33.5	29.6	23.5	28.2	21.8	24.7	20.5	27.6	27.8	36.4	34.3
13:00	36.1	33.4	29.1	21.1	28.4	22.8	24.8	23.1	29.0	28.9	36.3	32.9
14:00	37.5	31.8	28.6	20.5	29.8	21.9	27.0	22.0	27.9	30.7	36.0	35.2
15:00	37.8	30.6	30.3	21.9	29.3	22.9	25.1	23.5	29.4	32.1	39.8	38.5
16:00	41.8	32.6	28.8	23.1	32.1	24.6	27.3	23.5	30.1	36.8	45.2	41.1
17:00	45.7	37.6	31.6	22.7	32.8	23.2	27.2	25.2	31.6	43.0	51.9	43.8
18:00	47.7	41.5	35.7	24.5	31.1	24.0	26.7	23.5	35.2	43.9	51.5	43.9
19:00	44.6	45.0	38.6	28.5	31.4	25.5	30.3	26.2	41.1	45.8	51.2	40.2
20:00	42.1	41.5	41.5	32.0	37.1	26.3	31.1	28.8	46.8	41.7	47.8	40.2
21:00	38.9	40.9	40.3	37.6	39.1	31.5	32.3	30.4	43.7	36.7	45.1	40.6
22:00	36.7	38.1	36.8	42.7	44.6	33.1	37.1	31.0	38.9	35.7	39.6	35.2
23:00	34.4	37.3	33.8	41.8	43.0	32.5	33.6	29.5	34.2	31.3	35.0	30.7

Moor Street 2021 Roadside Lat 52.479895   Long -1.8919552 (range set at 30-40)

Hour	January	February	March	April	May	June	July	August	September	October	November	December
00:00	28.1	28.9	27.5	34.6	28.6	23.6	23.3		32.5	28.8	34.0	33.4
01:00	26.3	25.5	24.8	29.5	28.6	18.9	21.8		29.6	26.4	30.8	30.5
02:00	22.7	27.6	22.9	28.8	25.8	15.2	17.8		27.4	24.7	22.2	25.9
03:00	20.3	25.6	22.1	28.6	26.1	15.1	14.8		23.3	23.9	20.8	24.3
04:00	22.2	27.1	22.7	31.4	24.0	17.7	16.8		24.9	27.7	20.0	23.0
05:00	21.7	28.7	27.4	38.8	29.1	24.4	22.7		29.4	30.8	22.6	24.9
06:00	25.8	29.4	33.9	46.1	35.2	27.0	28.6		36.5	36.9	30.7	31.8
07:00	29.7	33.3	39.6	48.8	36.4	30.1	28.3		40.3	39.4	41.5	38.0
08:00	38.6	42.0	43.9	43.8	34.4	29.7	27.4		41.5	42.4	48.6	39.2
09:00	42.3	45.0	41.2	37.7	32.8	27.8	20.8		36.2	38.3	49.4	42.9
10:00	40.4	42.2	37.3	31.0	30.3	27.0	19.7		28.8	32.1	49.4	43.3
11:00	34.1	38.2	33.5	28.0	29.1	26.4	20.7		30.1	31.0	41.2	41.5
12:00	36.0	34.1	30.5	26.7	28.5	24.6	20.9		27.6	29.2	39.1	39.7
13:00	31.2	30.5	28.6	26.4	28.4	25.7	20.0		27.6	29.2	38.5	37.7
14:00	34.4	31.6	28.6	26.8	29.0	25.4	20.6		27.1	29.7	39.1	39.0
15:00	31.5	30.0	30.4	27.7	29.3	26.9	19.9		26.8	31.5	40.6	40.6
16:00	36.1	32.8	30.6	31.0	31.0	27.0	20.5		31.3	34.1	45.0	45.9
17:00	43.6	36.1	34.3	30.1	32.5	27.5	20.3		35.2	40.8	51.9	49.5
18:00	46.5	40.1	36.8	30.0	31.6	28.2	24.3		40.5	44.0	54.1	48.7
19:00	39.9	40.8	39.7	31.3	27.7	26.7	20.9		44.0	44.1	54.3	45.0
20:00	36.3	37.8	38.6	40.2	34.9	28.1	22.3		45.8	37.9	49.4	41.9
21:00	33.8	36.3	37.4	42.1	37.9	31.7	21.7		44.4	35.5	44.8	39.2
22:00	30.7	35.3	33.1	44.5	38.0	29.1	22.2		40.6	35.7	40.1	36.8
23:00	29.5	32.4	30.5	41.9	35.5	28.5	24.4		39.4	33.3	36.3	33.7