



Glasgow City Council

**Net Zero and Climate Progress Monitoring
City Policy Committee**

**Report by George Gillespie, Executive Director of Neighbourhoods
Regeneration and Sustainability**

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Item 3

19th September 2023

ANNUAL PROGRESS REPORT ON AIR QUALITY

Purpose of Report:

To advise Committee of the city's 2023 Annual Progress Report on Air Quality.

Recommendations:

The Committee is asked to note:

- (a) The content of this report on air quality in the city.
- (b) The new data available on pollution levels
- (c) The impact of fewer pandemic restrictions on pollution levels
- (d) The trends in concentrations of nitrogen dioxide, particularly within the city centre

Ward No(s):

Citywide:

Local member(s) advised: Yes No

consulted: Yes No

1. Introduction

- 1.1 This report presents the findings of the Council's Annual Progress Report (APR) on air quality, detailing a comprehensive overview of data and trends for air quality across the city in the 2022 calendar year. Members can access the full report [here](#).
- 1.2 The Environment Act 1995, which implemented EC Directive 96/62, requires that local authorities regularly review and assess the air quality within their area of responsibility. This review and assessment process is the basis of Local Air Quality Management (LAQM). It is intended to compare current and future concentrations of key air pollutants against the objectives detailed in the regulations as part of the national strategy for air quality.
- 1.3 Both short- and long-term exposure to air pollution can lead to a wide range of diseases, including stroke, chronic obstructive pulmonary disease, trachea, bronchus and lung cancers, aggravated asthma and lower respiratory infections. Further evidence is emerging of links between exposure to air pollution and type 2 diabetes, obesity, systemic inflammation, Alzheimer's disease and dementia. A recent global review found that chronic exposure can affect every organ in the body, complicating and exacerbating existing health conditions. Children and adolescents are particularly vulnerable because their bodies, organs and immune systems are still developing. Air pollution damages health during childhood and increases the risk of diseases later in life.
- 1.4 In accordance with LAQM requirements, the APR considers monitoring data available since the last round of review and assessment, the [Air Quality Progress Report 2022](#), as well as assessing the impact from various potential sources of pollution, such as any major new developments. Reporting of air pollution levels is a statutory function for local authorities, particularly in relation to any legal breaches of statutory air quality objectives.
- 1.5 Previous rounds of the LAQM review and assessment process have seen Glasgow declare Air Quality Management Areas (AQMA). A local authority is required by law to declare an AQMA where air quality objectives are not being met. In Glasgow these have been due to elevated levels of the air pollutants nitrogen dioxide (NO₂) and particulate matter (PM₁₀).
- 1.6 The main source of air pollution produced within the city itself comes from road traffic. Airborne particulate matter is more heavily influenced by non-local effects, such as prevailing wind conditions, over which the city has no control, which can blow in pollutants from continental Europe and beyond. Nitrogen dioxide, however, is more directly attributable to local traffic volumes and engine type – and in particular to diesel engines, which emit comparatively more nitrogen dioxide than petrol engines.
- 1.7 To date the city has declared four AQMAs, as follows:
 - City Centre (NO₂ and PM₁₀) – declared in 2002.
 - Parkhead Cross (NO₂) – declared in 2007 and revoked in 2020.

- Byres Road/ Dumbarton Road (NO₂ and PM₁₀) – declared in 2007. Amended in 2020 to remove PM₁₀. Revocation pending for NO₂.
- City-wide (PM₁₀) – declared in 2012 and revoked in 2016

2 Actions to Improve Air Quality

- 2.1 In response to the implementation of the AQMAs in the city, Glasgow City Council produced Air Quality Action Plans (AQAP) in 2004 and 2009, introducing a range of measures aimed at reducing pollution in the city. The Action Plans considered several measures such as vehicle idling enforcement, vehicle emission testing and initiatives towards cleaner vehicles. Other measures such as sustainable transport initiatives and public information promotion continue to evolve. Progress on actions is reported within the APR in section 2.3. New actions have been incorporated into the APR reporting process since the last official AQAP, however a revised AQAP is currently in draft and will be further developed before consultation and adoption.
- 2.2 A table outlining progress of the Air Quality Action Plan measures in 2022 can be found in Table 2.2 of the APR.
- 2.3 As a result of these combined measures, the Citywide AQMA for PM₁₀ was revoked in 2016 and the Parkhead Cross AQMA for NO₂ was revoked in 2020 following a prolonged period of achieving the relevant air quality objectives. The Byres Rd / Dumbarton Rd AQMA was amended in 2020 to remove the PM₁₀ component and revocation of the NO₂ aspect is pending. These developments are tangible evidence that improvements in air quality continue to be achieved within Glasgow.

3 Air Quality Update

- 3.1 Air quality is a devolved matter, and the Council therefore works to measure and achieve hourly, daily and annual objectives on various pollutants which have been established by the Scottish Government. The APR represents the Council's submission in respect of both the current levels of these pollutants and the efforts made to reduce these and achieve compliance with the health-based objectives.
- 3.2 An update on the main pollutants of concern can be summarised as follows:
- 3.2.1 Particulate Matter (PM₁₀)

Levels of PM₁₀ recorded across the city in 2022 were satisfactory with both the daily mean and annual mean objectives being met at all monitoring locations. Annual mean concentrations recorded at nine automatic monitoring stations ranged from 8ug/m³ to 13ug/m³ against an objective level of 18ug/m³. Five of the stations recorded two days in 2022 where annual average PM₁₀ exceeded 50ug/m³ with seven days above this level permitted before an exceedance is considered to have been made. This continued the trend of compliance in

respect of this pollutant which has been observed for several years. It should be noted that the Scottish annual mean objective for this pollutant is set at just under half that of the UK and EU limits. The city therefore continues to perform relatively well in this area.

3.2.2 Particulate Matter (PM_{2.5})

Levels of PM_{2.5} recorded across the city in 2022 were satisfactory with both the annual mean objectives being met at all monitoring locations. Annual mean concentrations recorded at nine automatic monitoring stations ranged from 5ug/m³ to 7ug/m³ against an objective level of 10ug/m³. As ultra-fine particulate pollution is considered to be a pollutant with significant impact on human health, the city is also performing relatively well in this respect.

3.2.3 Nitrogen Dioxide (NO₂)

Monitoring of NO₂ uses a combination of both automatic monitoring stations and diffusion tube monitoring. Use of diffusion tubes allows the monitoring of this pollutant at more locations than is practical or economical using automatic stations. Levels of NO₂ in 2022 at all automatic monitoring stations were within the objective levels for the first time since the heavily pandemic affected year of 2020. However, it should be noted that the compliance recorded at Glasgow Kerbside (Hope St - see Figure 1 below) was marginal, recording an annual mean of 39.1ug/m³ against an objective level of 40ug/m³.

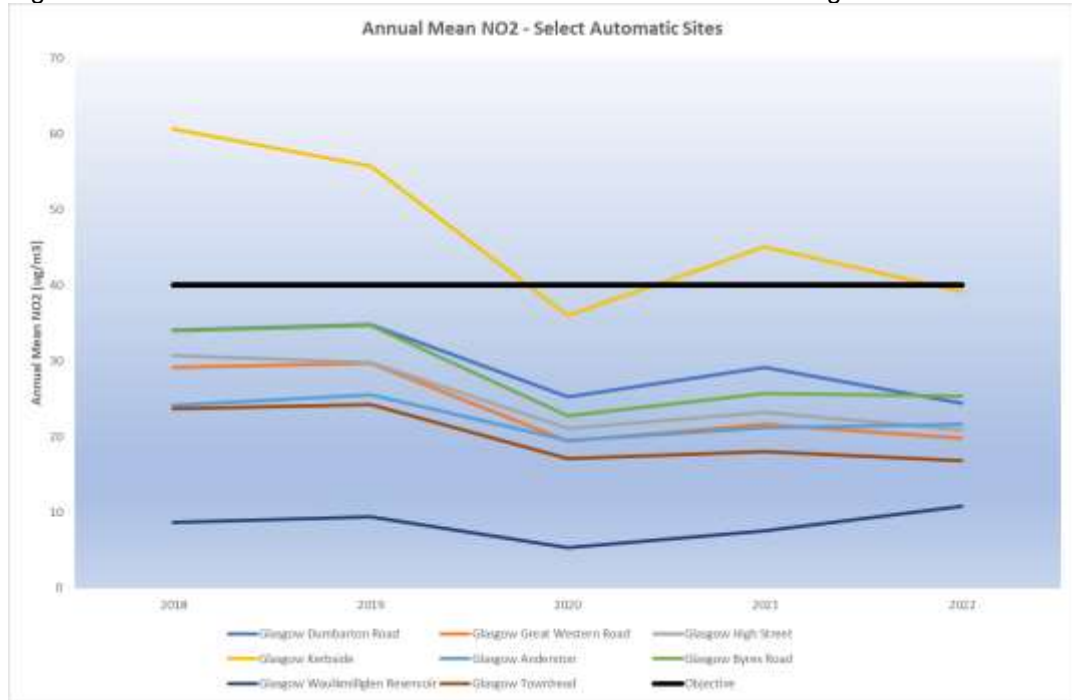
Exceedances of the annual mean objective were recorded in monitoring conducted by diffusion tube at four monitoring locations. A further two locations sit at the objective (40ug/m³ rounded to nearest whole number), and 4 locations lie within 10% of the objective (including the Kerbside automatic station).

The NO₂ Hourly Mean Objective was not exceeded at any of the automatic monitoring stations.

3.2.4 NO₂ Trends

Levels of NO₂ pollution have been on a downward trend in recent years, as a result of improvements in vehicle emissions and the phased introduction of the Glasgow LEZ for scheduled bus services since 2018. NO₂ levels dropped significantly in 2020 as a result of the pandemic restrictions, before increasing in 2021 as these restrictions lessened. However, most automatic stations recorded a slight decrease in NO₂ levels between 2021 and 2022, maintaining a significant decrease on the pre-pandemic levels. Figure 1 below shows the trend at automatic stations between 2018 and 2022.

Figure 1: Trends in annual mean NO₂ at selected automatic monitoring stations



3.2.5 City Centre NO₂ Trends

Table 1 below shows results from the city centre monitoring using NO₂ diffusion tubes. NO₂ levels have been on a generally downward trend, and this accelerated significantly in the pandemic affected year of 2020, where all but one location recorded levels below the annual mean objective. As pandemic restrictions eased in 2021, all but three locations recorded rising levels of NO₂, with two locations exceeding the objective level for this year.

As pandemic restrictions eased further in 2022, a significant rise in NO₂ levels was recorded at almost all city centre locations monitored by diffusion tube, with annual mean NO₂ rising by between 4 and 44% across the 27 monitoring locations. The average rise in recorded NO₂ levels by city centre diffusion tubes between 2021 and 2022 was 20%. The number of locations recording exceedances of the annual mean NO₂ by diffusion tube in Glasgow city centre, rose to four with one location exceeding the objective by 28% (CC14 – Gordon St).

Table 1: Monitoring results from city centre locations during the period 2019 – 2022

Site ID	Site Name	2018	2019	2020	2021	2022	% Increase 2021 to 2022
CC01	George Square	35	32	19	25	31	24
CC02	Union Street	47	47	28	38	40	5
CC03	Bath Street	41	39	23	32	37	16
CC04	Glassford St	40	40	25	29	35	21
CC05	Buchanan St	41	38	24	26	34	31
CC06	Castle Street	31	29	20	24	28	17

CC07	Hope Street 3	40	40	23	35	42	20
CC08	Montrose St	29	28	19	22	28	27
CC09	Cochrane St	35	35	22	26	31	19
CC10	Renfield Street	45	42	28	33	40	21
CC11	George Street	39	32	20	25	31	24
CC12	North Street	30	27	21	19	23	21
CC13	Hope Street 1	63	56	40	44	46	5
CC14	Gordon Street	60	59	36	40	51	28
CC15	Hielanman's Umbrella North	60	59	36	36	43	19
CC16	Saltmarket	27	31	23	26	33	27
CC17	High Street	40	42	26	25	36	44
CC18	Dobbies Loan	27	23	19	22	24	9
CC20	Dundasvale St	30	28	21	24	25	4
CC21	Royston Road	29	29	21	24	30	25
CC22	St Mungo Ave	27	26	20	21	24	14
CC23	Brown Street	29	24	17	19	22	16
CC24	Broomielaw	39	37	23	32	37	16
CC25	McLeod Street	31	30	22	22	30	36
CC26	Sauchiehall St	31	32	21	24	29	21
CC28	St Mungo's PS	26	24	19	15	20	33
CC29	Garnetbank PS	31	29	21	22	24	9

**Exceedances of annual mean shown in bold.

Table 2 and Figure 2 below shows those monitoring locations which were exceeding, or within 10% of, the annual mean objective in the last full pre-pandemic year of 2019 and the results for these locations in the subsequent years. Diffusion tube results show a clear upward trend since the pandemic affected year of 2020 with all locations showing increases between 2021 and 2022.

Table 2: Selected monitoring results from city centre locations exceeding or within 10% of the objective during the period 2019 – 2022

	Location Description	Annual Mean NO ₂ (µg/m ³)			
		2019	2020	2021	2022
Hope St 1	Road canyon – next to taxi rank	56	40	44	46
Gordon St	Road canyon – next to taxi rank	59	36	40	51
Hope St 3	Road canyon – general traffic	40	23	35	42
Heilanman's Umbrella	Sheltered location – poor dispersion	59	36	36	43
Union St	Bus gate – buses and commercial traffic	47	28	38	40
Renfield St	Road canyon – general traffic	42	28	33	40
High St	General traffic	42	26	25	36
Glassford St	General traffic	40	25	29	35
Bath St	General traffic	39	23	32	37
Buchanan St	Bus gate – buses and taxis	38	24	26	34
Broomielaw	General traffic	37	23	32	37

*All figures rounded to nearest whole number (40ug/m³ may be a technical exceedance or compliance based on rounding)
 **Exceedances of annual mean shown in bold and red. Monitoring within 10% of objective shown in bold.

Figure 2: Selected monitoring results from city centre locations exceeding or within 10% of the objective during the period 2019 – 2022

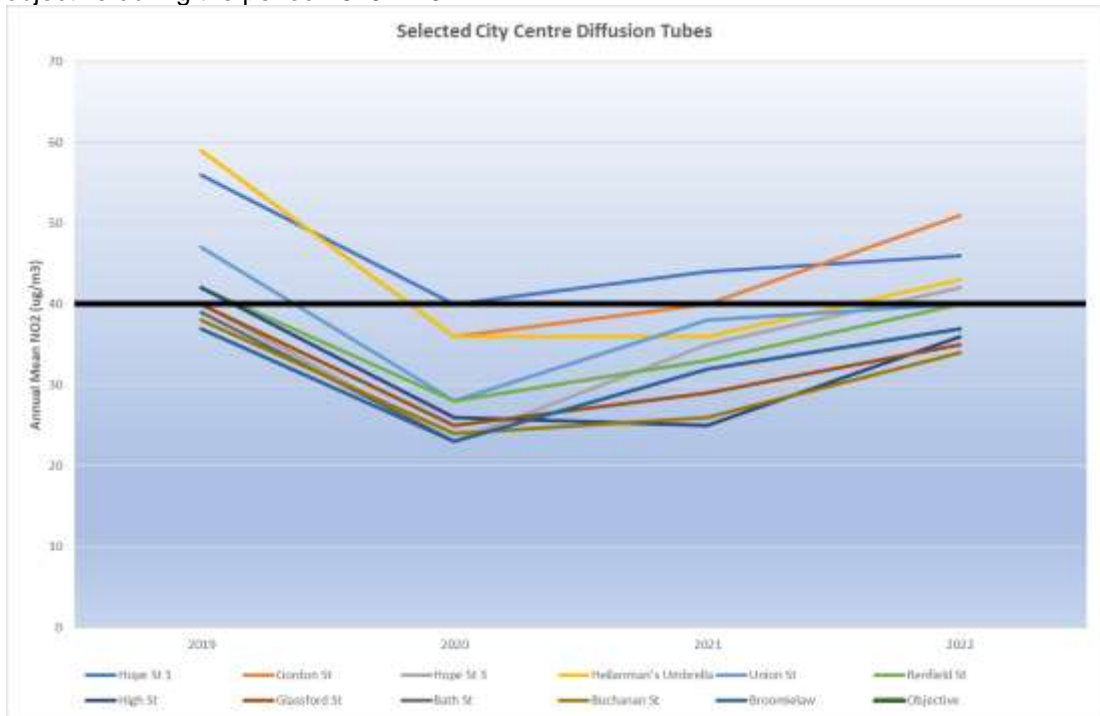
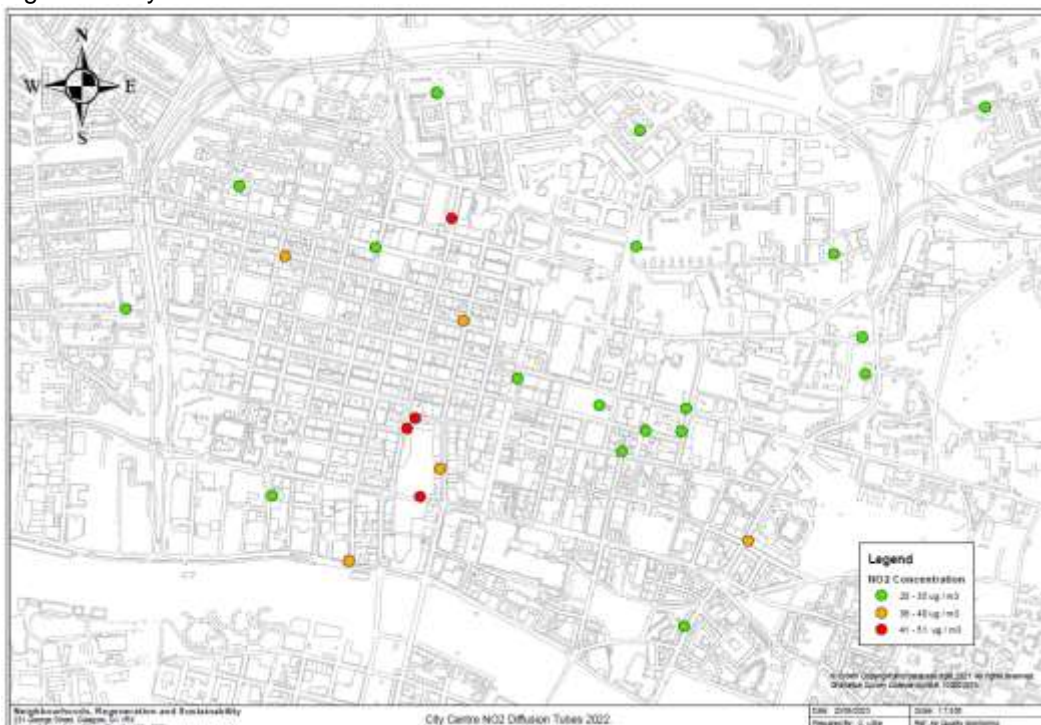


Figure 3 below shows the location of the city centre diffusion tube monitoring with annual average NO₂ levels recorded in 2022.

Figure 3: City Centre NO₂ diffusion Tubes 2022



4 Conclusions

- 4.1 Reporting of air pollution levels is a statutory function for local authorities, particularly in relation to any legal breaches of statutory air quality objectives. Monitoring results from 2022 show a mixed picture with results from automatic monitoring stations across the city showing a general reduction from 2021. However, monitoring within the city centre conducted by diffusion tubes show a significant (20%) increase on 2021 figures. Whilst automatic stations use reference grade chemiluminescent analysers for NO₂, diffusion tubes are passive analysers where ambient NO₂ is absorbed over the exposure period of one month before being laboratory analysed. Diffusion tubes are suitable for comparison against annual mean objectives and the accuracy of this method is improved by co-location with the automatic stations.
- 4.2 The number of locations showing exceedances of the annual mean NO₂ objective has increased year on year from the pandemic-affected low of 2020. Four locations show exceedances for 2022, with a further two at the objective level and three within 10%, indicating potential exceedances.
- 4.3 Monitoring follows LAQM technical guidance with most located on the facades of buildings, set back from roadside receptors and therefore recording lower levels of pollution than at roadside. Monitoring is necessarily limited in terms of locations, however results for 2022 are consistent with the modelling work undertaken by the Scottish Environment Protection Agency for the Low Emission Zone (LEZ) evidence base. This predicted more widespread exceedances of the objectives at roadside receptors as well as exceedances at monitoring locations prior to the introduction of phase 2 of the LEZ. The latest monitoring data in respect of the annual mean objective for NO₂, as detailed in this report, reflects this modelling and represents the final air quality monitoring information available in advance of the introduction of LEZ phase 2.
- 4.4 LAQM Guidance states in relation to the revocation of Air Quality Management Areas, *“A minimum requirement however will normally be at least three consecutive years where the objectives of concern are being achieved and where monitoring data demonstrates that further exceedances of the objectives are unlikely to occur.”* It is clear that objectives of concern (annual mean objective for NO₂) have not been achieved, even within 2020 when pandemic restrictions were at their height and continue to increase during recovery from the pandemic. Nor has it been demonstrated that *“further exceedances of the objectives are unlikely to occur.”*
- 4.5 Continued interventions to improve air quality, such that revocation of the AQMA becomes possible, are required. This includes the implementation of phase 2 of the Glasgow LEZ and the adoption of the revised Air Quality Action Plan. Monitoring will continue to assess ongoing pollution trends and the impact of the introduction of phase 2 of the Glasgow LEZ.

Resource Implications:

<i>Financial:</i>	There are no new financial implications arising from the report.
<i>Legal:</i>	The report raises no new legal issues.
<i>Personnel:</i>	LAQM duties are undertaken utilising GCC personnel.
<i>Procurement:</i>	No relevant procurement issues.

Council Strategic Plan: This work supports the key aims of Grand Challenge 3, Mission 2 of the Council Strategic Plan.

Equality and Socio-Economic Impacts:

Does the proposal support the Council's Equality Outcomes 2021-25? Please specify. Generally supportive of the stated outcomes.

What are the potential equality impacts as a result of this report? No significant impact from this report.

Please highlight if the policy/proposal will help address socio-economic disadvantage. No significant impact from this report.

Climate Impacts:

Does the proposal support any Climate Plan actions? Please specify: LAQM has many co-benefits and shared actions with the Climate Plan including actions:
22 – development of the LEZ
26 – alternative actions for bus delivery
33 – feasibility study of a Workplace Parking Levy
42 – ban of gas heating in new developments
51 - delivery of a comprehensive active travel network

52 - enable a rapid and strategic shift to electric vehicles through increasing the current rate of deployment of EV charging infrastructure

53 – support transition to cleaner public transport

54 – transition GCC fleet to electric

55 – transition private hire fleet to zero emissions by 2030

56 - reduce the need to own and use a car through measures in the City Development Plan 2, Glasgow Transport Strategy and the Liveable Neighbourhoods

What are the potential climate impacts as a result of this proposal?

The APR includes an update on action plan measures, many of which have slight beneficial climate impacts.

Will the proposal contribute to Glasgow's net zero carbon target?

Measures progressed and reported within the APR have slight beneficial climate impacts, especially in relation to transport, and therefore contribute to the net zero carbon target.

Privacy and Data Protection Impacts:

Are there any potential data protection impacts as a result of this report
Y/N

No data protection or privacy implications. This report presents analysis of publicly available data and does not represent any privacy or data protection issues.

6 Recommendations

The Committee is asked to note:

- (a) The content of this report on air quality in the city.
- (b) The new data available on pollution levels
- (c) The impact of fewer pandemic restrictions on pollution levels
- (d) The trends in concentrations of nitrogen dioxide, particularly within the city centre