



20 May
2022

Auckland Air Quality Report

Monthly update

Research and
Evaluation Unit

RIMU



Introduction

Auckland Council continuously collects air quality data to assess compliance with national standards and provide information to aid policy development and evaluation. The data the council collects enables us to quantify ambient air quality in the region and note spatial and temporal variations. This report presents a monthly update on air quality in Auckland. It has three sections: sections A and B present tables and graphics illustrating air quality status in the Auckland region based on the data collected from continuous monitoring sites across the region. For this edition, section C focuses on one monitoring site – Queen Street. The monthly update is prepared using validated data which is generally available one month after raw data is collected. This update covers data to 31 March 2022.

Summary

- No breach of national air quality standards has occurred this year (1 Jan to 31 Mar 2022).
- All monitoring sites recorded particulate matter (PM₁₀) concentrations higher than the previous year.
- All monitoring sites, except Patumahoe and Henderson, registered lower average nitrogen dioxide (NO₂) concentrations compared to the previous year.
- The highest concentrations of air contaminants were measured at Auckland city centre monitoring sites.

Glossary of terms

Term	Meaning
Aerodynamic diameter	Used to describe the behaviour of a particle as it moves around in the air; it compares the behaviour with that of a spherical particle of unit density.
Air pollutant/contaminant	Any substance in the air that could harm humans, animals, vegetation, or other parts of the environment when present in high enough concentrations.
Air pollution	The presence of one or more air pollutants in high enough concentrations to cause harm.
Air quality	Is the degree to which air is suitable or clean enough for humans, animals, or plants to remain healthy.
Air quality index (AQI)	Score out of 100, based on dividing a pollutant concentration by a relevant standard. It can be used to approximate relative impact of different pollutants.
Ambient air	The external air environment (does not include the air environment inside buildings or structures)
Black carbon (BC)	Is an air pollutant made up of tiny soot-like particles discharged into the atmosphere from combustion processes.
CO	Carbon monoxide, a type of air pollutant.
Exceedance	An exceedance defines a period of time during which the concentration of a pollutant is greater than the appropriate air quality criteria.
Ground-level ozone (O₃)	At ground level, ozone is considered an air pollutant that can seriously affect the human respiratory system. It is a major component of photochemical smog.
Monitoring site	A facility for measuring the concentration of one or more pollutants in the ambient air; also referred to as 'monitoring station'
NESAQ	National Environmental Standard for Air Quality.
NO₂	Nitrogen dioxide, a type of air pollutant
PM	Particulate matter is made up of a mixture of various sizes of solid and liquid particles suspended in air.
PM₁₀	Particulate matter with an aerodynamic diameter of 10 micrometres or less; a type of air pollutant.
PM_{2.5}	Particulate matter with an aerodynamic diameter of 2.5 micrometres or less; a type of air pollutant.
SO₂	Sulphur dioxide, a type of air pollutant
µg/m³	Microgram of pollutant (1 millionth of a gram) per cubic metre of air, referenced to temperature of 0°C (273.15 K) and absolute pressure of 101.325 kilopascals (kPa)
n/a	Not applicable

Data can be viewed on the [environmental data portal](#) , [LAWA](#) or requested from environmentaldata@aucklandcouncil.govt.nz. Full state and trends analyses and reports are prepared every few years (last report; [Trends in Auckland's air quality 2006-2018](#)).

See the [frequently asked questions](#) about the Auckland air quality monitoring programme.

Section A – Data tables

Table 1. Summary information about Auckland air quality monitoring programme 1 January 2022 to 31 March 2022

Number of Continuous Monitoring Sites	10	
Location of Monitoring Sites	Queen Street, Customs Street, Khyber Pass Road, Penrose, Henderson, Takapuna, Glen Eden, Pakuranga, Papatoetoe, and Patumahoe	
Standard Contaminants Monitored	PM ₁₀ , CO, NO ₂ , O ₃ , and SO ₂	
Other Key Contaminants Monitored	PM _{2.5} , and Black Carbon	
Number of Exceedances Of NESAQ In 2022	0	
Number of Exceedances of Auckland Ambient Air Quality Targets In 2022	0	
Maximum PM₁₀ 24-Hours Mean (Jan - Mar 2022)	37.0 µg/m ³ (74.0% of NESAQ)	<i>Recorded at Queen Street on 25 March 2022</i>
Maximum PM_{2.5} 24-Hours Mean (Jan - Mar 2022)	13.8 µg/m ³ (55.2% of Auckland target)	<i>Recorded at Queen Street on 25 March 2022</i>
Maximum NO₂ 1-Hour Mean (Jan - Mar 2022)	119.0 µg/m ³ (59.5% of NESAQ)	<i>Recorded at Customs Street on 20 January 2022</i>
Maximum SO₂ 1-Hour Mean (Jan - Mar 2022)	18.0 µg/m ³ (5.1% of NESAQ)	<i>Recorded at Penrose on 30 January 2022</i>
Maximum O₃ 1-Hour Mean (Jan - Mar 2022)	56.0 µg/m ³ (37.3% of NESAQ)	<i>Recorded at Patumahoe on 28 January 2022</i>
Maximum CO Running 8-Hour Mean (Jan - Mar 2022)	0.46 mg/m ³ (4.6% of NESAQ)	<i>Recorded at Khyber Pass Rd on 16 February 2022</i>
Written Reports Framework	Monthly Updates, Annual Report, Trends Report, and State of The Environment Report	

Table 2. General changes in concentration of key contaminants monitored for the last 15, 27 and 39 months.

↑ indicates an increase ↓ indicates a decrease ↗ Increase but not significant ↘ Decrease but not significant

Site	PM ₁₀			PM _{2.5}			NO ₂			Black carbon			Ozone			CO			SO ₂			Air Quality Index(AQI)			Site
	Last 14 months	Last 26 months	Last 38 months	Last 14 months	Last 26 months	Last 38 months	Last 14 months	Last 26 months	Last 38 months	Last 14 months	Last 26 months	Last 38 months	Last 14 months	Last 26 months	Last 38 months	Last 14 months	Last 26 months	Last 38 months	Last 14 months	Last 26 months	Last 38 months	Last 14 months	Last 26 months	Last 38 months	
Customs Street*	n/a	n/a	n/a	↑	↘	n/a	↓	↓	n/a	↘	↘	n/a	↘	↘	n/a	n/a	n/a	n/a	Customs Street						
Glen Eden*	↘	↘	↓	↑	↗	↗	↘	↘	↘	n/a	n/a	n/a	↗	↘	↘	Glen Eden									
Henderson	↗	↗	↓	n/a	n/a	n/a	↗	↘	↘	↘	↘	↘	n/a	n/a	n/a	↗	↘	↓	Henderson						
Khyber Pass Road	↑	↗	↘	n/a	n/a	n/a	↘	↘	↘	n/a	n/a	n/a	n/a	n/a	n/a	↘	↓	↘	n/a	n/a	n/a	n/a	n/a	n/a	Khyber Pass Road
Pakuranga*	↗	↗	↓	↗	↘	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Pakuranga
Papatoetoe	↗	↑	↗	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Papatoetoe
Patumahoe	↗	↘	↘	↗	↗	↘	↗	↗	↘	n/a	n/a	n/a	↗	↘	↘	n/a	n/a	n/a	n/a	n/a	n/a	↗	↘	↓	Patumahoe
Penrose	↗	↘	↓	↘	↘	↓	↘	↘	↓	n/a	↑	↑	↗	↗	↘	↓	Penrose								
Takapuna	↘	↗	↓	↗	↗	↘	↘	↘	↓	n/a	n/a	n/a	↘	↘	↓	Takapuna									
Queen Street	↗	↑	↑	↗	↑	↗	↓	↓	↓	n/a	n/a	n/a	↗	↗	↗	Queen Street									

Notes

Effective dates: 15 months (1 Jan 2021 to 31 Mar 2022), 27 months (1 Jan 2020 to 31 Mar 2022), and 39 months (1 Jan 2019 to 31 Mar 2022)

PM₁₀ is monitored at Glen Eden, Henderson, Khyber Pass Rd, Pakuranga, Papatoetoe, Patumahoe, Penrose, Takapuna, and Queen St.

PM_{2.5} is monitored at Customs St, Glen Eden, Pakuranga, Patumahoe, Penrose, Takapuna, and Queen St.

NO₂ is monitored at Customs St, Glen Eden, Henderson, Khyber Pass Rd, Patumahoe, Penrose, Takapuna, and Queen St.

Black carbon is monitored at Customs St, and Henderson.

CO is monitored at Khyber Pass Rd.

Ozone is monitored at Patumahoe.

SO₂ is monitored at Customs St, and Penrose.

*PM_{2.5} data coverage for Glen Eden, Customs Street and Pakuranga is less than 75% due to instrument failure between Sep 2021 and Jan 2022.

Weather changes significantly affect concentrations of air contaminants ([see this report](#))



0 3,250 6,500 9,750
Meters
Scale @ A4
= 1:500,000

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Figure 1. Maps a, b and c show the air quality monitoring sites and their last 12- months (1 April 2021 to 31 March 2022) average PM and NO₂ concentrations in – brackets. Auckland city centre monitoring sites recorded the highest PM and NO₂ concentrations.

Section B. Key air contaminants across the 10 air quality monitoring sites (1 January 2022 to 31 March 2022)

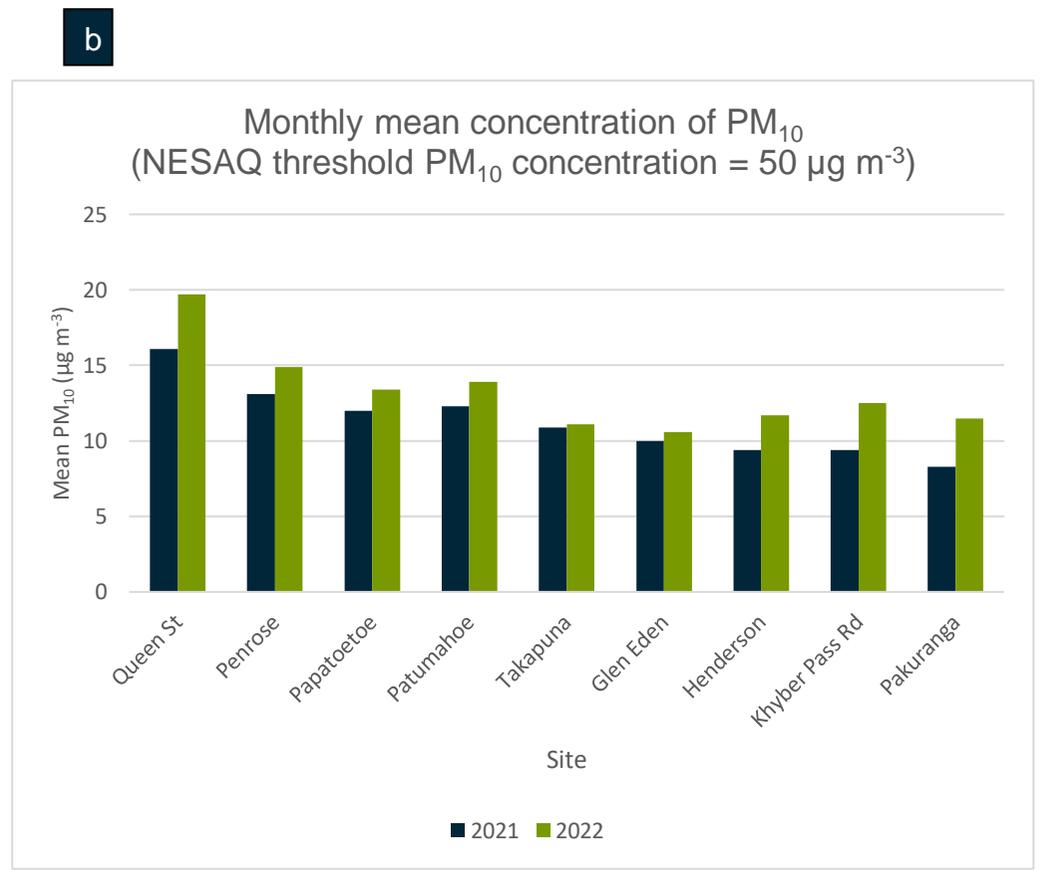
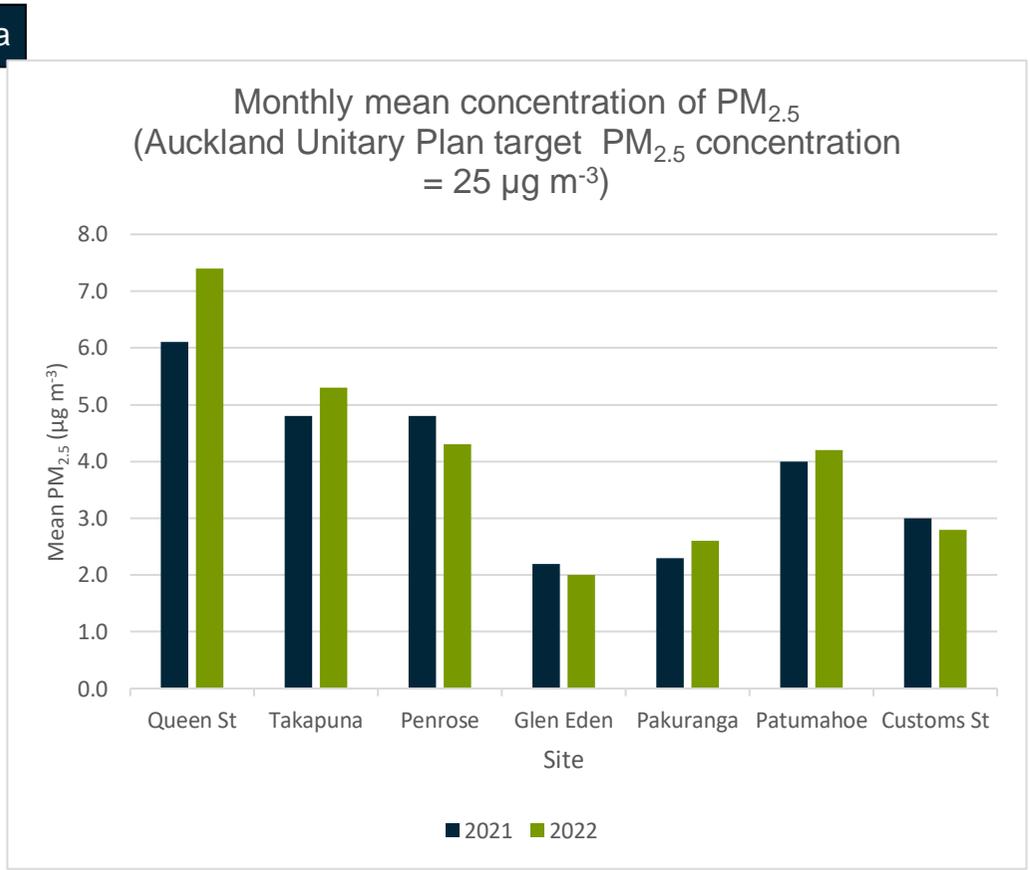


Figure 2. Monthly mean concentration of particulate matter. As in the previous year, the highest concentrations of both PM₁₀ and PM_{2.5} were recorded at Queen St. Plots a and b represent PM_{2.5} and PM₁₀ respectively. The average particulate matter concentration in all the monitoring sites is higher than the same period of the previous year. PM₁₀ and PM_{2.5} have multiple sources including motor vehicles, sea salt, marine diesel, and soils (windblown soil, road dust, and dust generated by earthworks, construction, and road works).

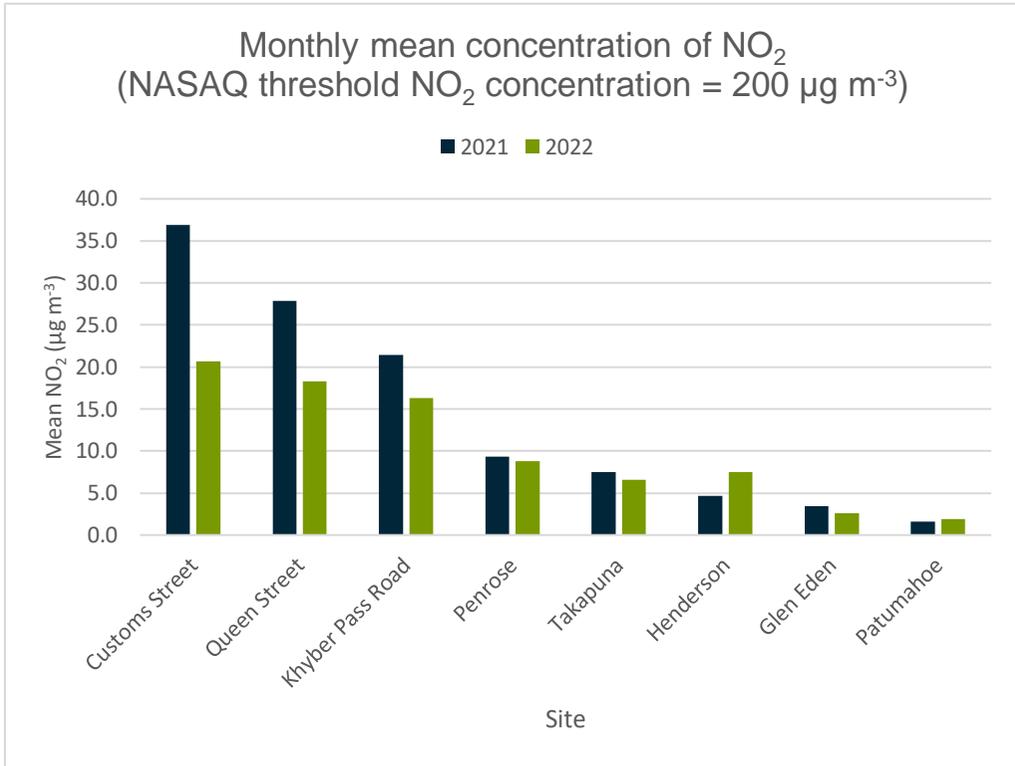


Figure 3. Monthly mean concentration of NO₂ across monitoring sites. Auckland city centre monitoring sites recorded the highest concentrations. All monitoring sites, except Penrose and Henderson, recorded lower average NO₂ concentrations compared to 2021. The main source of NO₂ is motor vehicles.

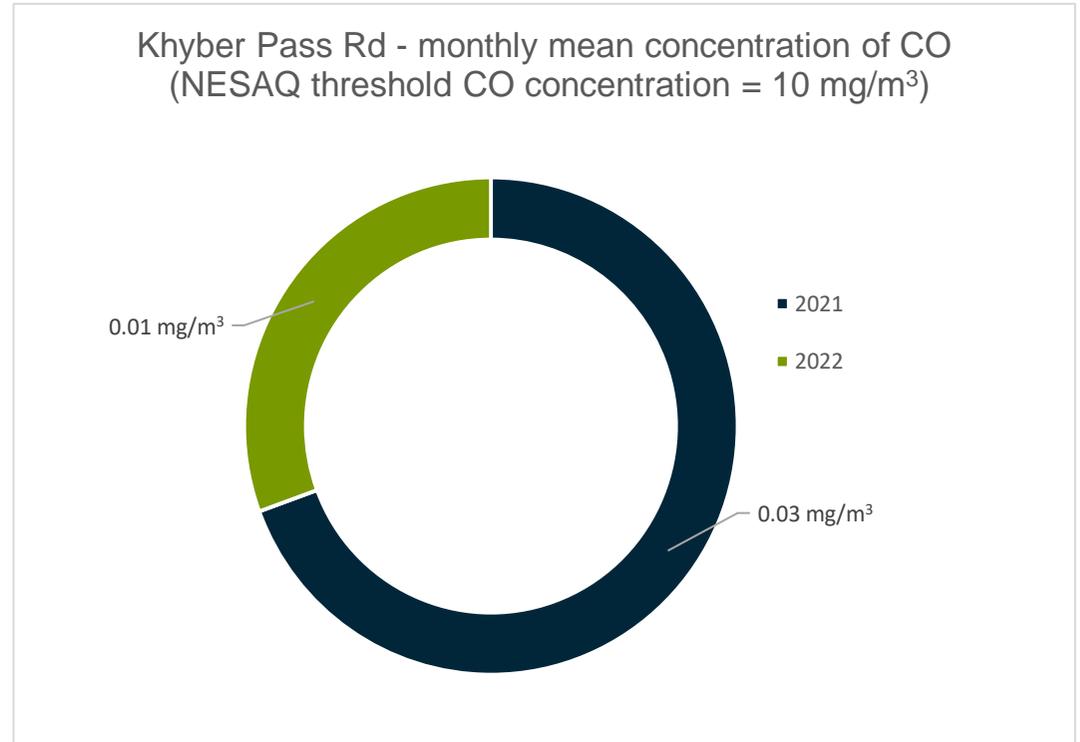


Figure 4. Monthly mean concentration of CO. The mean CO concentration is 78% less than the previous year. The main source of CO is motor vehicles. Note: currently, CO is only monitored at Khyber Pass Road.

Section C. Focus on a monitoring site: Queen Street

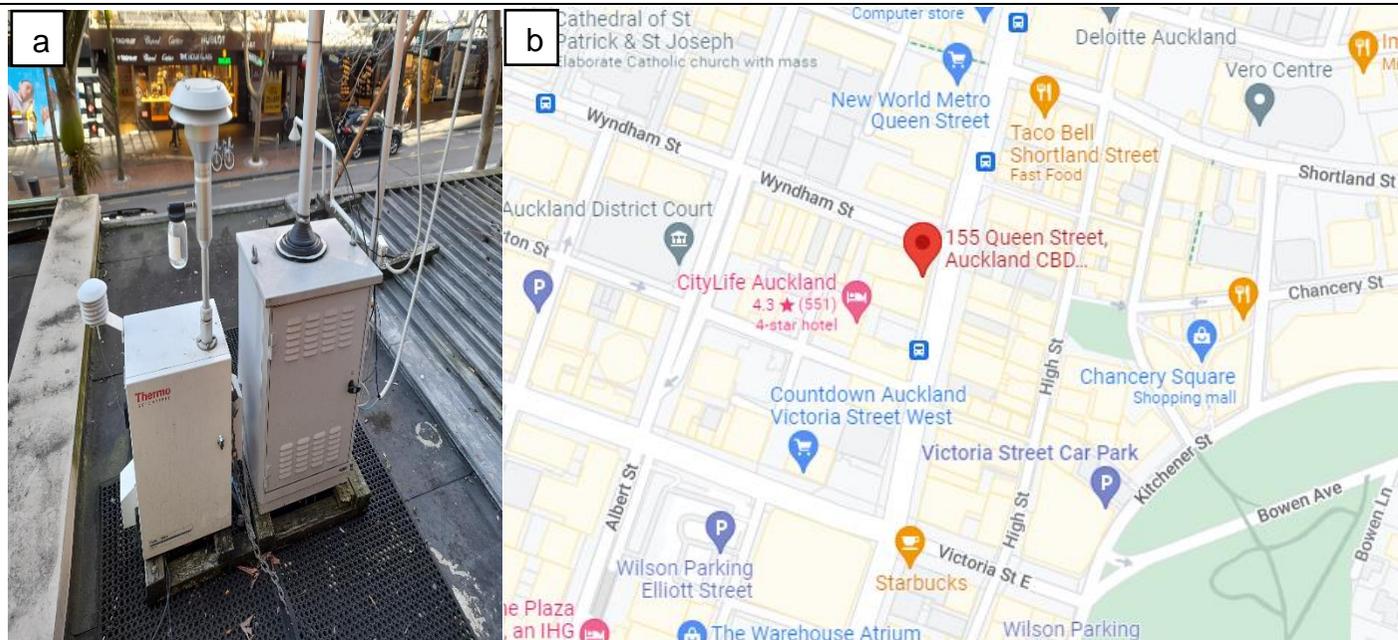


Figure 5. The Queen Street air quality monitoring site is located on a canopy 1st floor roof top, 155 Queen Street. Image a shows the air quality monitoring shed viewed from the north. Image b is an aerial view of the monitoring site and surroundings taken in May 2022 (Source: Google Maps). Air quality monitoring at this site commenced in 1998. PM₁₀, PM_{2.5}, NO₂, and meteorological parameters are monitored at this site. The main sources of air contaminants are motor vehicles, marine aerosols, and soils.

Key findings:

- Overall, Queen Street's average PM₁₀ concentration is 26.1 % higher than Auckland's average and 31.5 % higher than Patumahoe (a rural site).
- In general, Queen Street's average PM_{2.5} concentration is 24 % higher than Auckland's average and 37.3 % higher than Patumahoe.
- Overall, Queen Street's average NO₂ concentration is 71.1 % higher than Auckland's average and 14-fold higher than Patumahoe.
- Deseasonalised trend analysis results show there is an upward short-term trends in PM₁₀ and PM_{2.5} average concentrations (1 January 2017 to 31 March 2022)
- Conversely, deseasonalised trend analysis result shows there is a downward trend in NO₂ average concentrations.

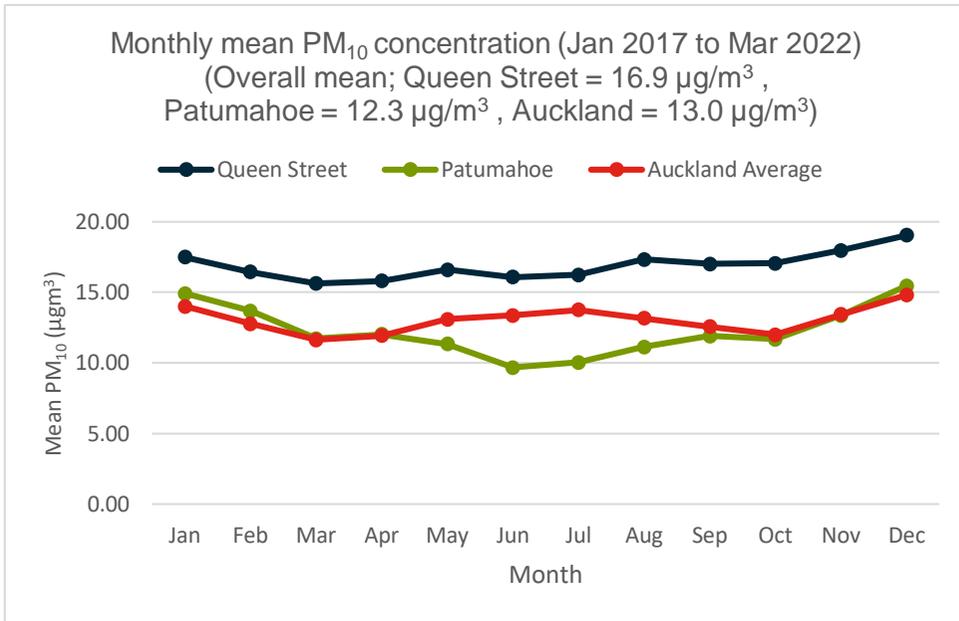


Figure 6. Temporal variation in monthly PM₁₀ concentrations – Queen Street compared to Patumahoe (rural site) and Auckland average. Overall, Queen Street average PM₁₀ concentration is 26.1 % more than Auckland’s average and 31.5 % more than Patumahoe (a rural site).

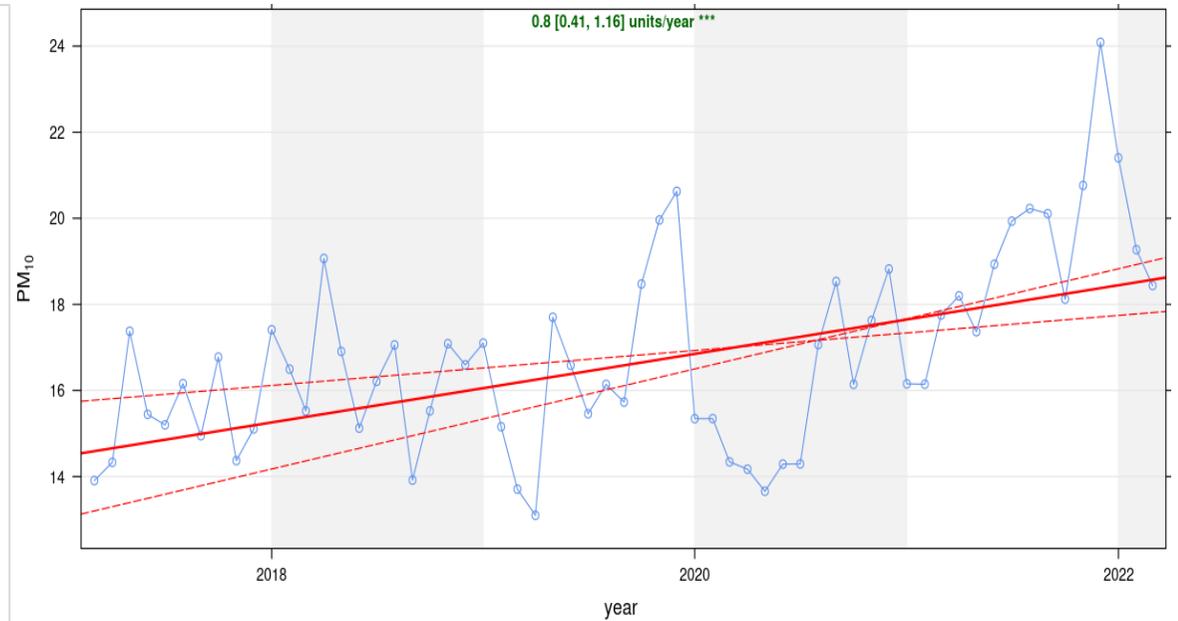


Figure 7. Trends in PM₁₀ at Queen Street. The plot shows the deseasonalised monthly mean concentrations of PM₁₀. The solid red line shows the trend estimate and the dashed red lines show the 95% confidence intervals for the trend based on resampling methods. The overall trend is shown at the top-left as 0.8 (µg/m³) per year and the 95% confidence intervals in the slope from 0.41 – 1.16 µg/m³/year. The ‘***’ show that the trend is significant to the 0.001 level.

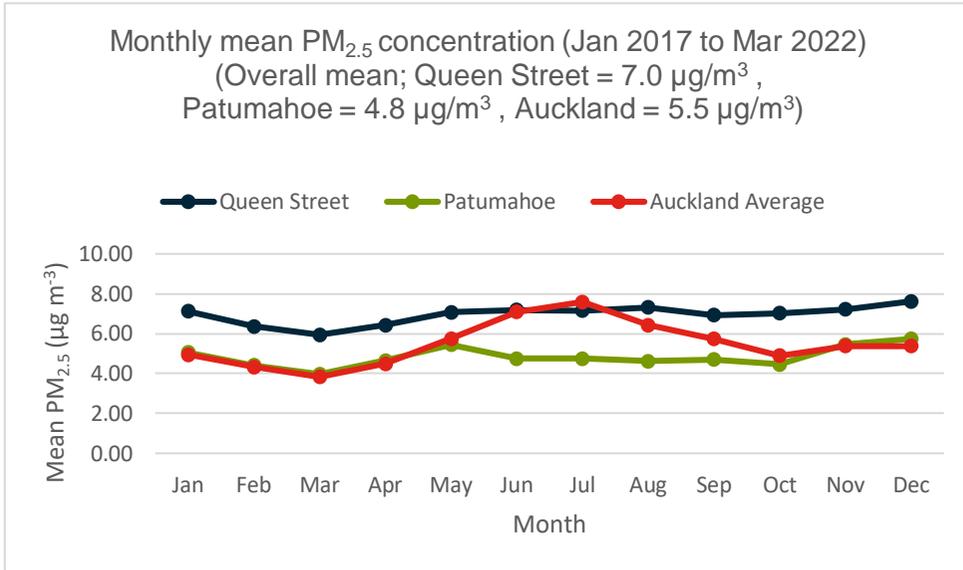


Figure 6. Temporal variation in monthly PM_{2.5} concentrations – Queen Street compared to Patumahoe (rural site) and Auckland average. Overall, Queen Street average PM_{2.5} concentration is 24 % more than Auckland’s average and 37.3 % more than Patumahoe (a rural site).

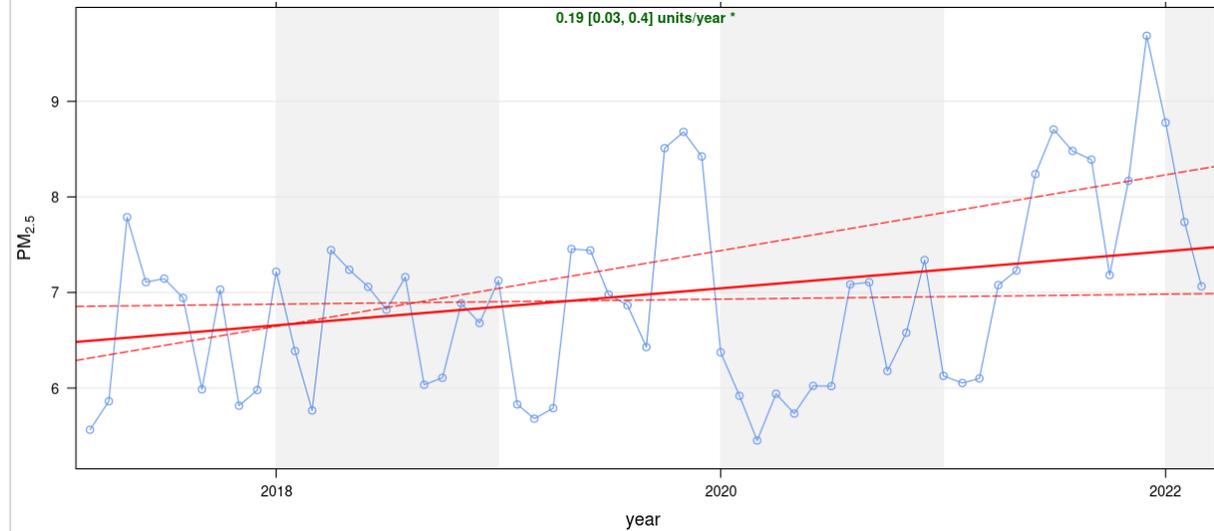


Figure 7. Trends in PM_{2.5} at Queen Street. The plot shows the deseasonalised monthly mean concentrations of PM_{2.5}. The solid red line shows the trend estimate and the dashed red lines show the 95% confidence intervals for the trend based on resampling methods. The overall trend is shown at the top-left as 0.19 (µg/m³) per year and the 95% confidence intervals in the slope from 0.03 – 0.04 µg/m³/year. The ‘*’ shows that the trend is significant to the 0.05 level.

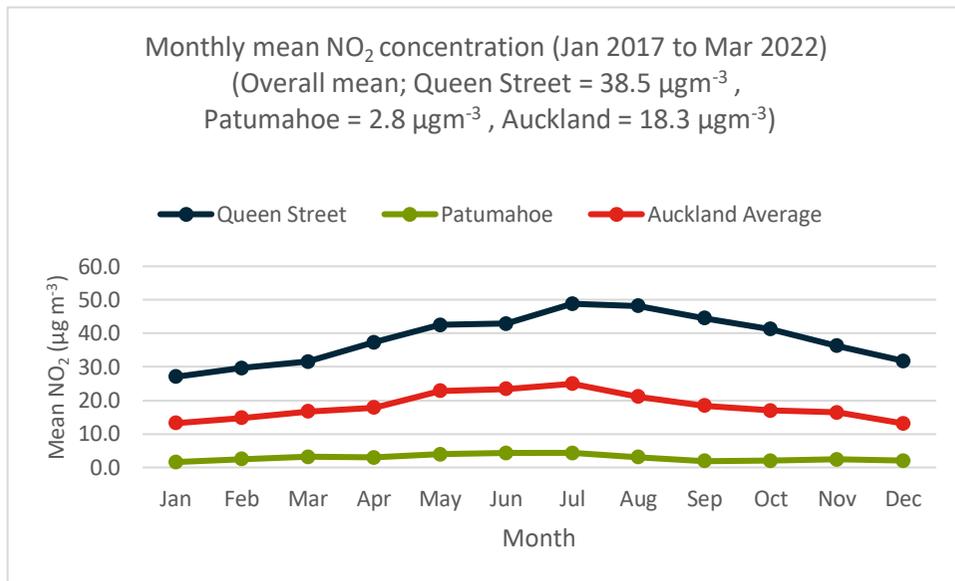


Figure 6. Temporal variation in monthly NO₂ concentrations – Queen Street compared to Patumahoe (rural site) and Auckland average. Overall, Queen Street average NO₂ concentration is 71.1 % more than Auckland’s average and 14-fold more than Patumahoe (a rural site).

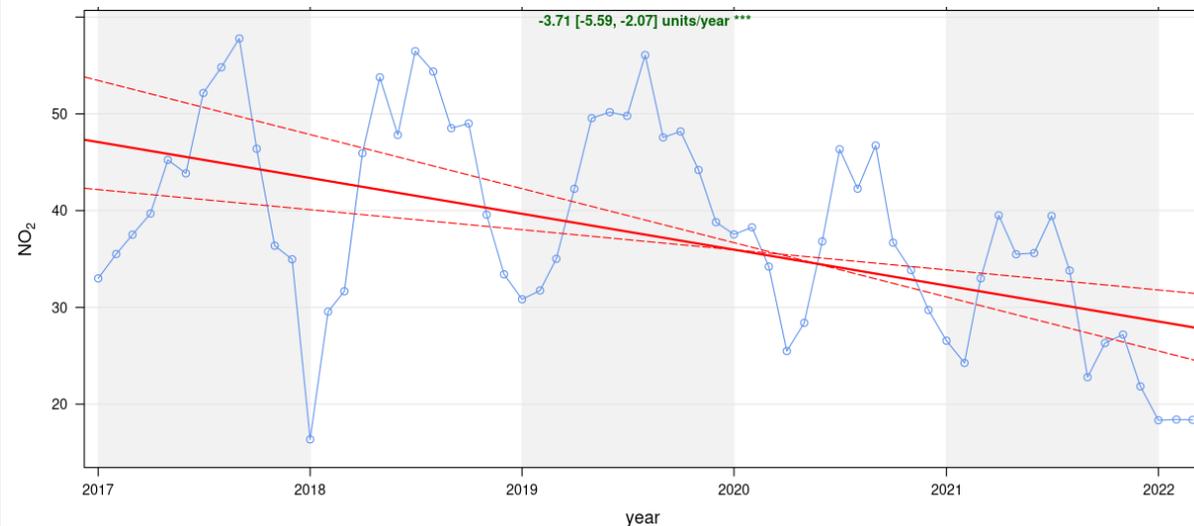


Figure 7. Trends in NO₂ at Queen Street. The plot shows the deseasonalised monthly mean concentrations of NO₂. The solid red line shows the trend estimate and the dashed red lines show the 95% confidence intervals for the trend based on resampling methods. The overall trend is shown at the top-left as - 3.71 (µg/m³) per year and the 95% confidence intervals in the slope from -5.59 – (- 2.07) µg/m³/year. The ‘***’ show that the trend is significant to the 0.001 level.

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