26 November 2021

Auckland Air Quality Report

Monthly update

Research and Evaluation Unit | RIMU

Auckland Council
Te Kaunihera o Tāmaki Makaurau

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 – Henderson. The monthly report is prepared using validated data which is generally available one month after raw data is collected.

Summary

- No breach of national air quality standards has occurred this year (January to September).
- Overall, air quality has slightly improved in Auckland over the last two years. A key contributor is COVID-19 restrictions.
- The highest monthly concentrations of air contaminants this year are found at Queen St and Customs St.
- Over the past two years, there has been a downward trend in nitrogen dioxide (NO_2) concentration in the Auckland city centre.

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's air quality monitoring programme – 1 January to 30 September 2021

Number of continuous monitoring sites	**10**
Location of monitoring sites	Queen St, Customs St, Khyber Pass Rd, Penrose, Henderson, Takapuna, Glen Eden, Pakuranga, Papatoetoe, and Patumahoe
Standard contaminants monitored	PM_{10} (fine particles < 10 microns in diameter), carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), and sulphur dioxide (SO_2)
Other key contaminants monitored	$PM_{2.5}$ (fine particles < 2.5 microns in diameter), and black carbon
Number of exceedances of National Environmental Standards for Air Quality (NESAQ) in 2021	0
Number of exceedances of Auckland Ambient Air Quality Targets in 2021	1 ($PM_{2.5}$) (24 June 2021 at Pakuranga)
Maximum PM_{10} 24-hour mean (Jan - Sep)	41.5 µg m^{-3} (83% of NESAQ) ↔ recorded at Queen St on 25 September 2021
Maximum $PM_{2.5}$ 24-hour mean (Jan - Sep)	26.5 µg m^{-3} (106% of Auckland target) ↔ recorded at Pakuranga on 24 June 2021
Maximum NO_2 1-hour mean (Jan - Sep)	200 µg m^{-3} (100% of NESAQ) ↔ recorded at Customs St on 15 March 2021
Maximum SO_2 1-hour mean (Jan - Sep)	19 µg m^{-3} (5% of NESAQ) ↔ recorded at Penrose on 24 May 2021
Maximum O_3 1-hour mean (Jan - Sep)	72 µg m^{-3} (48% of NESAQ) ↔ recorded at Patumahoe on 26 September 2021
Maximum CO running 8-hour mean (Jan - Sep)	Approximately 2 mg m^{-3} (20% of NESAQ) ↔ recorded at Khyber Pass Rd on 1 July 2021
Written reports framework	Monthly updates, state of the environment report , trends report (next report Mar 2022)

Table 2. General changes in concentration of key contaminants monitored for the last 9, 21 and 33 months.

● indicates an increase ● indicates a decrease ● indicates no significant change **n/a** implies not applicable.

	PM_{10}			$PM_{2.5}$			NO_2			Black carbon			Ozone			CO			SO_2			Air Quality Index(AQI)			
Site	*Last 9 months*	*Last 21 months*	*Last 33 months*	*Last 9 months*	*Last 21 months*	*Last 33 months*	*Last 9 months*	*Last 21 months*	*Last 33 months*	*Last 9 months*	*Last 21 months*	*Last 33 months*	*Last 9 months*	*Last 21 months*	*Last 33 months*	*Last 9 months*	*Last 21 months*	*Last 33 months*	*Last 9 months*	*Last 21 months*	*Last 33 months*	*Last 9 months*	*Last 21 months*	*Last 33 months*	Site
Customs Street	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	Customs Street
Glen Eden	●	●	●	●	●	●	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	●	●	●	Glen Eden
Henderson	●	●	●	n/a	n/a	n/a	●	●	●	●	●	●	n/a	n/a	n/a	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	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	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	●	●	●	●	●	●	Penrose
Takapuna	●	●	●	●	●	●	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	●	●	●	Takapuna
Queen Street	●	●	●	●	●	●	●	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	●	●	●	Queen Street
	PM_{10}			$PM_{2.5}$			NO_2			Black carbon			Ozone			CO			SO_2			Air Quality Index(AQI)			

Notes

Effective dates: 9 months (1 Jan 2021 to 30 Sep 2021), 21 months (1 Jan 2020 to 30 Sep 2021), and 33 months (1 Jan 2019 to 30 Sep 2021)

PM_{10} 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.

NO_2 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.

SO_2 is monitored at Customs St, and Penrose.

In August and September, due to malfunction of $PM_{2.5}$ sensors there is no $PM_{2.5}$ data for Glen Eden, Customs Street and Pakuranga sites.

Weather changes significantly affect concentrations of air contaminants (see October report)

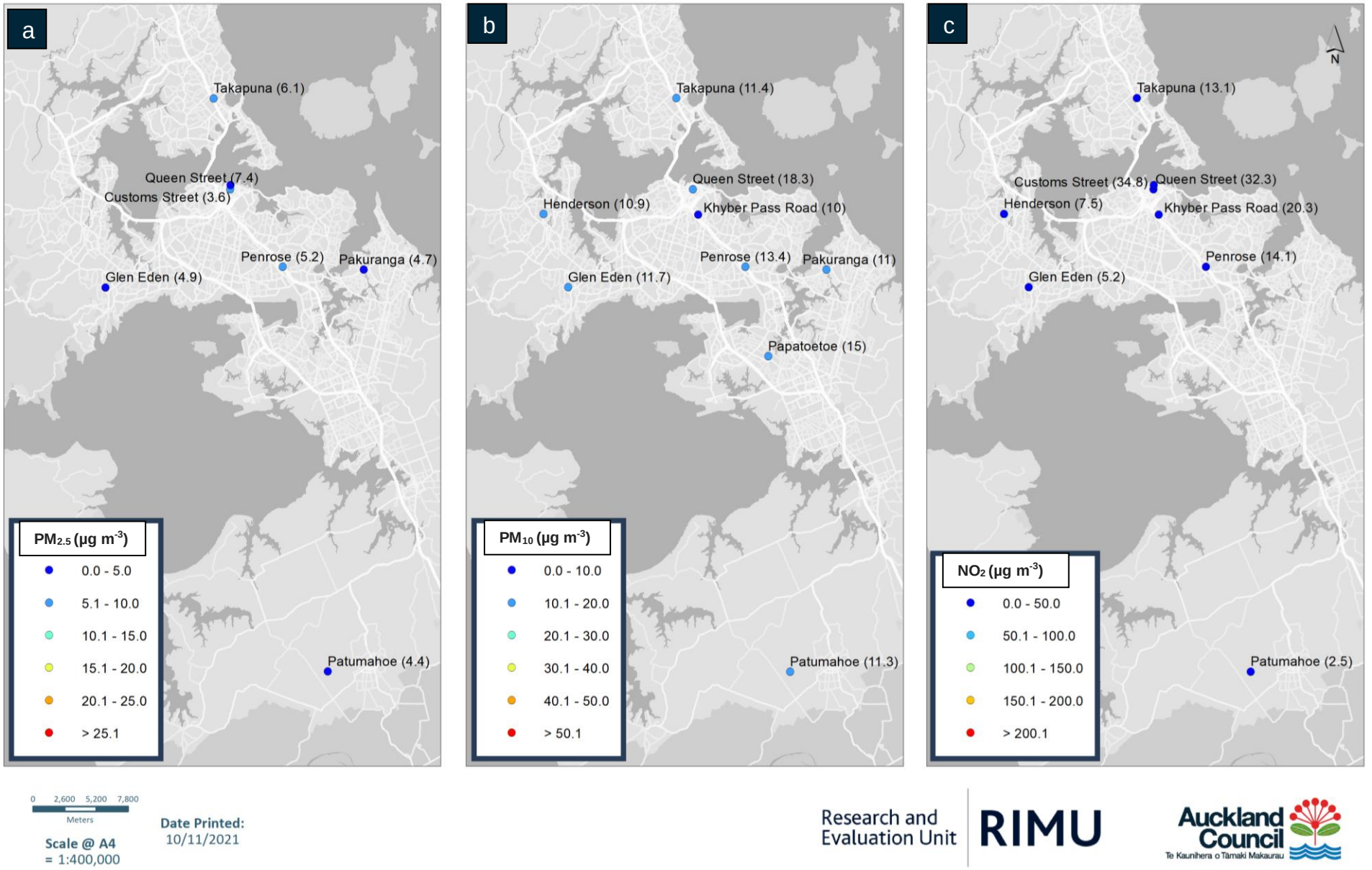

Figure 1. Maps a, b and c show the air quality monitoring sites and their monthly average contaminants concentration (January to September 2021) in brackets. Auckland City Centre monitoring sites have the highest concentration of air contaminants.

Section B. Key air contaminants across the 10 air monitoring sites (January to September)

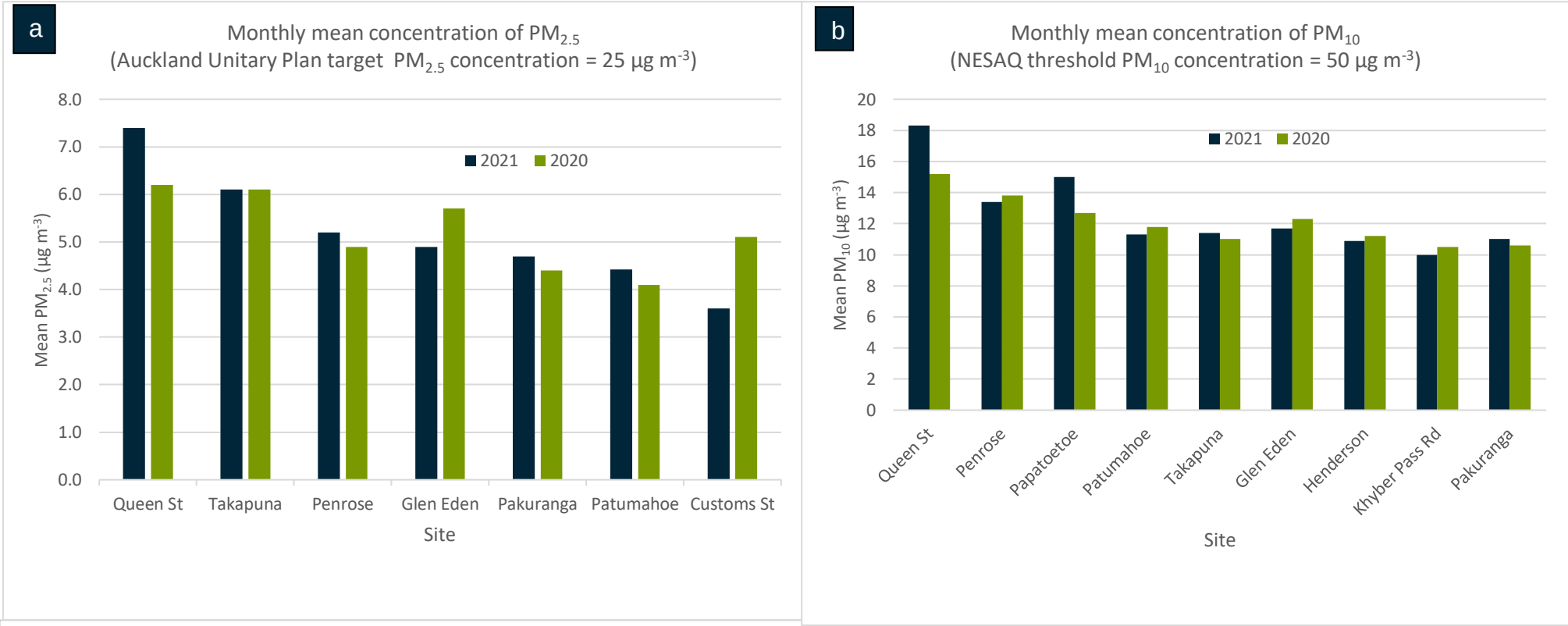

Figure 2. Monthly mean concentration of particulate matter. As in the previous year, highest concentrations of both PM_{10} and $PM_{2.5}$ were recorded at Queen St. Plots a and b represent $PM_{2.5}$ and PM_{10} respectively. The average particulate matter concentration in Queen St is higher than the same period of the previous year. This may be due to the various construction activities.

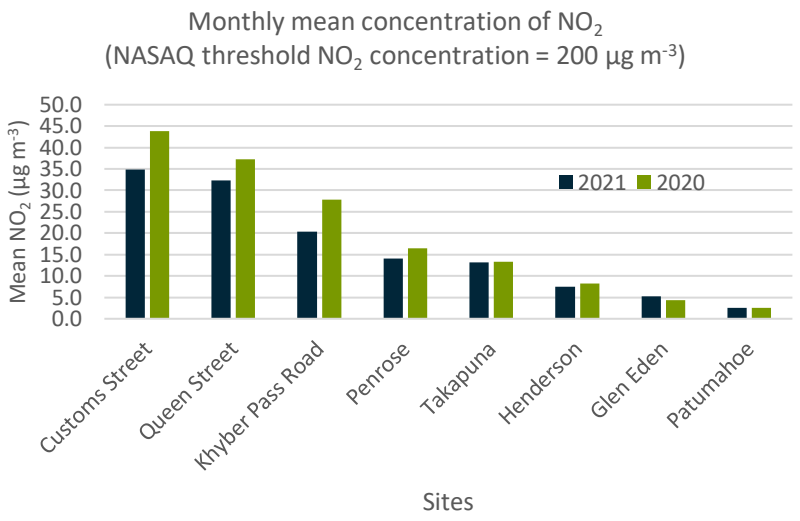

Figure 3. Monthly mean concentration of NO_2 across monitoring sites. Auckland City Centre monitoring sites recorded the highest concentrations while the lowest concentrations occurred at the rural monitoring site. Most sites have recorded lower average NO_2 concentrations compared to the previous year. Motor vehicles are the main sources of NO_2 in Auckland.

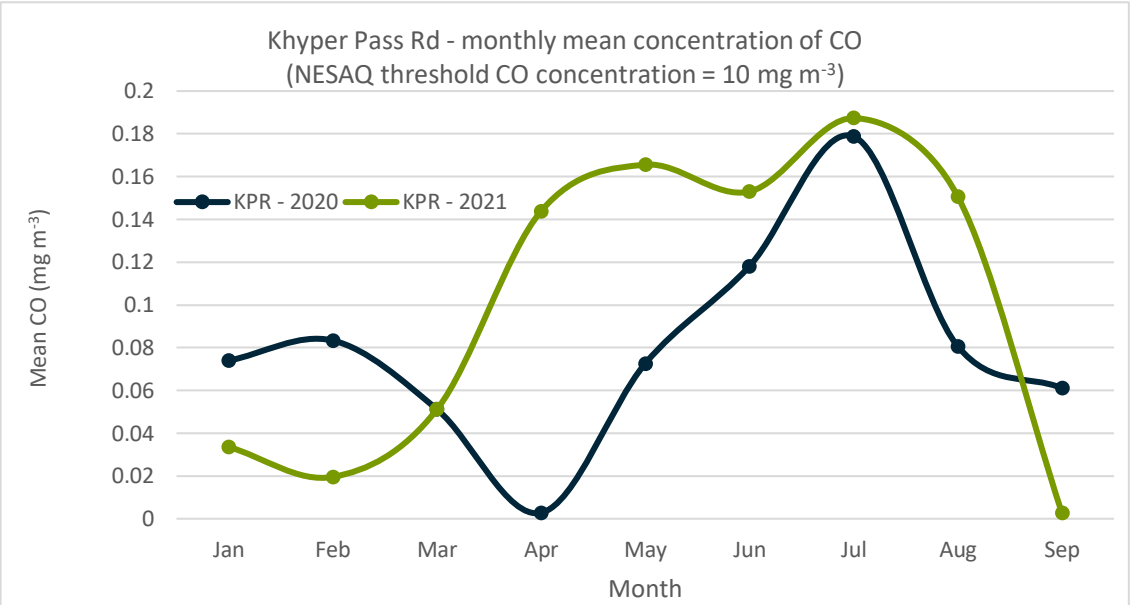

Figure 4. Monthly mean concentration of CO. Overall the mean concentration of CO 9% more than the previous year. Motor vehicles are the main sources of CO in Auckland. Note: currently, CO is only monitored at Khyber Pass Road.

Section C. Focus on a monitoring site: **Henderson**

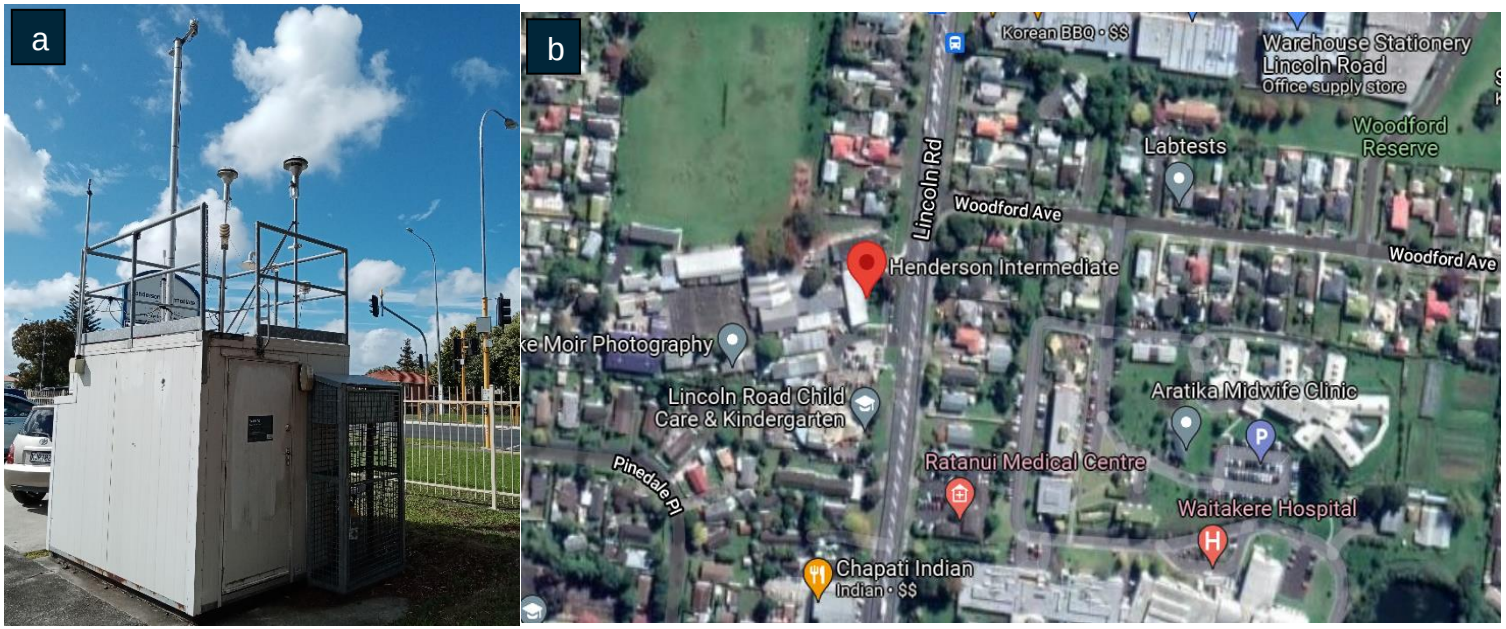

Figure 5. Henderson air quality monitoring station located in Henderson Intermediate School (70 Lincoln Rd). Image a shows the air quality monitoring shed viewed from the south. Image b is an aerial view of the monitoring site and surroundings taken in November 2021 (Source: Google Maps). Air quality monitoring at this site commenced on 15th December 1993. Air contaminants monitored are particulate matter, nitrogen dioxide and black carbon. The main sources of air contaminants are motor vehicles, biomass burning, marine aerosol, and soils.

Key findings:

- Overall, Henderson's average PM_{10} concentration is 11% lower than Auckland average and 9% more than Patumahoe (rural site)
- Henderson's NO_2 average concentration is 47% lower than Auckland's average and approximately 3 - folds more than Patumahoe.
- There is a downward long-term trend in particulate matter and nitrogen dioxide concentrations.

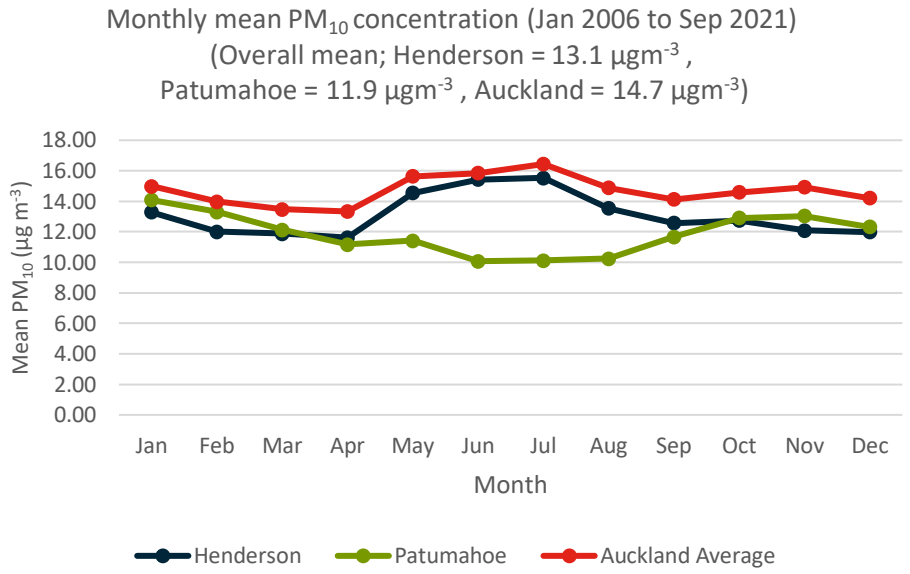

Figure 6. Temporal variation in monthly PM_{10} concentrations – Henderson compared to Patumahoe (rural site) and Auckland average. Overall, Henderson's average PM_{10} concentration is 11% lower than Auckland average and 9% more than Patumahoe.

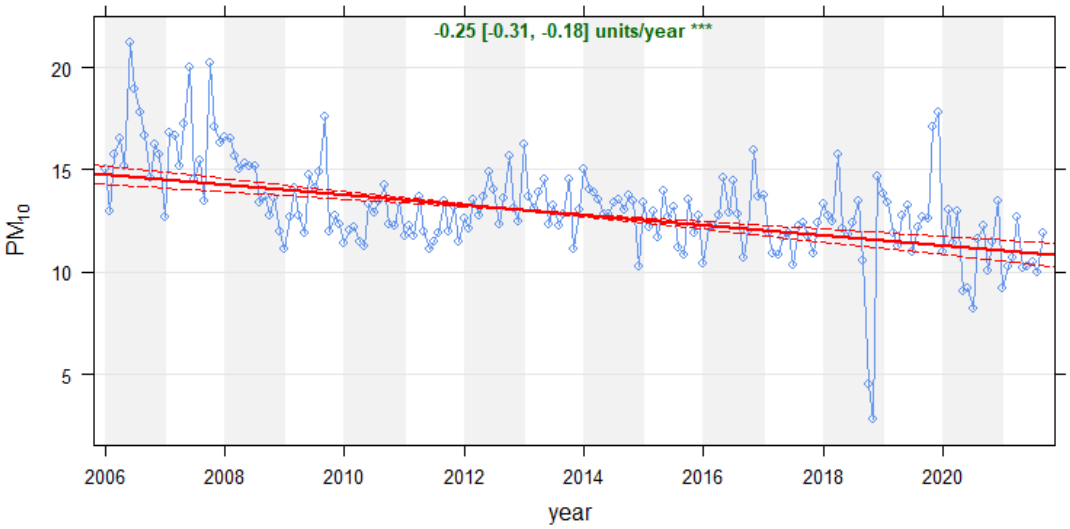

Figure 7. Deseasonalised trend in PM_{10} concentrations showing that there was a significant decreasing trend (95 % confidence interval) over the monitoring period.

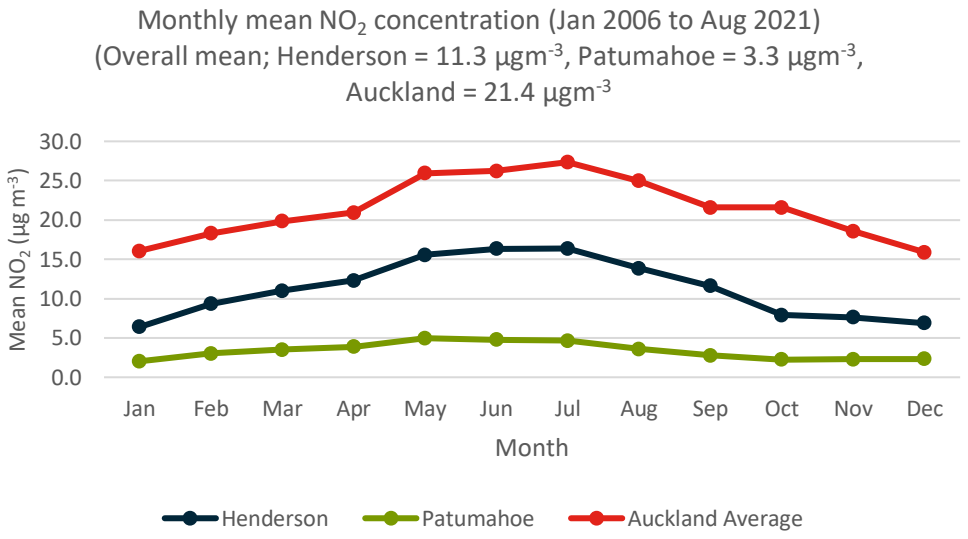

Figure 8. Temporal variation in monthly NO_2 concentrations – Henderson compared to Patumahoe (rural site) and Auckland average. Overall, Henderson's NO_2 average concentration is 47% lower than Auckland's average and approximately 3 - folds more than Patumahoe.

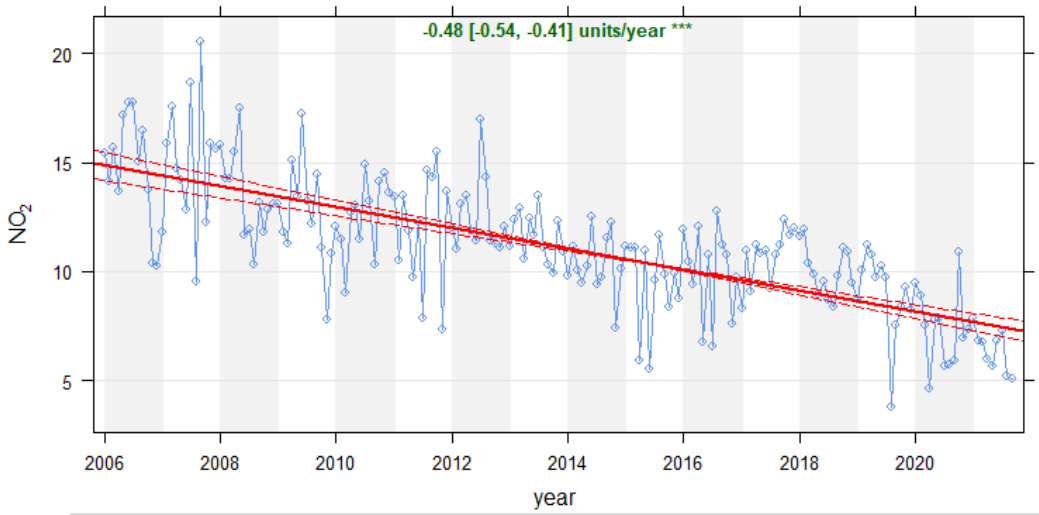

Figure 9. Deseasonalised trend in NO_2 concentrations showing that there was a significant decreasing trend (95 % confidence interval) over the monitoring period.

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