OFFICIAL

Analysis of West Gate Tunnel Project air monitoring data

Analysis of WGTP air monitoring data during the construction phase

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1 Introduction

This report reviews the Westgate Tunnel Project (WGTP) air quality data collected between July 2016 and December 2022, which is during the tunnel project's construction phase.

Environment Protection Authority Victoria (EPA) operates its own air monitoring stations across the state including in Melbourne's inner west. The relevant inner west stations are located in Footscray and Brooklyn, which have been collecting long-term air quality data.

The following air pollutants are measured at EPA stations (noting that not all air quality measures were collected at every station, Table 1):

- Particulate matter ($PM_{2.5}$ - particulate matter less than 2.5 microns and PM_{10} - particulate matter less than 10 microns).
- Carbon monoxide (CO).
- Nitrogen dioxide (NO_2).

These pollutants are common in urban areas. The major sources of these pollutants in Melbourne's west are:

- Emissions from motor vehicles.
- Domestic activities (for example smoke from wood heating).
- Industry/commercial activities.
- Shipping.
- Diesel train movements.

The Inner West Air Quality Network asked EPA Victoria to undertake an analysis of air quality data from the West Gate Tunnel Project (WGTP) stations, including a comparison of the results against its Melbourne air monitoring station data. The Network includes members from local councils and the community.

This report is an update on a previous report, which looked at data between July 2016 and December 2019 – Air Pollution in Melbourne's Inner West, Appendix D: Analysis of West Gate Tunnel Project Air Monitoring Data, 2020 Inner West Air Quality Reference Group, 2020).

There are some minor differences in the reported air quality concentrations between the previous report and the current one. This is due to more recent EPA validated and updated measurement values, with minor differences arising from the revised statistical analysis. These revisions do not alter the conclusions of the previous report. Nevertheless, for consistency, the data presented in this report is the air quality information that should be referenced in further work.

EPA have assessed air quality concentrations measured at the six WGTP monitoring stations located across Brooklyn, Spotswood and Yarraville and compared them to:

- General ambient concentrations recorded at EPA's monitoring stations.
- The relevant values in the Victorian Environment Reference Standard (ERS) (Victorian Government, 2021).

Monitoring around the WGTP will continue for either a minimum of five years following the tunnel's opening, or a lesser period as agreed with EPA. This will allow for ongoing assessment of air quality levels in the local area once vehicles are using the tunnel. The data can also be used to determine appropriate controls that could be implemented to further reduce air pollution.

2 Monitoring stations

The WGTP operates six air monitoring stations to assess air quality around the tunnel development. The location of each WGTP air monitoring station is shown in Figure 1 along with EPA's inner west air monitoring stations.

Figure 1. Location of WGTP and EPA (Brooklyn and Footscray) air monitoring stations. EPA's Alphington and CBD stations are not shown.

Monitoring stations at Francis Street (WGTP 2), Primula Avenue (WGTP 4), Donald McLean Reserve (WGTP 5) and Millers Road (WGTP 6) are located near busy major roads. These roads experience more heavy-vehicle traffic compared to other major roads in Melbourne. Thus, these WGTP stations are classified as 'roadside sites,' and would be expected to have higher air quality concentrations due to vehicle emissions.

The monitoring station at Yarraville Gardens (WGTP 1) is not located near major roads. For this reason, it represents 'background' air quality in the area. The Wood Street station (WGTP 3) is also considered a background site, as it is in a park approximately 40 metres from an elevated major road. The station is within a typical residential area with low vehicle traffic.

EPA's Footscray air monitoring station (located in West Footscray) represents general background air quality in the inner west. The Brooklyn monitoring station measures local air quality in the Brooklyn area, including local industrial and commercial activities.

Also included in this assessment are EPA monitoring stations (not shown in Figure 1) located at Alphington and in the inner north Melbourne central business district (CBD), representing background air quality near roads in the CBD, respectively.

The instrumentation used to measure air pollutants across all ten stations met the United States EPA Federal Register (part 53) for Ambient Air Monitoring Equivalent Methods (USEPA, 2023). The WGTP air quality monitoring was carried out by an independent NATA (National Association of Testing Authorities) accredited laboratory. EPA completed monitoring at its own stations using its NATA accreditation for air quality analysis and measurement following Australian/New Zealand Standard (AS/NZS) air monitoring methods. The air pollutants measured at each of the different stations are listed in Table 1.

***Table 1**. Air pollutants measured at each monitoring station.*

Monitoring station	Air pollutant			
Yarraville Gardens (**WGTP station 1**)	$PM_{2.5}$	PM_{10}		
Francis Street (**WGTP station 2**)	$PM_{2.5}$	PM_{10}		
Woods Street (also known as Railway Reserve) (**WGTP station 3**)	$PM_{2.5}$	PM_{10}		
Primula Avenue (**WGTP station 4**)	$PM_{2.5}$	PM_{10}	NO_2	CO
Donald McLean Reserve (**WGTP station 5**)	$PM_{2.5}$	PM_{10}		
Millers Road (**WGTP station 6**)	$PM_{2.5}$	PM_{10}		
EPA network station, Alphington (EPA 1)	$PM_{2.5}$	PM_{10}	NO_2	CO
***EPA network station, Brooklyn (EPA 2)**		PM_{10}		
EPA network station, Melbourne CBD (CBD) (EPA 3)	$PM_{2.5}$			
EPA network station, Footscray (EPA 4)	$PM_{2.5}$	PM_{10}	NO_2	CO

*The $PM_{2.5}$ data from the EPA Brooklyn station is not used for comparison in this review because the method of $PM_{2.5}$ measurement is derived from a 'visibility' measurement, which is not the same method of measurement as the other stations. The methods EPA uses to monitor air quality is summarized on the EPA website.

2.1 Air quality reference standards used for assessing air pollutant concentrations

The ERS (Victorian Government, 2021) outlines the desired outcomes for human health and the environment in Victoria. The ERS provides a range of reference points or benchmarks for each pollutant, to be used in the reviewing and understanding the condition of the air environment. Table 2 shows the ERS values for air pollutants: particulates ($PM_{2.5}$ and PM_{10}), NO_2 and CO. EPA uses the ERS indicators and objectives when reporting to the community about environmental quality measures.

The ERS adopts the requirements of the National Protection Measure for Ambient Air Quality (AAQ NEPM) with some modifications for example for PM_{10} the ERS has adopted a lower 1-year threshold of 20 $\mu g/m^3$ compared to the AAQ NEPM (25 $\mu g/m^3$, proposed to be reduced to 20 $\mu g/m^3$ in 2025). This ERS is not a compliance standard. Its primary function is to provide an environmental assessment and reporting benchmark.

EPA has determined that the pollutant ambient air objectives are not compliance standards (EPA publication 1992, 2021), and that they should not be considered levels that one can pollute up to, or below (whereby further action is no longer required). This is because ERS listed air quality indicators such as $PM_{2.5}$ and PM_{10} are based on a combination of health risk assessment and cost benefit analysis. The ERS notes that they are not an indicator of a risk-free level, but are instead to be used as a benchmark to help evaluate the level of risk posed by concentrations in ambient air.

Consequently, EPA uses the ERS objectives to understand the level of risk to health, ascertain whether there has been a change to the level of risk that might influence our advice to community, or enable discussions with the WGTP group.

Table 2. Environment Reference Standard values for air pollutants in Victoria.

Pollutant	Environment Reference Standard information	
	Averaging period	**Concentration**
$PM_{2.5}$	1 day	25 µg/m^3
	1 year	8 µg/m^3
PM_{10}	1 day	50 µg/m^3
	1 year	20 µg/m^3
NO_2	Hourly	80 ppb
	1 year	15 ppb
CO	8 hourly	9 ppm

ppb = parts per billion
ppm = parts per million
µg/m^3 = micrograms per cubic metre

3 Analysis of data

The summary air quality data is provided in Table 3 of this report. Air quality measurements were commenced from mid-2016. The EPA CBD station (EPA 3) was established in 2017 and only measures $PM_{2.5}$. The following sections provide a summary for each of the four air pollutants measured across all ten stations, benchmarked against the ERS.

3.1 $PM_{2.5}$ concentrations

The average daily concentrations of $PM_{2.5}$ are shown in Figure 2 and Figure 3. Figure 2 shows the entire data set, while Figure 3 displays the same period without January 2020 from bushfire smoke concentrations greater than 100 µg/m³, so that other concentrations can be viewed in greater detail. Table 3 presents a summary of the maximum $PM_{2.5}$ concentration for 1 day and the number of times concentrations were higher than the ERS (1 day maximum: 25 µg/m³) along with the annual maximum value.

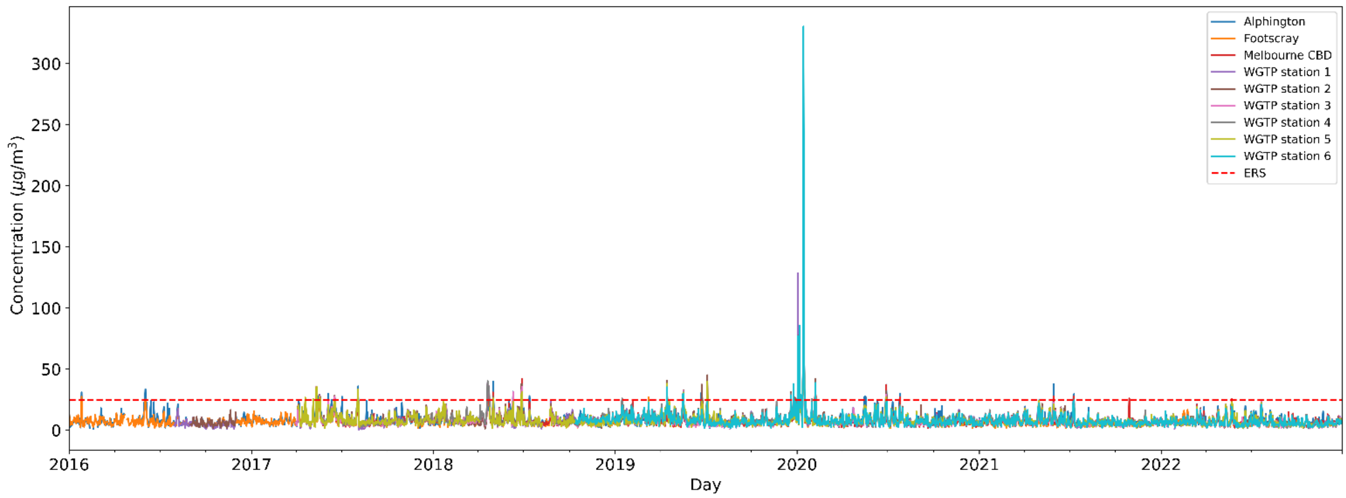

Figure 2. Daily averaged $PM_{2.5}$ concentrations measured between July 2016 and December 2022 at all WGTP and EPA stations. The red line shows the ERS 1 day concentration (25 µg/m³).

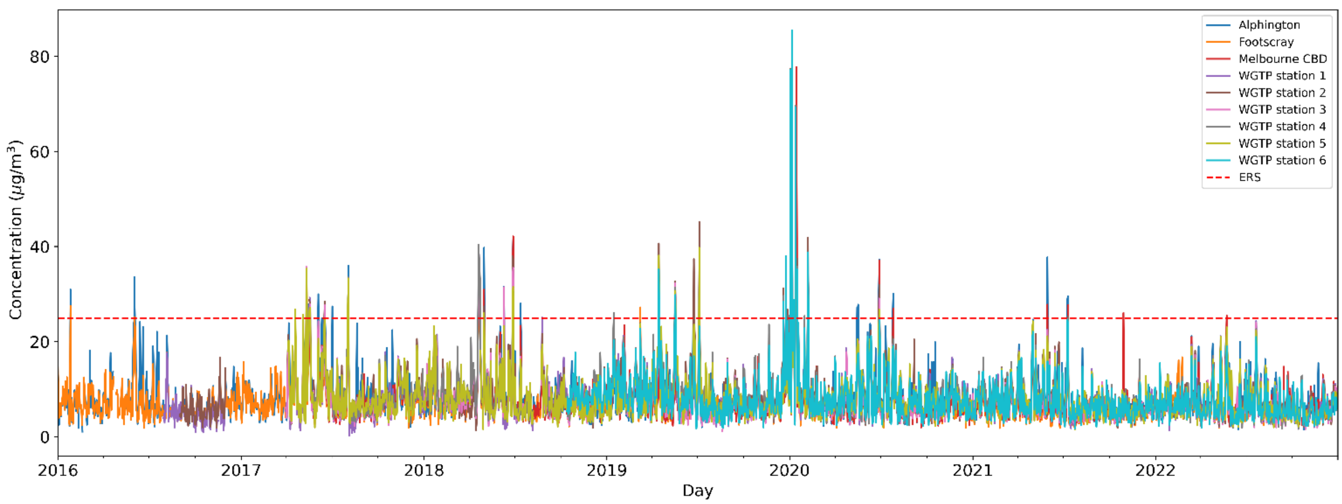

Figure 3. As per Figure 2, but with concentrations in January 2020 greater than 100 µg/m³ (from bushfire smoke) removed so that other concentrations can be viewed in detail. The red line shows the ERS 1 day concentration (25 µg/m³).

Overall, the data shows that all nine stations reported similar 1-day average concentrations of $PM_{2.5}$ air pollution (Figure 4).

Assessment of the data shows that concentrations were higher than the ERS $PM_{2.5}$ 1-day value of 25 µg/m^3 on at least one occasion per year between 2017 and 2020 (with a maximum number of 13 days in 2020). When $PM_{2.5}$ daily concentrations are benchmarked against the 1-day ERS of 25 µg/m^3, concentrations were lower than the standard 96.4 per cent of the time over the 5.5-year period. In 2021 and 2022, the data shows that on 99.2 per cent and 99.7 per cent of the days, respectively, $PM_{2.5}$ daily concentrations were lower than the corresponding ERS value (Table 3).

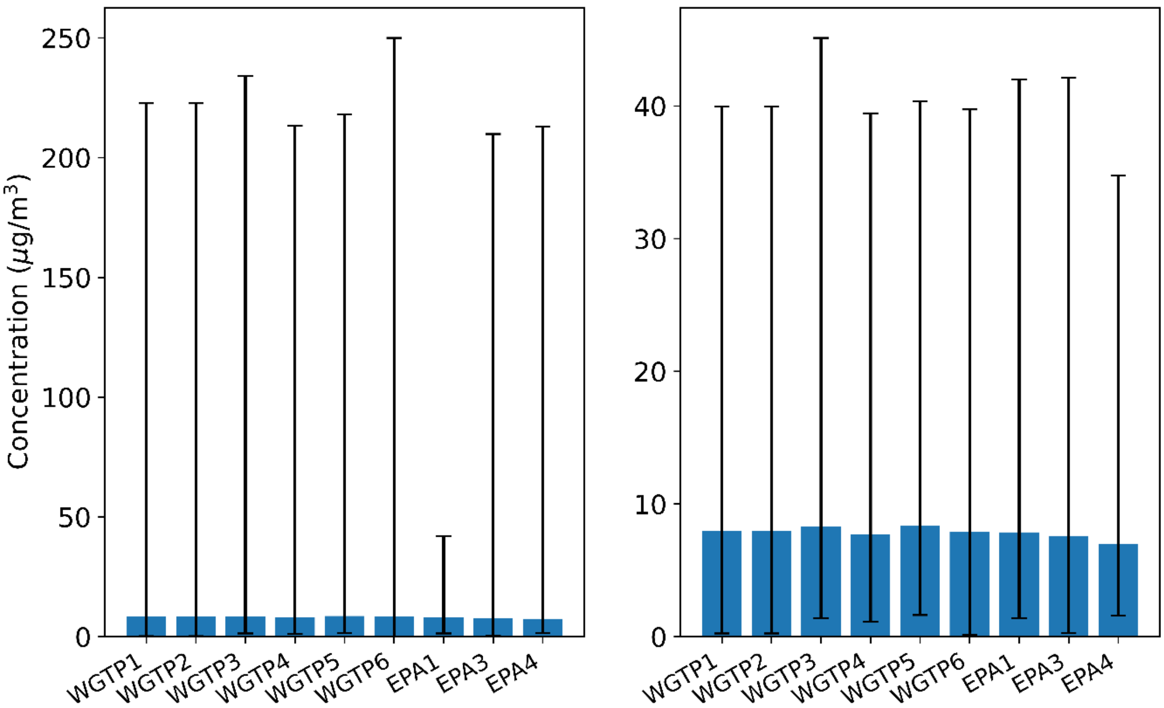

Figure 4. Average daily $PM_{2.5}$ concentrations over the 5.5 -year data period. The vertical lines show the range of values (minimum and maximum) over the data period. Left panel: average daily $PM_{2.5}$ concentrations measured from 2016-2022 at WGTP and EPA stations. Right panel: average daily $PM_{2.5}$ concentrations measured during 2016-2022 (year 2020 excluded due to extremes from bushfires) at the WGTP and EPA stations.

Between 2017 and 2020 most stations reported 1-year average concentrations of $PM_{2.5}$ above the corresponding ERS value of 8 µg/m^3 (Table 3). In 2019 and 2020, $PM_{2.5}$ air quality measures at WGTP stations were slightly higher than EPA stations (Table 3). Concentrations at all stations were below the 1-year average value of 8 µg/m^3 in 2021 and 2022 (Table 3).

The concentrations at each monitoring station were influenced by local weather and pollution sources, which varied over the 5.5-year data period. Apart from the period covering late 2019 to early 2020, which was impacted by high concentrations of bushfire smoke, the data shows that peak $PM_{2.5}$ concentrations occurred during autumn and winter (Figures 2 and 3). These peak concentrations of air quality typically occur due to calm weather that limits the dispersal of local pollution sources during these periods. In 2021 the reduction of vehicle traffic due to the mobility restrictions in response to the COVID-19 pandemic contributed to lower concentrations of $PM_{2.5}$. In 2022, the wet weather associated with the La Niña event helped to reduce atmospheric concentrations of $PM_{2.5}$. These influencing factors can change, and some variation is expected going forward.

3.2 PM_{10} concentrations

The average daily concentrations of PM_{10} for all stations are shown in Figure 5 in relation to the ERS for PM_{10} (daily average, 50 µg/m^3). Summary data for the number of times concentrations were higher than the ERS maximum 1 day value (50 µg/m^3) along with the annual maximum value for each station are provided in Table 3.

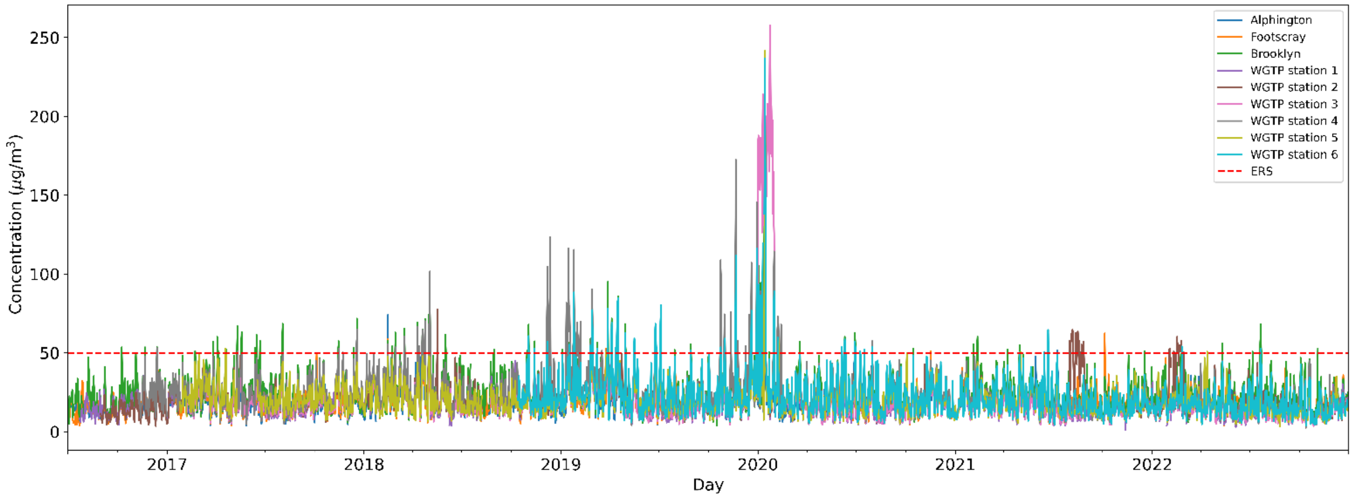

Figure 5. Daily averaged PM_{10} concentrations measured between July 2016 and December 2019 for all WGTP and EPA stations operating. The red line represents the 1 -day PM_{10} ERS standard.

Over the 5.5-year data period, there were numerous days where concentrations were higher than the ERS 1-day value on at least on occasion per year (with a maximum number of days 46 in 2020) (Figure 5, Table 3). The highest concentrations of PM_{10} occurred in January 2020 due to bushfire smoke, resulting in multiple days where concentrations were higher than the 1-day ERS (50 µg/m^3).

PM_{10} concentrations were below the ERS 1-day value (50 µg/m^3), 87.4 per cent of the time between 2016 and 2020. The frequency of daily PM_{10} concentrations being greater than 50 µg/m^3 has reduced over time, with over 98 per cent of days being lower than the ERS standard in 2021 and 2022.

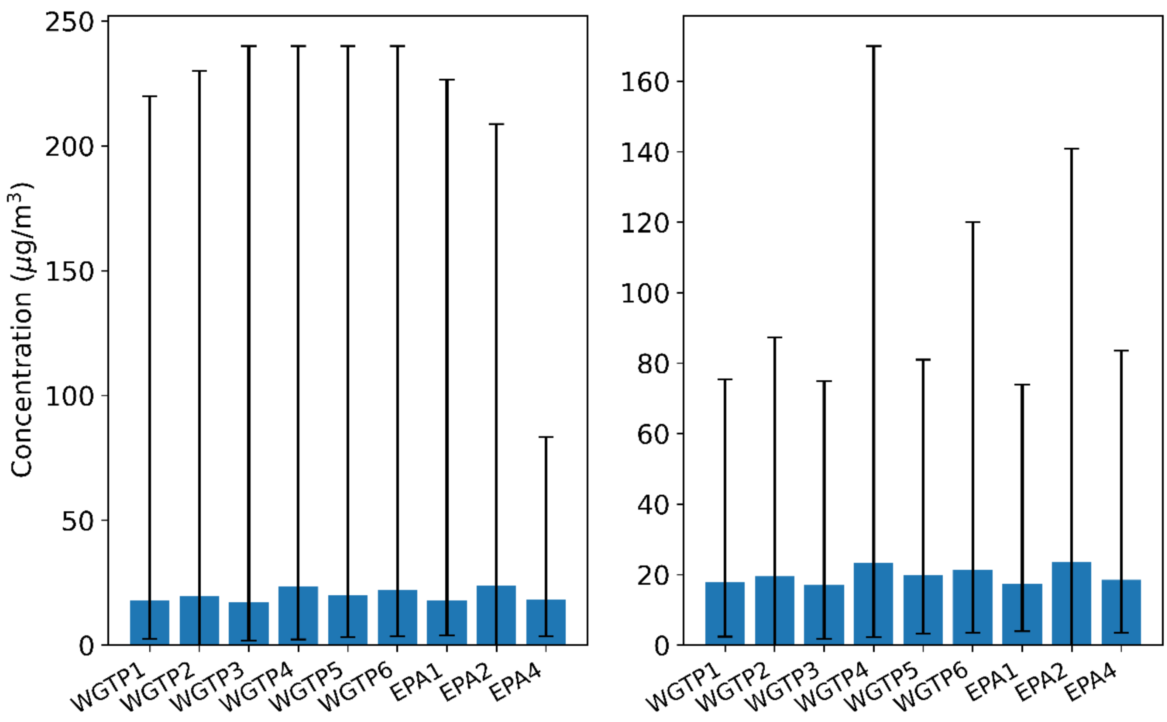

Figure 6. Average daily PM_{10} concentrations over the 5.5-year data period. The vertical lines show the range of values (minimum and maximum) over the data period. Left panel: average daily PM_{10} concentrations measured during 2016-2022 at the WGTP and EPA stations. Right panel: average daily PM_{10} concentrations measured during 2016-2022 (year 2020 excluded due to extremes from bushfires) at the WGTP and EPA stations.

The 1-year average concentrations were variable, with results higher than the ERS (20 µg/m³) across the WGTP and EPA2 (Brooklyn) stations, between 2016 and 2020 (Table 3). WGTP4 reported higher concentrations than the EPA station at Brooklyn (EPA2) between 2016 and 2020. Concentrations fell below the standard at all stations during 2021 and 2022 except at the EPA Brooklyn station. Overall, the full year data from 2017-2022 shows a reduction in 1-year PM_{10} concentration (Figure 7, Table 3):

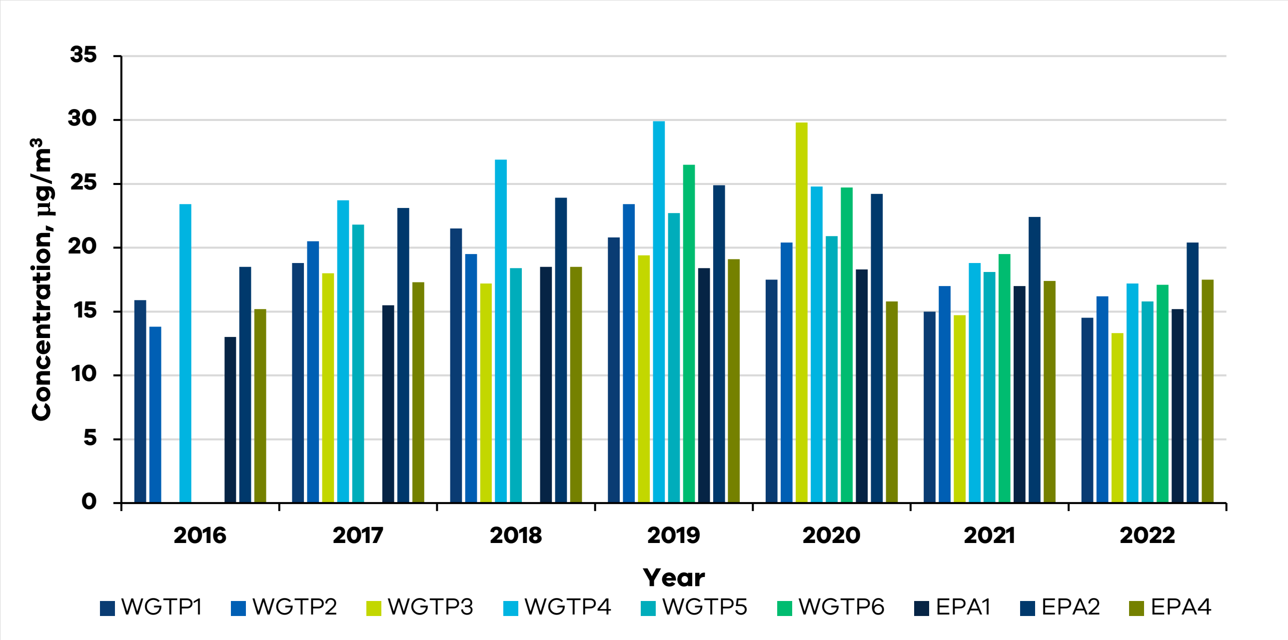

Figure 7. PM_{10} concentrations (1 -year average) across monitoring period 2016 – 2022.

Measured PM_{10} concentrations are affected by variations in local pollution sources and weather conditions, which transport and disperse pollutants.

PM_{10} concentrations were found to be relatively higher than $PM_{2.5}$ concentrations during late spring and summer (when there is typically less rain to flush particles from the atmosphere). This suggests that the main source of PM_{10} during this period is remobilised dust. The reduction of vehicle traffic in 2021, due to the mobility restrictions in response to the COVID-19 pandemic, contributed to lower concentrations of PM_{10}. In 2022, the wet weather associated with La Niña event helped to reduced atmospheric concentrations of PM_{10}. These influencing factors can change, and some variation is expected going forward.

The EPA Brooklyn station (EPA 2) measures dust sources associated with the Brooklyn Industrial Precinct which is home to more than 60 businesses including recycling sites, abattoirs, tallow producers and landfills (EPA, 2020). Over the study period it is evident that this location has persistent PM_{10} issues and remains a focus for EPA action. Current actions to mitigate risks associated PM_{10} dust production at the Precinct includes an alert system that consists of a warning email from EPA to local residents and industry. The email advises recipients to take relevant action to reduce dust production and impacts. For example, advice to industry operating at the Brooklyn Industrial Precinct includes the use of water carts, sprinklers, street sweepers and limiting dust producing activities.

Aside of the Brooklyn Industrial Precinct (EPA2), the data shows similar 1-day average concentrations of PM_{10} air quality across all stations (Figure 5), with 1-year average concentrations slightly higher at WGTP stations compared to EPA stations (EPA1, EPA4) between 2017 and 2020. Overall, assessment of the full annual data between 2017-2022 shows that the number of days of air quality was better than the ERS PM10 1-day value of 50 µg/m3 has increased as has the annual average concentrations during 2021 and 2022.

3.3 Carbon monoxide nitrogen dioxide concentrations

Carbon monoxide and NO_2 concentrations are measured only at the WGTP 4 station. EPA measures the same air pollutants at its Alphington (EPA 1) and Footscray (EPA 4) stations (Table 1).

Figure 6 shows the 8-hr average CO concentrations plotted against the corresponding ERS 8-hour value of 9 ppm. There is no 1-year ERS for CO. At no time during the data period were any concentrations greater than the ERS, with the maximum being 2.2 ppm, recorded in 2020 at the Footscray EPA 4 station.

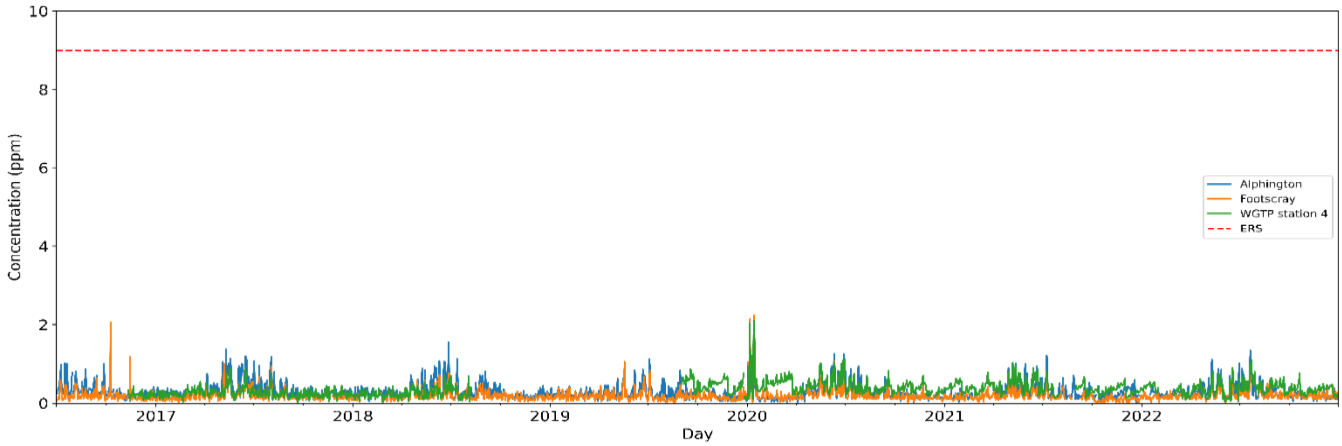

Figure 6. 8-hourly averaged CO concentrations measured at EPA stations (Alphington and Footscray) and WGTP 4. Note: in 2017, CO data is available from 05 January to 31 December at WGTP4.

Assessment of NO_2 concentrations is benchmarked against the ERS values for 1 hour at 80 ppb and a 1-year value at 15 ppb. The maximum 1-hour concentrations for each day and station are shown in Figure 7 and are compared to the 1-hour ERS value for NO_2.

The average of the annual maximum concentrations measured at all three NO_2 monitored stations over the 5.5-year data period was 11.1 ppb, with the WGTP 4 station recording values higher than the ERS in 2016, 2017 and 2018 (Table 3).

In addition, the WGTP 4 station was the only station to record concentrations higher than the NO_2 1-hour average ERS in 2022. The higher NO_2 concentrations at the WGTP 4 station are likely to it being located near a major road.

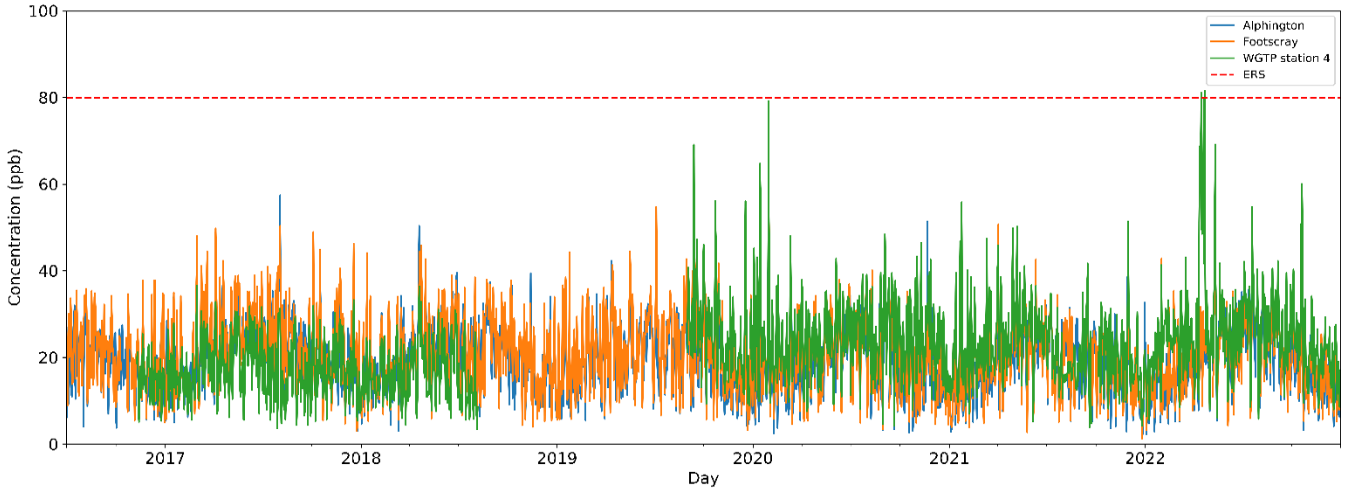

Figure 7. Maximum daily 1-hour NO_2 concentrations measured at EPA stations (Alphington and Footscray) and WGTP 4.
Note: in 2016 NO_2 data is available only from 3 November to 31 December at WGTP4.

4 Conclusion

The data shows that the highest concentrations of air pollution were associated with $PM_{2.5}$ and PM_{10}. Concentrations varied over the years across all stations due to a range of local air pollution sources and weather conditions.

- Average daily $PM_{2.5}$ concentrations were below the 1-day ERS standard 96.4 per cent of days between 2017 and 2020, increasing to over 99 per cent of days in 2021 and 2022.
- Between 2017 and 2020, every station recorded a 1-year average $PM_{2.5}$ concentration above the ERS at least once.
- Average annual $PM_{2.5}$ concentrations at WGTP stations were above EPA stations in 2019 and 2020.
- All stations reported average 1-year $PM_{2.5}$ concentrations below the ERS in 2021 and 2022.
- Average daily PM_{10} concentrations were below the 1-day ERS standard 87.2 per cent of the time between 2017 and 2020, increasing to over 98 per cent of days in 2021 and 2022.
- The PM_{10} 1-year average concentrations were variable, with results higher than the ERS for all the years between 2017-2022 at one EPA site (EPA 2) and none at the other EPA sites.
- Results varied across WGTP stations, with PM_{10} concentrations higher than ERS for one to four years depending on the station during 2017-2020.
- All WGTP stations reported average 1-year PM_{10} concentrations below the ERS in 2021 and 2022.

Lower concentrations in particulate matter in 2021 and 2022 were influenced by reductions in traffic during COVID-19 pandemic restrictions, fewer bushfire events, and wet weather associated with a La Niña event (2022) that helped to reduced atmospheric concentrations of particulate matter. These influencing factors can change, and some variation is expected going forward.

CO concentrations were not recorded at concentrations greater than the CO ERS. WGTP station 4 recorded concentrations higher than the NO_2 1-year ERS (in 2017 and 2018) and 1-hour ERS in 2022.

Overall, the air quality measured across locations experienced similar pollutant concentrations over the data period. Particulate pollution sources were primarily:

- local industrial and commercial activities
- road-source emissions
- smoke from domestic sources (for example, wood heating) and bushfires during late 2019 and early 2020.

The higher NO_2 concentrations at the WGTP locations are likely to be due to road source emissions. Elevated concentrations of air pollution typically arise due to calm weather that allows a local build-up of pollutants. Given that exposure to air pollution can be associated with poorer health outcomes, especially in sensitive people it is necessary to reduce all sources where possible to prevent potential harm to people and the environment. The first step in prevention is to understand the sources of pollution in detail.

To this end, EPA undertook a study during 2021 – 2022 to better understand sources of $PM_{2.5}$ pollution in Melbourne's inner west. The findings from this study will be reported in 2023 and will help inform measures to better manage pollution at their source.

In addition, EPA's Western Metropolitan Region is also working to reduce and prevent industrial air pollution in Melbourne's inner west. This is being achieved through EPA's proactive regulatory approach using its new laws, guidelines, and tools across the regulatory cycle, from education and awareness through to compliance and enforcement. EPA targets higher-risk areas and activities such as businesses and stations in the Brooklyn Industrial Precinct. Information about EPA's work, actions and outcomes is available through the Brooklyn Community Representative Group (Brooklyn Industrial Precinct, 2023).

EPA continues to work with the Department of Energy, Environment and Climate Action and other government departments to implement the Victorian Air Quality Strategy (Victorian Government, 2022). The Strategy is focused on tackling major pollution, and includes a $2.84 million commitment to establish Air Quality Improvement Precincts in Melbourne's inner and outer west to address local air quality issues (Sustainability Victoria, 2023).

Table 3. Summary of pollutant averaged concentrations for the WGTP (data supplied by Westgate Tunnel Project) and EPA stations assessed in this report. Monitoring results are collected every 5 minutes, and the averaging period is:

- 1-day max value refers to the maximum 1-day (24 hour) concentration recorded at each station during the relevant year.
- 1 year refers to the average concentration at each station during the relevant year.
- 1-hour max value refers to the maximum 1-hour concentration recorded at each station during the relevant year.
- 8-hour max value is the maximum concentration recorded at each station during the relevant year.
- The "(days above ERS)" refers to the numbers of days when air quality measures were reported above the ERS value at that station in any given year, presented in brackets beside the pollutant concentration.

Note, air quality measurements commenced mid 2016 with different stations coming online according to their respective installation and operation date.

Year	Pollutant	Averaging period	ERS	WGTP1	WGTP2	WGTP3	WGTP4	WGTP5	WGTP6	EPA1	EPA2	EPA3	EPA4
2016	$PM_{2.5}$	1 day max (days above ERS)	25 $\mu g/m^3$	17.6	16.6					21.3			17.7
		1 year	8 $\mu g/m^3$	5.2	5.8					6.5			6.3
	PM_{10}	1 day max (days above ERS)	50 $\mu g/m^3$	43.8	29.9		53.2 (1)			34.3	53.8 (3)		38.8
		1 year	20 $\mu g/m^3$	15.9	13.8		23.4			13.0	18.5		15.2
	NO_2	1 hour max (above ERS)	80 ppb				25.5			34.0			38.0
		1 year	15 ppb				15.3			8.1			9.2
	CO	8 hour max (above ERS)	9 ppb				0.4			1.0			2.0
2017	$PM_{2.5}$	1 day max (days above ERS)	25 $\mu g/m^3$	31.6 (6)	32.8 (7)	35.8 (7)	33.5 (3)	35.4 (8)		35.9 (8)		28.7 (3)	34.8 (4)
		1 year	8 $\mu g/m^3$	8.8	9.2	9.0	8.8	9.4		9.3		8.5	7.9
	PM_{10}	1 day max (days above ERS)	50 $\mu g/m^3$	43.4	51.7 (1)	40.6	65.0 (6)	52.6 (1)		41.1	71.7 (16)		49.8
		1 year	20 $\mu g/m^3$	18.8	20.5	18.0	23.7	21.8		15.5	23.1		17.3
	NO_2	1 hour max (above ERS)	80 ppb				36.5			57.0			50.0
		1 year	15 ppb				17.4			9.7			11.5
	CO	8 hour max (above ERS)	9 ppb				0.9			1.4			0.9
2018	$PM_{2.5}$	1 day max (days above ERS)	25 $\mu g/m^3$	40.0 (9)	39.0 (8)	39.5 (7)	40.4 (7)	31.6 (3)	17.8	42.0 (8)		42.1 (7)	31.2 (5)
		1 year	8 $\mu g/m^3$	8.7	8.0	7.1	7.8	7.2		8.5		8.5	7.8
	PM_{10}	1 day max (days above ERS)	50 $\mu g/m^3$	53.8 (1)	77.5 (6)	49.2	123.2 (19)	48.1	60.7 (3)	74.0 (3)	99.2 (17)		58.8 (1)
		1 year	20 $\mu g/m^3$	21.5	19.5	17.2	26.9	18.4		18.5	23.9		18.5
	NO_2	1 hour max (above ERS)	80 ppb				36.4			50.0			46.0
		1 year	15 ppb				16.2			9.6			10.3
	CO	8 hour max (above ERS)	9 ppb				0.7			1.6			0.8
2019	$PM_{2.5}$	1 day max (days above ERS)	25 $\mu g/m^3$	37.2 (7)	45.1 (8)	33.4 (5)	38.7 (7)	39.7 (6)	38.0 (5)	30.6 (2)		28.6 (2)	29.6 (4)
		1 year	8 $\mu g/m^3$	9.3	9.7	8.0	10.1	9.1	9.1	7.8		7.6	7.6
	PM_{10}	1 day max (days above ERS)	50 $\mu g/m^3$	75.5 (14)	87.3 (17)	75.0 (8)	170 (46)	81.0 (15)	120 (27)	69.8 (6)	141 (30)		83.5 (8)
		1 year	20 $\mu g/m^3$	20.8	23.4	19.4	29.9	22.7	26.5	18.4	24.9		19.1
	NO_2	1 hour max (above ERS)	80 ppb				69.0			42.4			54.8
		1 year	15 ppb				14.1			9.0			10.4
	CO	8 hour max (above ERS)	9 ppb				0.9			1.1			1.1
2020	$PM_{2.5}$	1 day max (days above ERS)	25 $\mu g/m^3$	223 (11)	234 (13)	213 (10)	218 (11)	250 (9)	330 (10)	214 (8)		210 (11)	213 (9)
		1 year	8 $\mu g/m^3$	9.8	10.0	9.3	10.0	9.9	9.5	8.5		8.9	8.6
	PM_{10}	1 day max (days above ERS)	50 $\mu g/m^3$	220 (8)	230 (9)	240 (7)	240 (15)	240 (9)	240 (14)	226 (7)	209 (19)		225 (6)
		1 year	20 $\mu g/m^3$	17.5	20.4	29.8	24.8	20.9	24.7	18.3	24.2		15.8
	NO_2	1 hour max (above ERS)	80 ppb				79.1			51.5			64.8
		1 year	15 ppb				13.9			8.2			9.8
	CO	8 hour max (above ERS)	9 ppb				2.1			2.0			2.2
2021	$PM_{2.5}$	1 day max (days above ERS)	25 $\mu g/m^3$	24.1	25.3 (1)	22.5	24.5	24.3	24.7	37.8 (3)		27.8 (3)	21.5
		1 year	8 $\mu g/m^3$	7.4	7.5	6.9	7.7	7.5	7.3	7.4		6.9	5.7
	PM_{10}	1 day max (days above ERS)	50 $\mu g/m^3$	36.0	45.0	39.0	48.0	51.0 (1)	64.0 (2)	51.6 (1)	60.4 (6)		62.4 (1)
		1 year	20 $\mu g/m^3$	15.0	17.0	14.7	18.8	18.1	19.5	17.0	22.4		17.4
	NO_2	1 hour max (above ERS)	80 ppb				55.8			41.4			50.7
		1 year	15 ppb				12.6			7.8			8.8
	CO	8 hour max (above ERS)	9 ppb				1.0			1.2			0.7
2022	$PM_{2.5}$	1 day max (days above ERS)	25 $\mu g/m^3$	24.4	21.3	24.0	22.7	23.1	21.0	23.2		25.5 (1)	23.7
		1 year	8 $\mu g/m^3$	7.0	7.0	6.5	6.8	7.0	6.5	7.4		7.6	6.3
	PM_{10}	1 day max (days above ERS)	50 $\mu g/m^3$	36.0	44.0	36.0	45.0	51.0 (1)	54.0 (2)	43.2	68.2 (6)		56.2 (1)
		1 year	20 $\mu g/m^3$	14.5	16.2	13.3	17.2	15.8	17.1	15.2	20.4		17.5
	NO_2	1 hour max (above ERS)	80 ppb				81.5 (2)			38.3			43.2
		1 year	15 ppb				14.1			8.6			9.5
	CO	8 hour max (above ERS)	9 ppb				1.1			1.4			0.7

5 References

Brooklyn Industrial Precinct (2023). Brooklyn Community Representative Group, Brooklynip website, accessed 27 September 2023. Available at: http://www.brooklynip.com.au/bcrg-community-forum/ (accessed 2 October 2023).

EPA (2021). Guide to the Environment Reference Standard. EPA publication 1992, Environment Protection Authority Victoria, Australia. Available at: https://www.epa.vic.gov.au/about-epa/publications/1992 (accessed 2 October 2023).

EPA (2020). Air quality issues near the Brooklyn Industrial Precinct, EPA website, accessed 27 September 2023. Available at: https://www.epa.vic.gov.au/for-community/current-projects-issues/preventing-pollution-brooklyn (accessed 2 October 2023).

Inner West Air Quality Community Reference Group (2020). Air Pollution in Melbourne's Inner West. Report. March 2020. Available at: https://www.environment.vic.gov.au/__data/assets/pdf_file/0029/486506/IWAQCRGReportFINAL.pdf (accessed 2 October 2023).

Sustainability Victoria (2023). Air Quality Improvement Precincts Grant Program. Available at: https://www.sustainability.vic.gov.au/grants-funding-and-investment/grants-and-funding/air-quality-improvement-precincts-grant-program (accessed 2 October 2023).

US EPA (2023). Ambient Air Monitoring Equivalent and Equivalent Methods; Designation of One New Equivalent Method. 88 FR 42718. Available at: https://www.federalregister.gov/documents/2023/07/03/2023-14083/ambient-air-monitoring-equivalent-and-equivalent-methods-designation-of-one-new-equivalent-method (accessed 2 October 2023).

Victoria Government (2021). Environment Reference Standard. Victoria Government Gazette No. S245, 26 May 2021. Melbourne. Victoria. Australia. Available at: https://www.gazette.vic.gov.au/gazette/Gazettes2021/GG2021S245.pdf (accessed 2 October 2023).

Victorian Government (2022). Clean air for all Victorians. Victoria's Air Quality Strategy. Available at: https://www.environment.vic.gov.au/__data/assets/pdf_file/0032/603977/Victorias-air-quality-strategy.pdf (accessed 2 October 2023).

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