Air monitoring report 2019 – Compliance with the National Environment Protection (Ambient Air Quality) Measure

EPA VICTORIA | Environment Protection Authority Victoria

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This report presents the 2019 Victorian air quality monitoring results as assessed against the National Environment Protection (Ambient Air Quality) Measure[1] (referred to as the Measure).

Victoria's air quality was generally good in 2019, although there were periods of poor air quality due mostly to smoke and urban pollution.

Executive summary

What is the Measure?

The Measure establishes national ambient air quality standards. It aims to guide policies around the protection of human health by providing a consistent framework for monitoring and reporting common air pollutants: nitrogen dioxide (NO_2), carbon dioxide (CO), ozone (O_3), sulfur dioxide (SO_2), lead (Pb), and particles (PM_{10}) and ($PM_{2.5}$). Environment Protection Authority Victoria (EPA) is responsible for monitoring and reporting Victoria's ambient air quality in accordance with the requirements of the Measure. EPA also provides air quality data (updated hourly) on its website[2] and produces annual data summaries.[3]

Compliance with the Measure

EPA assesses air quality in Victoria against the standards and pollutant goals defined in the Measure. Compliance with the Measure requires that air quality standards are not exceeded more than the allowable number (as outlined in Schedule 2 of the Measure). Compliance with the Measure also requires that a minimum of 75 per cent of data is available for each quarter in the year. In addition to standard instrumentation for measuring compliance, EPA also collects data from stations at sites with specific air pollution issues, such as the Brooklyn Industrial Precinct and in the Latrobe Valley (excluding Traralgon air monitoring station). These data are not assessed against the Measure and therefore not included in this report. Results for these air monitoring stations are reported on EPA's website.[4]

Air quality in Victoria in 2019

Air quality in Victoria in 2019 was generally good. There were some periods of poor air quality due to elevated levels of ozone, PM_{10} and $PM_{2.5}$. Pollutant levels for carbon monoxide, nitrogen dioxide and sulfur dioxide were below the national ambient air quality standards.

Two major bushfires in eastern Victoria in 2019 were the main source of high levels of $PM_{2.5}$ and ozone, resulting in periods of poor air quality. For PM_{10}, there was an increase in the number of exceedances measured at many air monitoring stations in 2019. While some exceedances were due to bushfires, the majority were from windblown dust most likely related to lower than average rainfall.

The Altona air monitoring station was closed for relocation approximately half of 2019. As a result, EPA collected insufficient sulfur dioxide data to comply with the Measure at this site. Local works resulted in insufficient data capture at Traralgon for one quarter in 2019. With the exception of this site, the standard for nitrogen dioxide was met at all other monitoring stations.

[1] National Environment Protection Measure for Air Quality, National Environment Protection Council publication, available from https://www.legislation.gov.au
[2] EPA hourly data tables http://www.epa.vic.gov.au
[3] https://discover.data.vic.gov.au
[4] EPA publications http://www.epa.vic.gov.au/our-work/publications

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Authorised and published by Environment Protection Authority Victoria
200 Victoria Street, Carlton VIC 3053
W epa.vic.gov.au | T 1300 372 842 (1300 EPA VIC)

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Measure performance monitoring stations

Victoria's air monitoring plan for the assessment of air quality against the Measure was first approved in February 2001 by the National Environment Protection Council Ministers. Data presented in this report has been produced in accordance with the monitoring plan, with exceptions noted where required.

The Measure requires EPA to monitor the pollutants: carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), sulfur dioxide (SO_2), particles less than 10 micrometres in diameter (PM_{10}), and particles less than 2.5 micrometres in diameter ($PM_{2.5}$), and lead (Pb). EPA no longer monitors the air for lead concentrations as levels in Victoria have decreased significantly, due to the phase out of leaded petrol.

Eight regions are defined in the air monitoring plan, including:

- Port Phillip and Latrobe Valley regions, which have Measure-compliant monitoring stations.
- Ballarat, Bendigo, Shepparton, Warrnambool and Mildura, where campaign monitoring was previously conducted.
- Wodonga, where data from monitoring at Albury New South Wales was used.

EPA's 2019 Measure-compliant monitoring stations are shown in Figure 1 and Figure 2. The monitoring stations, pollutants monitored, and site types are summarised in Table 1. Site types are defined in the Measure as 'generally representative upper bound for community exposure' and 'population-average sites'. Another site type, trend stations, provide data on the long-term trends in air quality over many years.

Description of 'exposed population'

The exposed population, or the types of communities covered by each monitoring station is described in the 'location category' column in Table 1.

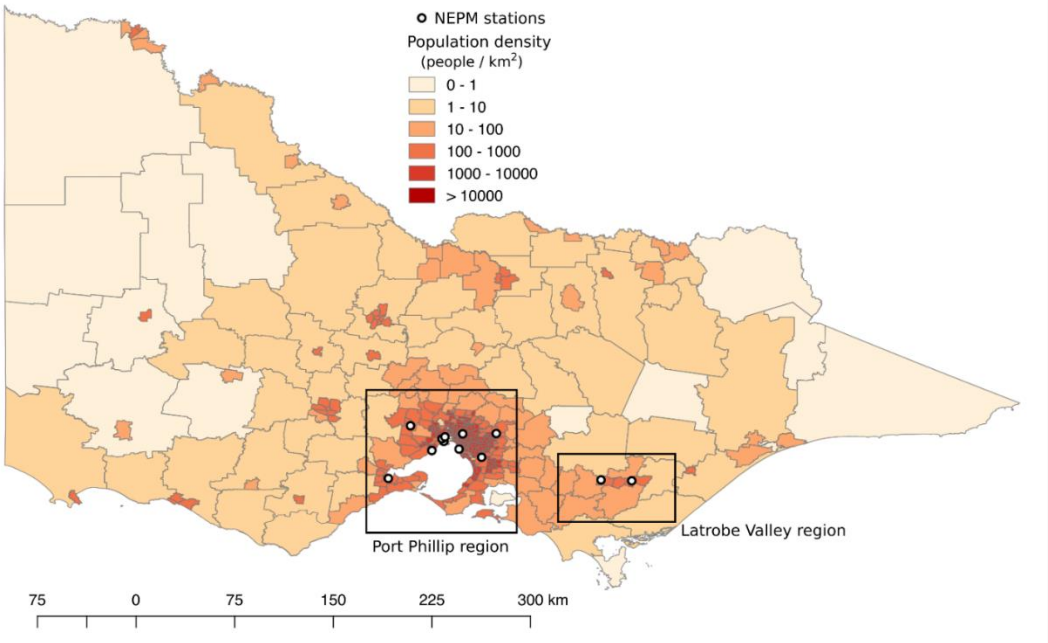

Figure 1: Defined regions and population density in Victoria

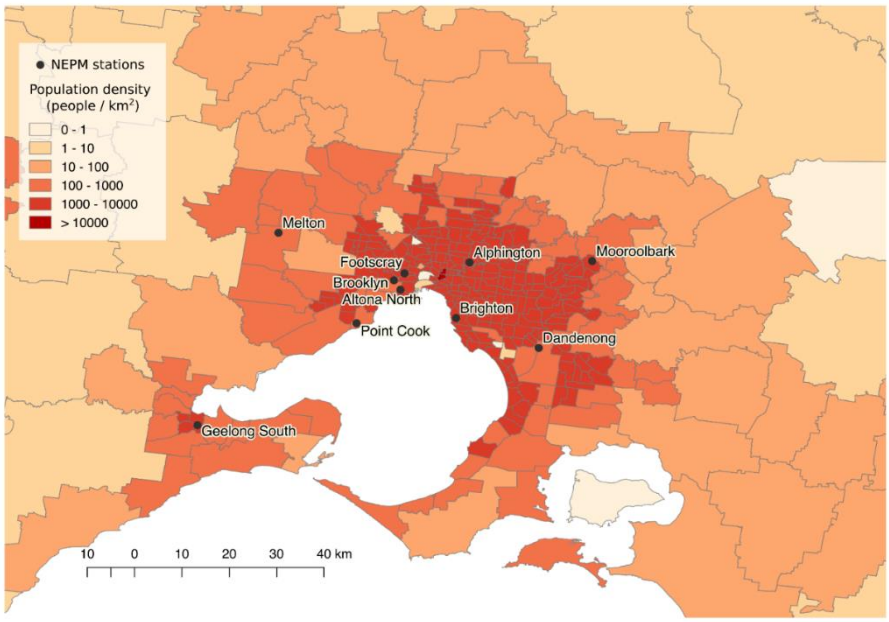

Figure 2: Monitoring stations and population density in Port Phillip region

Table 1: Victorian performance monitoring stations

Region	Location category	Site type					
Monitoring station		CO	NO_2	O_3	SO_2	PM_{10}	$PM_{2.5}$
Port Phillip							
Alphington	Residential/light industrial	G*	G*	Pop	Pop*	G*	G*
Altona [f]	Industrial/residential				G		
Brighton	Residential		G	Pop*		Pop	
Dandenong	Light industrial			Pop		Pop	
Footscray[d]	Industrial/residential		G*	G*		G*	G*
Geelong	Light industrial/residential	G*	G*	Pop*	G*	G*	G*
Melton	Residential			G			
Mooroolbark	Residential			Pop		Pop	
Point Cook	Rural/residential		Pop*	G*			
Point Henry [c]	Industrial/rural			Pop			
Richmond	Residential	G				G	
RMIT (CBD) [a]	CBD	G*	G*		G	G*	
Latrobe Valley							
Moe [b]	Residential		Pop	G	G	G	
Traralgon	Residential		G*	G*	G*	G*	G*

* Trend station (used to determine long term trends in air quality).
G Generally representative upper bound.
Pop Population average.
a RMIT station closed in 2006.
b Moe closed in 2009, monitoring for $PM_{2.5}$ (beta attenuation) started in 2015.
c Point Henry closed in 2011.
d SO_2 monitoring ceased in 2015.
e Richmond station closed in 2016.
f Altona station closed in 2019 for relocation to new site in 2020.

Implementation of the monitoring plan

EPA continually evaluates Victoria's air quality monitoring program to determine which sites and pollutants need to be monitored. Stations are located and set up according to the Australian Standard (Table 2).

Generally, EPA's air monitoring stations have remained stable over the years, although changes to the network are made as needed. Recent changes include:

- A new Moe station established in 2015 after the Hazelwood mine fire to monitor for $PM_{2.5}$ as a part of the Community Co-Designed Air Monitoring Network.
- Monitoring ceased at the CBD station (at Richmond) in 2016, when the lease was terminated. A non-Measure-compliant roadside station was established in the Melbourne CBD in 2017. Data from this station is available on EPA's website.
- In mid-2019, the Altona monitoring station was temporarily shut down pending relocation to another site. Monitoring is anticipated to resume in 2020 after the relocation is complete.

Screening procedure

Victoria's air monitoring plan outlines how EPA may use screening procedures to demonstrate whether concentrations of pollutants are consistently below the standards. If these screening procedures are satisfied, monitoring may not be required, or may be conducted at fewer locations.

Screening procedures conducted in accordance with the Measure have been satisfied for Victorian regions. EPA did not monitor air quality at Ballarat, Bendigo, Shepparton, Warrnambool, Wodonga and Mildura in 2019 as previous monitoring campaigns in these areas showed that pollutant levels were expected to be consistently below the relevant standards in the Measure.

Monitoring and reporting methods

Victorian monitoring is conducted in accordance with the Australian Standard as shown in Table 2 and Table 3. Data not meeting the requirements of these Standards and EPA's quality assurance procedures was identified as invalid and not included in this report.

TEOM PM_{10} data included in this report has been adjusted according to the approved procedure as outlined in *Technical Paper No. 10 – Collection and Reporting of TEOM PM_{10} Data*[5], using the temperature-dependent formula with a constant value of K equal to 0.04. The resulting adjustments vary from no change at daily average temperatures at or above 15°C, to an increase of 40 per cent at a temperature of 5°C. Particle concentration units of $\mu g/m^3$ refer to volumes at 0°C and one atmosphere of pressure.

$PM_{2.5}$ monitoring

On 25 February 2016, the Measure was varied to introduce a daily standard of 25 $\mu g/m^3$ for $PM_{2.5}$ and an 8 $\mu g/m^3$ annual standard for $PM_{2.5}$. The varied Measure also removed the number of allowable exceedances for $PM_{2.5}$ and PM_{10}. These were replaced with an 'exceptional event' rule requiring exceedances relating to an event such as bushfire or windblown dust to be evaluated and reported separately in annual compliance reports.

Victoria monitors $PM_{2.5}$ by the reference method specified in the Measure (once every three days) at two stations (Alphington and Footscray). $PM_{2.5}$ is also continuously monitored at these two stations along with Geelong and Traralgon using beta attenuation monitors (BAMs).

Prior to this, Victoria also participated in the $PM_{2.5}$ Equivalence Program, with Tapered Element Oscillating Microbalance (TEOM) monitors located at Alphington and Footscray. TEOM $PM_{2.5}$ readings were taken with the inbuilt adjustment for PM_{10} removed and no adjustment for loss of volatiles.

NATA status

As of February 2016, monitoring for PM_{10} and $PM_{2.5}$ using the Hivol and Partisol gravimetric methods were outsourced by EPA to Golder Associates (NATA accreditation Number 1910).

All other methods currently used by EPA for performance monitoring are covered by its National Association of Testing Authorities (NATA) accreditation (Number 15119) except for $PM_{2.5}$ using BAMs. EPA was successfully reaccredited by NATA in 2016.

Work has been carried out to incorporate monitoring for $PM_{2.5}$ using BAMs within EPA Victoria's NATA accreditation. All technical elements have been completed, the method is in use, and it is due to be assessed at an upcoming NATA audit. Table 2 shows compliance with the Australian Standard for the siting an operation of each air monitoring station.

5 *Technical Paper No. 10 – Collection and Reporting of TEOM PM_{10} Data,* National Environment Protection Council

Table 2: Summary of stations' siting compliance with AS 3580.1.1-2016

Region Station	Height above ground	Minimum distance to support structure	Clear sky angle of 120°	Unrestricted airflow of 270°/360°	20 m from trees	No boilers or incinerators nearby	Minimum distance from road or traffic
Port Phillip							
Alphington	Y	Y	Y	Y	N	Y	N
Altona	Y	Y	Y	Y	Y	Y	N
Dandenong	Y	Y	Y	Y	N	Y	N
Footscray	Y	Y	Y	Y	N	Y	Y
Geelong	Y	Y	Y	Y	N	Y	N
Melton	Y	Y	Y	Y	N	Y	N
Mooroolbark	Y	Y	Y	Y	N	Y	N
Point Cook	Y	Y	Y	Y	N	Y	N
Latrobe Valley							
Traralgon	Y	Y	Y	Y	N	Y	N
Moe	Y	Y	Y	Y	N	Y	N

Table 3: Methods for monitoring pollutants in the Measure

Pollutant		Applicable Standard "Title of Standard"	Method used
Carbon monoxide	CO	Australian Standard 3580.7.1 "Ambient air - Determination of carbon monoxide, direct instrumental method"	Gas filter correlation/infrared
Nitrogen dioxide	NO_2	Australian Standard 3580.5.1 "Ambient air — Determination of oxides of nitrogen — Direct reading instrument method"	Gas phase chemiluminescence
Photochemical oxidant (ozone)	O_3	Australia Standard 3580.6.1 "Ambient air — Determination of ozone — Direct reading instrument method"	Non-dispersive ultraviolet
Sulfur dioxide	SO_2	Australian Standard 3580.4.1 "Ambient air — Determination of sulfur dioxide — Direct reading instrument method"	Pulsed fluorescence
Particles	PM_{10}	Australian Standard 3580.9.8 "Determination of suspended particulate matter — PM_{10} continuous direct mass method using a tapered element oscillating microbalance analyser"	Tapered element oscillating microbalance (TEOM)
	$PM_{2.5}$	Australian Standard 3580.9.10 "Determination of suspended particulate matter – $PM_{2.5}$ low volume sampler – Gravimetric method"	Gravimetric reference method
		Australian Standard 3580.9.12 Determination of suspended particulate matter $PM_{2.5}$ beta attenuation monitors	Beta attenuation monitors (BAM)

2 Assessment of compliance with standards and goals

Air quality is assessed against the standards defined in the Measure and the associated goals shown in Table 4. The goal of the Measure is to achieve the National Environment Protection Standards as assessed in accordance with the monitoring protocol to the extent specified in Schedule 2 of the Measure. The extent is expressed as a maximum allowable number of exceedances for each standard (shown in column four of Table 4).

Table 4: Air quality standards and goals in the Measure

Pollutant	Averaging period	Standard	Goal max. allowable exceedances
Carbon monoxide	8 hours	9.0 ppm	1 day a year
Nitrogen dioxide	1 hour 1 year	0.12 ppm 0.03 ppm	1 day a year None
Ozone	1 hour 4 hours	0.10 ppm 0.08 ppm	1 day a year 1 day a year
Sulfur dioxide	1 hour 1 day 1 year	0.20 ppm 0.08 ppm 0.02 ppm	1 day a year 1 day a year None
Particles as PM_{10}	1 day 1 year	50 µg/m^3 25 µg/m^3	None None
Particles as $PM_{2.5}$	1 day 1 year	25 µg/m^3 8 µg/m^3	None None
Lead	1 year	0.50 µg/m^3	None

For $PM_{2.5}$, there is an additional goal to further reduce concentrations to below a daily concentration of 20 µg/m^3 and an annual concentration of 7 µg/m^3 by 2025.

The number of allowable exceedances associated with the standards has been set to account for unusual meteorological conditions. In the case of particles, allowable exceedances include exceptional events such as bushfires, hazard reduction burning (if authorised by state jurisdiction) or continental-scale windblown dust that cannot be controlled through normal air quality management strategies.

Air quality monitoring data from each monitoring site is assessed against the Measure's standards and the associated goals for each pollutant.

Compliance with the Measure requires that air quality standards are not exceeded more than the allowable number (as outlined in Schedule 2 of the Measure). Compliance with the Measure also requires that a minimum of 75 per cent of data is available for each quarter in the year. Regions are deemed to meet the Measure's standards and goal if previous screening has shown that pollution levels are consistently below air quality standards and monitoring is therefore not required. In this way, lead is deemed to meet the Measure's standards and goals, because lead was shown to be consistently below the Measure's standards, particularly resulting from the introduction of unleaded fuel in 1985. As a consequence, EPA stopped monitoring for lead in 2004.

The Measure's goals for carbon monoxide, nitrogen dioxide, ozone, sulfur dioxide, PM_{10}, $PM_{2.5}$ and lead must be below the standards within the extent specified, such as taking into consideration exceptional events as described in the Measure.

A **Green**, **Amber** & **Red** traffic light system has been implemented to indicate compliance.

- **MET**– standard and goal achieved.
- **NOT MET (i)** – standard and goal not achieved due to insufficient data capture.
- **NOT MET** – standard and goal not achieved.

3 Assessment of compliance with standards and goals of the Measure

A Carbon monoxide (CO)

In Victoria, carbon monoxide is assessed against an eight-hour standard of 9.0 ppm, with one exceedance day allowed per year as shown in Table 5. In 2019, the carbon monoxide standard was not exceeded, and compliance was demonstrated at all three stations that monitor CO: Alphington, Footscray and Geelong.

Table 5: 2019 compliance summary for carbon monoxide in Victoria

Monitoring station	Data availability rates (% of hours)					Number of exceedances (days)	Performance against the standard and goals
	Q1	Q2	Q3	Q4	Annual		
Port Phillip							
Alphington	93.84	94.96	94.66	90.58	93.49	0	MET
Footscray	94.72	93.96	94.52	94.83	94.50	0	MET
Geelong	90.05	95.01	92.48	93.97	92.88	0	MET

Table 6: 2019 summary statistics for daily peak eight-hour carbon monoxide in Victoria

Monitoring station	Highest reading (ppm)	Highest reading (date)	2nd highest reading (ppm)	2nd highest reading (date)
Port Phillip				
Alphington	1.33	05/07/2019	1.17	23/6/2019
Footscray	1.11	19/5/2019	0.70	18/5/2019
Geelong	1.54	26/6/2019	1.32	25/6/2019

Table 7: 2019 percentiles for daily peak eight-hour carbon monoxide in Victoria

Monitoring station	Data availability	Max	Percentiles (ppm)					
	(% of days)	(ppm)	99th	98th	95th	90th	75th	50th
Port Phillip								
Alphington	93.97	1.33	1.04	0.88	0.70	0.51	0.36	0.24
Footscray	96.71	1.11	0.68	0.61	0.47	0.36	0.25	0.18
Geelong South	94.25	1.54	0.85	0.71	0.48	0.31	0.23	0.15

Trends and pollutant distributions for carbon monoxide between 2015 and 2019

Percentiles of 2019 daily peak concentrations (over an eight-hour averaging period) are provided for carbon monoxide for each station and standard. In these tables, daily peak values are formed only when at least 75 per cent of the data for the day is valid. Data for stations with less than 15 per cent data in the year is omitted and stations with less than 75 per cent data are shown in italics. The percentiles for eight-hour carbon monoxide is based on rolling averages, including those that overlap from one day to the next.

Table 8: Percentiles of daily maximum eight-hour carbon monoxide at Alphington (2015–2019)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99th	98th	95th	90th	70th	50th
2015	92.1	0	1.7	1.5	1.3	1.1	0.8	0.5	0.4
2016	90.2	0	2.1	1.3	1.2	0.9	0.8	0.5	0.3
2017	94.2	0	1.6	1.4	1.2	1.1	0.9	0.4	0.3
2018	94.5	0	1.8	1.3	1.1	0.9	0.7	0.4	0.3
2019	93.97	0	1.33	1.04	0.88	0.70	0.51	0.36	0.24

Table 9: Percentiles of daily maximum eight-hour carbon monoxide at Footscray (2016–2019)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99th	98th	95th	90th	70th	50th
2016	93.4	0	1.3	0.7	0.7	0.6	0.5	0.3	0.2
2017	92.6	0	1.1	0.9	0.8	0.6	0.5	0.3	0.2
2018	87.7	0	1.0	0.7	0.7	0.6	0.5	0.3	0.2
2019	96.71	0	1.11	0.68	0.61	0.47	0.36	0.24	0.18

Table 10: Percentiles of daily maximum eight-hour carbon monoxide at Geelong (2015–2019)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99th	98th	95th	90th	70th	50th
2015	98.4	0	1.1	0.8	0.7	0.5	0.4	0.2	0.2
2016	92.3	0	1.7	0.8	0.8	0.6	0.4	0.3	0.2
2017	93.4	0	1.1	0.9	0.8	0.5	0.4	0.3	0.2
2018	87.7	0	1.1	0.8	0.7	0.6	0.4	0.3	0.2
2019	94.25	0	1.54	0.85	0.71	0.48	0.31	0.23	0.15

B Nitrogen dioxide (NO_2)

In Victoria, nitrogen dioxide is assessed against a one-hour standard of 0.12 ppm, with one exceedance a day allowed per year and an annual standard of 0.030 ppm, with no exceedances allowed (Table 11). At all stations operating in Port Phillip 2019, the nitrogen dioxide standard was not exceeded and compliance demonstrated. Traralgon did not comply due to insufficient data being collected in quarter three. This occurred because data was invalidated due to the temporary installation of a diesel generator next to the station.

Table 11: 2019 compliance summary for nitrogen dioxide in Victoria

Monitoring station	Data availability rates (% of hours)					Number of exceedances (days)	Annual mean (ppm)	Performance against the standard and goals	
	Q1	Q2	Q3	Q4	Annual			1-hour	Annual
Port Phillip									
Alphington	93.15	94.69	92.16	87.18	91.77	0	9.04	MET	MET
Footscray	94.72	93.96	94.52	94.83	94.50	0	10.37	MET	MET
Geelong	89.40	95.28	92.21	94.38	92.82	0	5.54	MET	MET
Latrobe Valley									
Traralgon	92.22	93.91	66.08	91.16	85.78	0	6.71	NOT MET (i)	MET

Table 12: 2019 summary statistics for peak one-hour nitrogen dioxide in Victoria

Monitoring station	Highest reading (ppm)	Highest reading (date)	2nd highest reading (ppm)	2nd highest reading (date)
Port Phillip				
Alphington	0.042	12/04/2019	0.040	18/05/2019
Footscray	0.049	23/10/2019	0.044	17/05/2019
Geelong	0.038	14/06/2019	0.037	23/10/2019
Latrobe Valley				
Traralgon	0.035	04/10/2019	0.034	13/06/2019

Table 13: 2019 percentiles for daily peak one-hour nitrogen dioxide in Victoria

Monitoring station	Data availability (% of days)	Max (ppm)	Percentiles (ppm)					
			99th	98th	95th	90th	75th	50th
Port Phillip								
Alphington	94.52	0.042	0.038	0.035	0.032	0.030	0.025	0.019
Footscray	98.08	0.049	0.043	0.042	0.037	0.033	0.028	0.022
Geelong	95.89	0.038	0.035	0.031	0.029	0.025	0.021	0.014
Latrobe Valley								
Traralgon	87.95	0.035	0.034	0.032	0.029	0.025	0.020	0.014

Trends and pollutant distributions for nitrogen dioxide between 2015 and 2019

Percentiles of 2019 daily peak concentrations are provided for nitrogen dioxide for each station and standard as shown in Table 14 to Table 17. In these tables, daily peak values are calculated only when at least 75 per cent of the data for the day is valid. Data for stations with less than 15 per cent data in the year is omitted and stations with less than 75 per cent data are shown in italics.

Table 14: Percentiles of daily maximum one-hour nitrogen dioxide at Alphington (2015–2019)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99th	98th	95th	90th	70th	50th
2015	93.4	0	0.043	0.035	0.033	0.032	0.030	0.025	0.021
2016	91.5	0	0.043	0.038	0.036	0.031	0.029	0.023	0.018
2017	92.6	0	0.057	0.038	0.036	0.033	0.031	0.027	0.020
2018	96.7	0	0.050	0.039	0.036	0.033	0.031	0.026	0.020
2019	94.52	0	0.042	0.038	0.035	0.032	0.030	0.025	0.019

Table 15: Percentiles of daily maximum one-hour nitrogen dioxide at Footscray (2015–2019)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99th	98th	95th	90th	70th	50th
2015	98.6	0	0.046	0.040	0.038	0.035	0.032	0.028	0.021
2016	95.1	0	0.052	0.042	0.038	0.035	0.032	0.026	0.020
2017	92.6	0	0.050	0.047	0.042	0.039	0.035	0.029	0.023
2018	98.6	0	0.046	0.041	0.038	0.035	0.032	0.027	0.021
2019	98.08	0	0.049	0.043	0.042	0.037	0.033	0.028	0.022

Table 16: Percentiles of daily maximum one-hour nitrogen dioxide at Geelong (2015–2019)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99th	98th	95th	90th	70th	50th
2015	91.0	0	0.038	0.032	0.031	0.028	0.026	0.020	0.013
2016	90.3	0	0.044	0.037	0.031	0.028	0.025	0.021	0.014
2017	94.8	0	0.042	0.038	0.034	0.030	0.027	0.021	0.015
2018	88.3	0	0.051	0.038	0.034	0.030	0.026	0.019	0.014
2019	95.89	0	0.038	0.035	0.031	0.029	0.025	0.021	0.014

Table 17: Percentiles of daily maximum one-hour nitrogen dioxide at Traralgon (2015–2019)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99th	98th	95th	90th	70th	50th
2015	95.1	0	0.034	0.029	0.029	0.026	0.022	0.017	0.012
2016	86.6	0	0.036	0.033	0.030	0.027	0.024	0.020	0.014
2017	90.4	0	0.034	0.031	0.030	0.027	0.024	0.020	0.013
2018	97.3	0	0.053	0.031	0.030	0.027	0.025	0.020	0.012
2019	87.95	0	0.035	0.034	0.032	0.029	0.025	0.020	0.014

C Ozone (O_3)

In Victoria, ozone is assessed against a one-hour standard of 0.10 ppm and a four-hour standard of 0.08 ppm, with one exceedance day allowed per year as shown in Table 18. The one-hour and four-hour standards for ozone were met at Footscray, Geelong and Melton. An exceedance of the one-hour and four-hour standard was recorded at Alphington, Dandenong and Mooroolbark on 20 December 2019. The exceedance has been attributed to major bushfires across the state at the time. For the purpose of the Measure, the goal was met even though the standards were exceeded. Insufficient data was collected at Point Cook during quarters three and four due to issues associated with the station's power supply and hence compliance could not be demonstrated.

Table 18: 2019 compliance summary for ozone in Victoria

Region	Data availability rates (% of hours)					Number of exceedances (days) annual mean (ppm)		Performance against the standard and goals	
Monitoring station	Q1	Q2	Q3	Q4	Annual	1-hour	4-hour	1-hour	4-hour
Port Phillip									
Alphington	93.89	94.96	94.70	93.88	94.35	1	1	NOT MET	NOT MET
Dandenong	87.59	94.28	94.66	94.93	92.88	1	1	NOT MET	NOT MET
Footscray	93.84	94.87	94.57	94.79	94.51	0	0	MET	MET
Geelong	90.69	95.05	92.48	94.38	93.15	0	0	MET	MET
Melton	92.31	94.00	95.06	93.38	93.69	0	0	MET	MET
Mooroolbark	94.77	94.92	82.79	94.93	91.82	1	1	NOT MET	NOT MET
Point Cook	89.72	84.75	8.65	0.00	45.45	0	0	NOT MET (i)	NOT MET (i)
Latrobe Valley									
Traralgon	94.17	88.83	95.02	91.62	92.40	0	0	MET	MET

Table 19: 2019 summary statistics for daily peak one-hour ozone in Victoria

Monitoring station	Highest reading (ppm)	Highest reading (date)	2nd highest reading (ppm)	2nd highest reading (date)
Port Phillip				
Alphington	0.109	20/12/2019	0.084	14/01/2019
Dandenong	0.110	20/12/2019	0.079	09/03/2019
Footscray	0.088	20/12/2019	0.078	09/03/2019
Geelong South	0.076	18/12/2019	0.069	24/01/2019
Melton	0.076	14/01/2019	0.073	15/01/2019
Mooroolbark	0.103	20/12/2019	0.094	14/01/2019
Point Cook	0.067	24/02/2019	0.065	02/02/2019
Latrobe Valley				
Traralgon	0.089	04/03/2019	0.080	20/12/2019

Table 20: 2019 summary statistics for daily peak four-hour ozone in Victoria

Monitoring station	Highest reading (ppm)	Highest reading (date)	2nd highest reading (ppm)	2nd highest reading (date)
Port Phillip				
Alphington	0.097	20/12/2019	0.068	14/01/2019
Dandenong	0.103	20/12/2019	0.073	09/03/2019
Footscray	0.078	20/12/2019	0.069	09/03/2019
Geelong South	0.070	18/12/2019	0.063	02/02/2019
Melton	0.069	14/01/2019	0.066	09/03/2019
Mooroolbark	0.102	20/12/2019	0.079	14/01/2019
Point Cook	0.063	02/02/2019	0.063	24/01/2019
Latrobe Valley				
Traralgon	0.076	04/03/2019	0.075	20/12/2019

Table 21: 2019 percentiles for daily peak one-hour ozone in Victoria

Monitoring station	Data availability (% of days)	Max (ppm)	Percentiles (ppm)					
			99th	98th	95th	90th	75th	50th
Port Phillip								
Alphington	98.08	0.109	0.069	0.058	0.052	0.043	0.032	0.027
Dandenong	95.89	0.110	0.069	0.060	0.051	0.044	0.031	0.027
Footscray	98.08	0.088	0.068	0.060	0.050	0.041	0.031	0.026
Geelong	96.44	0.076	0.064	0.059	0.049	0.038	0.030	0.027
Melton	97.26	0.076	0.069	0.064	0.051	0.047	0.035	0.030
Mooroolbark	95.62	0.103	0.082	0.069	0.057	0.048	0.036	0.029
Point Cook	*46.85*	*0.067*	*0.065*	*0.065*	*0.058*	*0.050*	*0.034*	*0.027*
Latrobe Valley								
Traralgon	95.62	0.089	0.066	0.060	0.052	0.043	0.031	0.027

Table 22: 2019 percentiles for daily peak four-hour ozone in Victoria

Monitoring station	Data availability (% of days)	Max (ppm)	Percentiles (ppm)					
			99th	98th	95th	90th	75th	50th
Port Phillip								
Alphington	97.81	0.097	0.060	0.055	0.049	0.042	0.030	0.026
Dandenong	96.16	0.103	0.060	0.057	0.050	0.043	0.030	0.025
Footscray	98.08	0.078	0.059	0.054	0.046	0.040	0.029	0.024
Geelong	96.44	0.070	0.057	0.054	0.045	0.037	0.030	0.026
Melton	97.26	0.069	0.061	0.057	0.050	0.044	0.033	0.029
Mooroolbark	95.62	0.102	0.075	0.064	0.052	0.046	0.034	0.027
Point Cook	*46.85*	*0.063*	*0.060*	*0.058*	*0.053*	*0.047*	*0.032*	*0.027*
Latrobe Valley								
Traralgon	95.62	0.076	0.061	0.056	0.048	0.039	0.029	0.025

Trends and pollutant distributions for ozone between 2015 and 2019

Percentiles of 2019 daily peak concentrations are provided for ozone each station and standard for one-hour and four-hour averaging periods. In Table 23 to

Table 38, daily peak values are formed only when at least 75 per cent of the data for the day is valid. Data for stations with less than 15 per cent data in the year is omitted and stations with less than 75 per cent data are shown in italics. The percentiles for four-hour ozone are based on running averages, including those that overlap from one day to the next.

In 2019, exceedances of both the four-hour and one-hour standards were recorded at Alphington, Dandenong and Mooroolbark. These exceedances all occurred on 20 December 2019 and were likely to have been associated with bushfires across the state. Prior to this, exceedances of the four-hour standard were also recorded in 2018 at Footscray and Dandenong, which were associated with urban pollution.

One-hour ozone trends

Table 23: Percentiles of daily maximum one-hour ozone at Alphington (2015–2019)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99th	98th	95th	90th	70th	50th
2015	91.0	0	0.061	0.055	0.053	0.048	0.042	0.032	0.025
2016	96.7	0	0.066	0.058	0.054	0.047	0.037	0.028	0.022
2017	86.0	0	0.073	0.061	0.057	0.050	0.040	0.030	0.025
2018	98.4	0	0.081	0.059	0.055	0.049	0.043	0.033	0.028
2019	98.08	1	0.109	0.069	0.058	0.052	0.043	0.032	0.027

Table 24: Percentiles of daily maximum one-hour ozone at Dandenong (2015–2019)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99th	98th	95th	90th	70th	50th
2015	98.6	0	0.071	0.060	0.057	0.050	0.041	0.031	0.026
2016	*42.1*	*0*	*0.060*	*0.058*	*0.057*	*0.053*	*0.046*	*0.036*	*0.026*
2017	*46.6*	*0*	*0.069*	*0.067*	*0.062*	*0.058*	*0.053*	*0.042*	*0.031*
2018	97.3	0	0.094	0.060	0.052	0.045	0.041	0.032	0.027
2019	95.89	1	0.110	0.069	0.060	0.051	0.044	0.031	0.027

Table 25: Percentiles of daily maximum one-hour ozone at Footscray (2015–2019)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99th	98th	95th	90th	70th	50th
2015	99.5	0	0.064	0.058	0.054	0.046	0.040	0.031	0.025
2016	*64.8*	*0*	*0.065*	*0.055*	*0.052*	*0.044*	*0.040*	*0.030*	*0.024*
2017	98.1	0	0.079	0.063	0.057	0.051	0.043	0.031	0.027
2018	*50.4*	*0*	*0.089*	*0.070*	*0.062*	*0.052*	*0.048*	*0.038*	*0.030*
2019	98.08	0	0.088	0.068	0.060	0.050	0.041	0.031	0.026

Table 26: Percentiles of daily maximum one-hour ozone at Geelong (2015–2019)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99th	98th	95th	90th	70th	50th
2015	99.7	0	0.079	0.062	0.054	0.044	0.038	0.030	0.026
2016	98.1	0	0.056	0.052	0.048	0.043	0.035	0.028	0.025
2017	97.5	0	0.067	0.058	0.057	0.048	0.042	0.032	0.029
2018	87.1	0	0.069	0.061	0.051	0.045	0.039	0.031	0.028
2019	96.44	0	0.076	0.064	0.059	0.049	0.038	0.030	0.027

Table 27: Percentiles of daily maximum one-hour ozone at Melton (2015–2019)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99th	98th	95th	90th	70th	50th
2015	99.5	0	0.072	0.066	0.057	0.048	0.042	0.033	0.028
2016	*48.6*	*0*	*0.070*	*0.062*	*0.058*	*0.052*	*0.046*	*0.038*	*0.028*
2017[a]	*44.7*	*0*	*0.073*	*0.070*	*0.068*	*0.064*	*0.055*	*0.046*	*0.033*
2018	99.2	0	0.085	0.063	0.056	0.048	0.042	0.034	0.030
2019	97.26	0	0.076	0.069	0.064	0.051	0.047	0.035	0.030

Table 28: Percentiles of daily maximum one-hour ozone at Mooroolbark (2015–2019)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99th	98th	95th	90th	70th	50th
2015	*58.1*	*0*	*0.065*	*0.055*	*0.051*	*0.046*	*0.039*	*0.028*	*0.024*
2016	*42.9*	*0*	*0.073*	*0.068*	*0.065*	*0.054*	*0.049*	*0.040*	*0.029*
2017	*52.9*	*0*	*0.071*	*0.064*	*0.063*	*0.056*	*0.050*	*0.042*	*0.032*
2018	98.4	0	0.071	0.061	0.056	0.051	0.044	0.034	0.028
2019	95.62	1	0.103	0.082	0.069	0.057	0.048	0.036	0.029

Table 29: Percentiles of daily maximum one-hour ozone at Point Cook (2015–2019)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99th	98th	95th	90th	70th	50th
2015	98.4	0	0.076	0.066	0.064	0.047	0.042	0.032	0.028
2016	*54.9*	*0*	*0.066*	*0.061*	*0.059*	*0.049*	*0.043*	*0.033*	*0.026*
2017	*46.8*	*0*	*0.080*	*0.066*	*0.062*	*0.058*	*0.052*	*0.041*	*0.029*
2018	98.6	0	0.082	0.066	0.057	0.048	0.041	0.033	0.030
2019	*46.85*	*0*	*0.067*	*0.065*	*0.065*	*0.058*	*0.050*	*0.034*	*0.027*

Table 30: Percentiles of daily maximum one-hour ozone at Traralgon (2015–2019)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99th	98th	95th	90th	70th	50th
2015	97.5	0	0.059	0.053	0.049	0.041	0.035	0.028	0.023
2016	90.4	0	0.063	0.051	0.043	0.038	0.033	0.028	0.025
2017	97.8	0	0.064	0.052	0.049	0.043	0.038	0.030	0.026
2018	*51.8*	*0*	*0.067*	*0.054*	*0.053*	*0.048*	*0.042*	*0.034*	*0.027*
2019	95.62	0	0.089	0.066	0.060	0.052	0.043	0.031	0.027

Four-hour ozone trends

Table 31: Percentiles of daily maximum four-hour ozone at Alphington (2015–2019)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99th	98th	95th	90th	70th	50th
2015	91.0	0	0.059	0.052	0.048	0.044	0.040	0.029	0.024
2016	96.4	0	0.058	0.052	0.050	0.044	0.035	0.027	0.022
2017	85.8	0	0.067	0.056	0.054	0.048	0.040	0.028	0.024
2018	98.1	0	0.076	0.054	0.050	0.045	0.039	0.031	0.027
2019	97.81	1	0.097	0.060	0.055	0.049	0.042	0.030	0.026

Table 32: Percentiles of daily maximum four-hour ozone at Dandenong (2015–2019)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99th	98th	95th	90th	70th	50th
2015	98.6	0	0.064	0.058	0.054	0.046	0.039	0.029	0.025

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99th	98th	95th	90th	70th	50th
2016	*42.1*	*0*	*0.057*	*0.055*	*0.054*	*0.049*	*0.043*	*0.033*	*0.025*
2017	*46.6*	*0*	*0.064*	*0.059*	*0.057*	*0.054*	*0.051*	*0.039*	*0.029*
2018	97.3	1	0.083	0.056	0.050	0.043	0.038	0.030	0.026
2019	96.16	1	0.103	0.060	0.057	0.050	0.043	0.030	0.026

Table 33: Percentiles of daily maximum four-hour ozone at Footscray (2015–2019)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99th	98th	95th	90th	70th	50th
2015	99.5	0	0.055	0.051	0.049	0.043	0.037	0.029	0.024
2016	*64.8*	*0*	*0.053*	*0.051*	*0.049*	*0.043*	*0.038*	*0.029*	*0.023*
2017	98.1	0	0.067	0.058	0.051	0.046	0.040	0.030	0.026
2018	*50.1*	*1*	*0.082*	*0.067*	*0.059*	*0.049*	*0.044*	*0.036*	*0.028*
2019	98.08	0	0.078	0.059	0.054	0.046	0.040	0.029	0.024

Table 34: Percentiles of daily maximum four-hour ozone at Geelong South (2015–2019)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99th	98th	95th	90th	70th	50th
2015	99.7	0	0.061	0.056	0.050	0.042	0.035	0.029	0.025
2016	98.1	0	0.051	0.047	0.044	0.039	0.033	0.027	0.024
2017	97.3	0	0.061	0.056	0.052	0.046	0.040	0.031	0.028
2018	86.6	0	0.067	0.050	0.048	0.044	0.036	0.031	0.027
2019	96.44	0	0.070	0.057	0.054	0.045	0.037	0.030	0.026

Table 35: Percentiles of daily maximum four-hour ozone at Melton (2015–2019)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99th	98th	95th	90th	70th	50th
2015	99.5	0	0.070	0.059	0.050	0.045	0.040	0.032	0.027
2016	*48.6*	*0*	*0.058*	*0.057*	*0.053*	*0.049*	*0.044*	*0.036*	*0.027*
2017	*44.7*	*0*	*0.067*	*0.064*	*0.062*	*0.059*	*0.052*	*0.044*	*0.032*
2018	98.9	0	0.072	0.057	0.052	0.047	0.040	0.033	0.029
2019	97.26	0	0.069	0.061	0.057	0.050	0.044	0.033	0.029

Table 36: Percentiles of daily maximum four-hour ozone at Mooroolbark (2015–2019)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99th	98th	95th	90th	70th	50th
2015	*58.1*	*0*	*0.061*	*0.049*	*0.047*	*0.042*	*0.035*	*0.027*	*0.023*
2016	*42.9*	*0*	*0.066*	*0.062*	*0.061*	*0.052*	*0.045*	*0.038*	*0.027*
2017	*52.9*	*0*	*0.067*	*0.059*	*0.055*	*0.051*	*0.047*	*0.040*	*0.029*
2018	98.1	0	0.065	0.057	0.052	0.046	0.041	0.032	0.027
2019	95.62	1	0.102	0.075	0.064	0.052	0.046	0.034	0.027

Table 37: Percentiles of daily maximum four-hour ozone at Point Cook (2015–2019)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99th	98th	95th	90th	70th	50th
2015	98.4	0	0.062	0.060	0.057	0.046	0.040	0.031	0.027
2016	*54.9*	*0*	*0.057*	*0.057*	*0.055*	*0.046*	*0.040*	*0.032*	*0.026*
2017	*46.8*	*0*	*0.071*	*0.061*	*0.056*	*0.055*	*0.048*	*0.038*	*0.028*
2018	98.4	0	0.071	0.062	0.054	0.044	0.039	0.032	0.029
2019	*46.85*	*0*	*0.063*	*0.060*	*0.058*	*0.053*	*0.047*	*0.032*	*0.027*

Table 38: Percentiles of daily maximum four-hour ozone at Traralgon (2015–2019)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99th	98th	95th	90th	70th	50th
2015	97.5	0	0.053	0.047	0.045	0.036	0.033	0.026	0.022
2016	90.4	0	0.059	0.047	0.041	0.035	0.031	0.027	0.024
2017	97.8	0	0.056	0.049	0.045	0.040	0.036	0.029	0.025
2018	*51.5*	*0*	*0.061*	*0.052*	*0.051*	*0.042*	*0.039*	*0.032*	*0.026*
2019	95.62	0	0.076	0.061	0.056	0.048	0.039	0.029	0.025

D Sulfur dioxide (SO_2)

In Victoria, sulfur dioxide is assessed against a one-hour standard of 0.200 ppm, a daily standard of 0.080 ppm and an annual standard of 0.020 ppm, with one exceedance day allowed per year (Table 39).

In 2019, there were no exceedances and sufficient data was collected to demonstrate compliance at Alphington, Geelong and Traralgon. The relocation of the Altona station in 2019 meant that insufficient data was collected to demonstrate compliance for the one-hour, daily and annual standards. The relocation of Altona station should be completed in late 2020.

Table 39: 2019 compliance summary for sulfur dioxide in Victoria

Monitoring station	Date availability rates (% of hours)					Exceedances (days)		Annual mean (ppm)	Performance against the standards and goal		
	Q1	Q2	Q3	Q4	Annual	1-hour	24-hour		1-hour	24-hour	1-year
Port Phillip											
Alphington	93.84	94.00	94.47	93.88	94.04	0	0	0.0004	MET	MET	MET
Altona	94.81	95.27	0	0	45.94	0	0	Insufficient data to calculate	NOT MET (i)	NOT MET (i)	NOT MET (i)
Geelong	89.12	95.01	92.48	88.36	91.23	0	0	0.0004	MET	MET	MET
Latrobe Valley											
Traralgon	94.63	95.15	95.02	91.62	94.09	0	0	0.0008	MET	MET	MET

Table 40: 2019 summary statistics for daily peak one-hour sulfur dioxide in Victoria

Monitoring station	Number of valid days	Highest (ppm)	Highest (date)	2nd highest (ppm)	2nd highest (date)
Port Phillip					
Alphington	330	0.010	06/03/2019	0.008	12/08/2019
Altona	174	0.035	09/02/2019	0.031	10/05/2019
Geelong South	256	0.047	17/06/2019	0.046	22/07/2019
Latrobe Valley					
Traralgon	341	0.050	22/12/2019	0.048	17/12/2019

Table 41: 2019 summary statistics for daily sulfur dioxide in Victoria

Region Performance monitoring station	Number of valid days	Highest (ppm)	Highest (date)	2nd highest (ppm)	2nd highest (date)
Port Phillip					
Alphington	330	0.002	13/12/2019	0.002	05/06/2019
Altona	174	0.008	26/04/2019	0.007	06/03/2019
Geelong South	256	0.005	22/07/2019	0.005	17/06/2019
Latrobe Valley					
Traralgon	341	0.008	17/12/2019	0.006	22/12/2019

Table 42: 2019 percentiles of daily peak one-hour sulfur dioxide concentrations in Victoria

Monitoring station	Data availability (% of days)	Max (ppm)	Percentiles (ppm) 99th	98th	95th	90th	75th	50th
Port Phillip								
Alphington	97.81	0.010	0.006	0.005	0.004	0.003	0.002	0.001
Altona	47.95	0.035	0.03026	0.02804	0.025	0.021	0.011	0.004
Geelong South	94.25	0.047	0.02657	0.018	0.00985	0.005	0.002	0.001
Latrobe Valley								
Traralgon	97.53	0.050	0.03045	0.0259	0.015	0.008	0.005	0.003

Table 43: 2019 percentiles of daily sulfur dioxide concentrations in Victoria

Monitoring station	Data availability (% of days)	Max (ppm)	Percentiles (ppm) 99th	98th	95th	90th	75th	50th
Port Phillip								
Alphington	97.81	0.002	0.002	0.001	0.001	0.001	0.001	<0.001
Altona	*47.95*	*0.008*	*0.007*	*0.006*	*0.005*	*0.003*	*0.002*	*0.001*
Geelong South	94.25	0.005	0.003	0.002	0.002	0.001	<0.001	<0.001
Latrobe Valley								
Traralgon	97.53	0.008	0.004	0.003	0.002	0.002	0.001	0.001

Trends and pollutant distributions for sulfur dioxide between 2015 and 2019

Percentiles of 2019 daily peak concentrations are provided for sulfur dioxide for each station and standard. In these tables, daily peak values are formed only when at least 75 per cent of the data for the day is valid. Data for stations with less than 15 per cent data in the year is omitted and stations with less than 75 per cent data are shown in italics.

Table 44: Percentiles of daily maximum one-hour sulfur dioxide at Alphington (2015–2019)

Year	Data availability (% of days)	No. of exceedances (days)	Percentiles (ppm) Max	99th	98th	95th	90th	70th	50th
2015	86.6	0	0.012	0.009	0.007	0.006	0.004	0.003	0.001
2016	92.1	0	0.009	0.008	0.007	0.005	0.004	0.002	0.001
2017	95.9	0	0.011	0.003	0.002	0.001	0.001	0.001	0.000
2018	97.3	0	0.013	0.007	0.007	0.005	0.003	0.002	0.001
2019	97.81	0	0.010	0.006	0.005	0.004	0.003	0.002	0.001

Table 45: Percentiles of daily maximum one-hour sulfur dioxide at Altona (2015–2019)

Year	Data availability (% of days)	No. of exceedances (days)	Percentiles (ppm) Max	99th	98th	95th	90th	70th	50th
2015	98.4	0	0.062	0.041	0.039	0.031	0.025	0.011	0.004
2016	75.4	0	0.044	0.039	0.033	0.024	0.020	0.008	0.003
2017	86.8	0	0.049	0.019	0.014	0.007	0.003	0.001	0.001
2018	85.2	0	0.053	0.037	0.034	0.029	0.019	0.011	0.004
2019	*47.95*	*0*	*0.035*	*0.030*	*0.028*	*0.025*	*0.021*	*0.011*	*0.004*

Table 46: Percentiles of daily maximum one-hour sulfur dioxide at Geelong (2015–2019)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99th	98th	95th	90th	70th	50th
2015	98.6	0	0.026	0.017	0.014	0.010	0.006	0.003	0.001
2016	97.3	0	0.010	0.007	0.006	0.005	0.004	0.002	0.001
2017	94.8	0	0.017	0.003	0.002	0.001	0.001	0.001	0.000
2018	95.3	0	0.029	0.012	0.009	0.007	0.005	0.002	0.001
2019	94.25	0	0.047	0.027	0.018	0.010	0.005	0.002	0.001

Table 47: Percentiles of daily maximum one-hour sulfur dioxide at Traralgon (2015–2019)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99th	98th	95th	90th	70th	50th
2015	96.4	0	0.061	0.023	0.020	0.013	0.010	0.006	0.003
2016	88.5	0	0.057	0.023	0.017	0.014	0.010	0.006	0.003
2017	94.8	0	0.063	0.036	0.022	0.012	0.009	0.006	0.003
2018	90.1	0	0.079	0.039	0.022	0.014	0.010	0.005	0.002
2019	97.81	0	0.050	0.030	0.026	0.015	0.008	0.005	0.003

Table 48: Percentiles of daily sulfur dioxide at Alphington (2015–2019)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99th	98th	95th	90th	70th	50th
2015	86.6	0	0.003	0.002	0.002	0.001	0.001	0.001	0.000
2016	92.1	0	0.002	0.002	0.002	0.001	0.001	0.001	0.000
2017	95.6	0	0.003	0.002	0.002	0.001	0.001	0.001	0.000
2018	97	0	0.004	0.002	0.002	0.001	0.001	0.001	0.000
2019	97.81	0	0.002	0.002	0.001	0.001	0.001	0.001	<0.001

Table 49: Percentiles of daily sulfur dioxide at Altona (2015–2019)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99th	98th	95th	90th	70th	50th
2015	98.4	0	0.018	0.012	0.010	0.005	0.003	0.002	0.001
2016	75.4	0	0.013	0.008	0.006	0.004	0.003	0.002	0.001
2017	86.6	0	0.014	0.009	0.007	0.005	0.003	0.002	0.001
2018	85	0	0.015	0.009	0.009	0.005	0.003	0.002	0.001
2019	47.95	*0*	*0.008*	*0.007*	*0.006*	*0.005*	*0.003*	*0.002*	*0.001*

Table 50: Percentiles of daily sulfur dioxide at Geelong (2015–2019)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99th	98th	95th	90th	70th	50th
2015	98.6	0	0.003	0.003	0.002	0.002	0.001	0.001	0.000
2016	97.3	0	0.002	0.002	0.002	0.001	0.001	0.000	0.000
2017	94.5	0	0.002	0.002	0.002	0.001	0.001	0.001	0.000
2018	95.1	0	0.003	0.002	0.002	0.002	0.001	0.001	0.000
2019	94.25	0	0.005	0.003	0.002	0.002	0.001	<0.001	<0.001

Table 51: Percentiles of daily sulfur dioxide at Traralgon (2015–2019)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99th	98th	95th	90th	70th	50th
2015	96.4	0	0.007	0.005	0.003	0.003	0.002	0.001	0.001

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99th	98th	95th	90th	70th	50th
2016	88.5	0	0.006	0.005	0.004	0.003	0.002	0.001	0.001
2017	94.5	0	0.015	0.006	0.004	0.002	0.002	0.001	0.001
2018	89.6	0	0.010	0.005	0.003	0.002	0.002	0.001	0.000
2019	97.53	0	0.008	0.004	0.003	0.002	0.002	0.001	0.001

E Particulate matter less than 10 µm (PM_{10})

In Victoria, PM_{10} is assessed against a daily standard of 50 µg/m^3, with a goal of zero exceedance days allowed per year, excluding exceptional events. PM_{10} is also assessed against an annual standard of 25 µg/m^3 as shown in Table 52.

The goal was not met in 2019 at any station due to exceedances of the PM_{10} standard caused by a combination of days affected by windblown dust and bushfires.

Inferred causes of elevated PM_{10} concentrations can include:

- windborne dust (geological crustal material, often from distant and area wide sources)
- smoke from bushfires and land burning (fuel hazard reduction, regeneration, agricultural burning, private burning)
- accumulation of urban sources of particles during stable atmospheric conditions. This is typically from motor vehicles, domestic wood heaters and commercial/industrial emissions.

Bushfires and continental scale dust storms are classified as exceptional events as per the definition in the Measure. In 2019 no exceedances were attributed to continental-scale dust storms.

Table 52: 2019 compliance summary for daily PM_{10} in Victoria

Monitoring station	Data availability rates (% of hours)					Number of exceedances (days)	Annual average (µg/m^3)	Performance against the standard and goals
	Q1	Q2	Q3	Q4	Annual			
Port Phillip								
Alphington	97.73	95.38	96.20	97.79	96.61	5	18.24	NOT MET
Dandenong	91.85	97.57	99.05	96.28	96.20	9	19.11	NOT MET
Footscray	96.02	97.44	97.74	30.71	80.37	7	18.99	NOT MET
Geelong South	76.20	99.73	90.99	92.30	89.84	11	19.65	NOT MET
Mooroolbark	98.43	97.02	99.86	98.96	98.56	4	16.31	NOT MET
Latrobe Valley								
Traralgon	93.98	99.68	98.41	94.61	96.67	5	17.61	NOT MET

Table 53: 2019 summary statistics for daily PM_{10} in Victoria

Monitoring station	Highest reading (µg/m^3)	Highest reading (date)	2nd highest reading (µg/m^3)	2nd highest reading (date)
Port Phillip				
Alphington	69.82	23/12/2019	69.80	21/11/2019
Dandenong	144.03	17/04/2019	86.02	21/11/2019
Footscray	66.92	17/04/2019	58.83	25/01/2019
Geelong South	101.51	21/11/2019	81.61	30/12/2019
Mooroolbark	74.92	20/12/2019	59.08	09/03/2019
Latrobe Valley				
Traralgon	77.99	21/11/2019	60.94	20/12/2019

Table 54: 2019 PM_{10} exceedances

Date	Port Phillip					Latrobe Valley	Inferred cause
	Alphington	Dandenong	Footscray	Geelong South (µg/m³)	Mooroolbark (µg/m³)	Traralgon	
17/01/2019			51.20				Windblown dust
25/01/2019	55.78	52.51	58.83	72.59			Windblown dust
25/02/2019				53.47			Windblown dust
28/02/2019			52.09	60.87			Windblown dust
03/03/2019						55.23	Bushfire
09/03/2019					59.08		Bushfire
25/03/2019			52.73				Windblown dust
29/03/2019				65.13			Windblown dust
05/04/2019		51.46					Windblown dust
16/04/2019			51.18	68.42			Windblown dust
17/04/2019	54.60	144.03	66.92	60.39			Windblown dust
25/06/2019				70.98			Windblown dust
25/10/2019			54.29	62.23			Windblown dust
31/10/2019		51.62					Windblown dust
01/11/2019		80.36					Windblown dust
21/11/2019	69.80	86.02		101.51	50.84	77.99	Windblown dust
20/12/2019	64.39	75.51		66.50	74.92	60.94	Windblown dust / bushfire
23/12/2019	69.82					57.11	Windblown dust / bushfire
27/12/2019		58.45					Windblown dust / bushfire
30/12/2019		77.87		81.61	57.72	50.01	Windblown dust / bushfire

Table 55: 2019 percentiles for daily PM_{10} concentrations in Victoria

Monitoring station	Data availability (% days)	Max (µg/m³)	Percentiles					
			99th	98th	95th	90th	75th	50th
Port Phillip								
Alphington	95.89	69.82	55.20	45.01	37.15	31.85	22.87	16.79
Dandenong	94.79	144.03	76.81	51.71	38.58	33.38	23.97	16.45
Footscray	*71.78*	*66.92*	*52.34*	*50.87*	*39.90*	*33.15*	*24.85*	*17.37*
Geelong South	84.66	101.51	70.78	64.66	46.12	36.97	24.16	17.24
Mooroolbark	77.81	75.10	48.61	39.46	31.48	27.26	18.59	14.06
Latrobe Valley								
Traralgon	95.34	77.99	52.79	46.23	35.88	29.45	22.68	16.72

Trends and pollutant distributions for PM_{10} between 2015 and 2019

Percentiles of 2019 daily peak concentrations are provided for PM_{10} for each station and standard. In Tables 56 to 61, daily peak values are formed only when at least 75 per cent of the data for the day is valid. Data for stations with less than 15 per cent data in the year is omitted and stations with less than 75 per cent data are shown in italics. Exceedances are shown in bold.

There was an increase in the number of exceedances observed at many air monitoring stations in 2019. Many these exceedances are attributed to bushfires as well as wind-blown raised dust. Bureau of Meteorology data [6]indicates that rainfall in 2019 was approximately 28 per cent less than the long-term mean.

Table 56: Percentiles of daily PM_{10} at Alphington (2015–2019)

Year	Data availability (% of days)	No. of exceedances (days)	Max (µg/m³)	Percentiles (µg/m³)					
				99th	98th	95th	90th	70th	50th
2015	92.9	0	108.0	38.4	33.3	27.5	24.7	20.0	15.3
2016	75.3	0	37.9	35.0	32.6	28.4	25.3	20.3	15.0
2017	95.9	0	41.1	32.5	31.2	27.3	24.1	20.0	15.8
2018	91.2	**3**	74.0	47.4	46.2	38.3	31.0	22.5	17.3
2019	95.89	**5**	69.82	55.20	45.01	37.15	31.85	22.87	16.79

Table 57: Percentiles of daily PM_{10} at Dandenong (2015–2019)

Year	Data availability (% of days)	No. of exceedances (days)	Max (µg/m³)	Percentiles (µg/m³)					
				99th	98th	95th	90th	70th	50th
2015[a]	69.9	0	47.8	41.9	38.1	32.9	26.5	22.6	17.5
2016	95.9	0	41.8	37.1	33.9	30.2	26.3	20.0	14.6
2017[a]	*22.7*	*0*	*37.5*	*35.3*	*34.2*	*30.0*	*28.1*	*22.8*	*16.7*
2018[b]	95.9	**3**	89.7	47.6	40.6	33.5	29.0	24.1	17.4
2019	94.79	**9**	144.03	76.81	51.71	38.58	33.38	23.97	16.45

Table 58: Percentiles of daily PM_{10} at Footscray (2015–2019)

Year	Data availability (% of days)	No. of exceedances (days)	Max (µg/m³)	Percentiles (µg/m³)					
				99th	98th	95th	90th	70th	50th
2015	97.0	**3**	71.8	44.7	35.7	32.5	28.8	21.9	16.4
2016	94.2	0	42.7	37.9	35.1	29.3	25.9	20.2	14.1
2017	91.2	0	49.8	39.5	36.6	31.0	28.1	23.0	17.4
2018	95.6	**1**	58.8	46.2	42.3	35.0	29.5	23.4	17.2
2019	*71.78*	***7***	*66.92*	*52.34*	*50.87*	*39.90*	*33.15*	*24.85*	*17.37*

[6] http://www.bom.gov.au/

Table 59: Percentiles of daily PM_{10} at Geelong (2015–2019)

Year	Data availability (% of days)	No. of exceedances (days)	Max (µg/m³)	Percentiles (µg/m³)					
				99th	98th	95th	90th	70th	50th
2015[a]	79.7	**10**	286.1	84.4	64.1	45.5	32.4	23.8	16.6
2016[a]	93.7	**5**	68.3	56.9	47.3	36.8	30.4	21.9	15.9
2017[a]	79.7	**3**	73.7	44.3	39.6	32.4	29.6	22.8	16.6
2018[a]	94.0	**6**	97.1	70.1	46.7	41.4	33.8	25.0	17.5
2019	84.66	**11**	101.51	70.78	64.66	46.12	36.97	24.16	17.24

Table 60: Percentiles of daily PM_{10} at Mooroolbark (2015–2019)

Year	Data availability (% of days)	No. of exceedances (days)	Max (µg/m³)	Percentiles (µg/m³)					
				99th	98th	95th	90th	70th	50th
2015	*15.6*	*0*	*39.5*	*37.5*	*35.5*	*31.8*	*27.2*	*22.0*	*17.5*
2016	96.4	0	44.7	32.4	29.7	26.3	22.4	17.4	12.5
2017	81.9	**2**	55.4	36.3	31.2	24.5	21.6	18.5	14.4
2018	95.9	**1**	111.3	34.6	33.7	29.1	25.3	20.2	15.3
2019	77.81	**4**	75.10	48.61	39.46	31.48	27.26	18.60	14.06

Table 61: Percentiles of daily PM_{10} at Traralgon (2015–2019)

Year	Data availability (% of days)	No. of exceedances (days)	Max (µg/m³)	Percentiles (µg/m³)					
				99th	98th	95th	90th	70th	50th
2015	84.4	0	45.0	29.7	29.0	26.2	21.9	17.2	13.9
2016	98.6	0	49.2	36.0	30.2	25.4	21.8	17.4	14.0
2017	91.8	0	42.8	32.2	28.4	24.6	21.8	18.0	14.7
2018	95.6	**1**	50.1	34.1	28.5	25.9	22.9	18.9	14.8
2019	95.34	**5**	77.99	52.79	46.23	35.88	29.45	22.68	16.72

F Particulate matter less than 2.5 µm ($PM_{2.5}$)

$PM_{2.5}$ is monitored using two methods as part of the network. The first is the reference method and the second is the reference equivalence method, which has been demonstrated to be an equivalent method. In Victoria, $PM_{2.5}$ is assessed against a one-day standard of 25 µg/m^3 and an annual standard of 8 µg/m^3 (Table 62 and Table 65).

While the goal for Alphington and Footscray in 2019 was met using the reference method, this method only provides data on one day out of every three days. The goal for $PM_{2.5}$ was not met at any stations where continuous reference equivalence monitoring was carried out. The annual standard was also exceeded at Traralgon. At Alphington, a flow issue due to a faulty pump was detected during data validation. As such, data during quarter four was not considered valid, resulting in data capture below 75 per cent for this quarter.

Inferred causes of $PM_{2.5}$ exceedances can include:

- smoke from bushfires and land burning (fuel hazard reduction, regeneration, agricultural burning, private burning)
- accumulation of urban sources of particles during stable atmospheric conditions. Urban sources typically come from motor vehicles, domestic wood heaters and commercial/industrial emissions.

Sources of $PM_{2.5}$ also include naturally occurring sources caused by weather conditions and the formation of secondary particles from aerosols.

Bushfires and land burns are classified as exceptional events as per the definition in the Measure.

Reference method (manual sample once every three days)

Table 62: 2019 compliance summary for daily $PM_{2.5}$ in Victoria (reference method)

Monitoring station	Data availability rates are based on a one-day-in-three sampling regime (% of days)					Number of exceedances (days)	Annual average (µg/m^3)	Performance against the standard and goals
	Q1	Q2	Q3	Q4	Annual			
Port Phillip								
Alphington	100	93.3	100	96.8	97.5	0	6.95	MET
Footscray	100	96.7	100	96.7	98.4	0	6.67	MET

Table 63: 2019 summary statistics for daily $PM_{2.5}$ in Victoria (reference method)

Monitoring station	Number of valid days	Highest (µg/m^3)	Highest (date)
Port Phillip			
Alphington	119	17.5	19/05/2019
Footscray	120	18.3	03/02/2019

Table 64: 2019 percentiles for daily $PM_{2.5}$ concentrations in Victoria (reference method)

Monitoring station	Data availability	Max (µg/m3)	Percentiles (µg/m^3)					
			99th	98th	95th	90th	75th	50th
Port Phillip								
Alphington	97.54	17.5	16.66	15.90	14.00	11.62	8.65	6.1
Footscray	98.36	18.3	17.18	15.69	13.02	11.55	8.43	5.7

Continuous equivalence methods

EPA monitors $PM_{2.5}$ using the reference method specified in the Measure (on a one-day-in-three basis) at two stations (Alphington and Footscray). EPA also monitors $PM_{2.5}$ continuously at these four stations (Alphington, Footscray, Geelong and Traralgon) using equivalence reference method.

Table 65: 2019 compliance summary for daily $PM_{2.5}$ in Victoria (equivalence method)

Monitoring station	Data availability rates (% of hours)					Number of exceedances (days)	Annual average (µg/m^3)	Performance against the standard and goals
	Q1	Q2	Q3	Q4	Annual			
Port Phillip								
Alphington	97.31	98.63	77.40	0	68.09	2	7.61	NOT MET
Footscray	98.84	98.67	99.14	98.96	98.89	4	7.48	NOT MET
Geelong	93.80	100.00	96.20	98.01	97.00	1	6.37	NOT MET
Latrobe Valley								
Traralgon	98.66	99.95	92.26	94.34	96.27	7	8.89	NOT MET

Table 66: 2019 summary statistics for daily $PM_{2.5}$ in Victoria (equivalence method)

Monitoring station	Highest (µg/m^3)	Highest (date)	2nd highest reading (µg/m^3)	2nd highest reading (date)
Port Phillip				
Alphington	30.65	23/06/2019	25.42	18/05/2019
Footscray	29.57	25/12/2019	27.77	18/05/2019
Geelong	32.01	25/12/2019	23.61	25/06/2019
Latrobe Valley				
Traralgon	37.40	20/05/2019	35.49	04/02/2019

Table 67: 2019 $PM_{2.5}$ exceedances

Date	Port Phillip Region				Inferred cause
	Alphington (µg/m^3)	Footscray (µg/m^3)	Geelong (µg/m^3)	Traralgon (µg/m^3)	
30/01/2019					Bushfire
04/02/2019				35.94	Bushfire
03/03/2019				32.74	Bushfire
04/03/2019				28.40	Bushfire
09/03/2019		27.21			Bushfire
10/03/2019				28.40	Bushfire
18/05/2019	25.4	27.771			Land burn
20/05/2019				37.40	Land burn
23/06/2019	30.65				Urban / wood heaters
05/07/2019		25.71			Urban
26/11/2019				29.77	Bushfire
20/12/2019				34.40	Bushfire
25/12/2019		29.57	32.01		Bushfire

Table 68: 2019 percentiles for daily $PM_{2.5}$ concentrations in Victoria (BAM)

Monitoring station	Data availability	Max (µg/m^3)	Percentiles (µg/m^3)					
			99th	98th	95th	90th	75th	50th
Port Phillip								
Alphington	67.95	30.65	23.69	18.89	16.18	13.29	9.27	6.45
Footscray	98.36	29.57	23.87	20.73	14.90	12.26	8.66	6.64
Geelong	95.89	32.00	19.20	16.96	12.86	10.41	7.56	5.56
Latrobe Valley								
Traralgon	95.34	37.40	31.35	23.88	19.25	14.82	10.57	7.57

Trends and pollutant distributions for $PM_{2.5}$ between 2015 and 2019

Percentiles of 2019 daily peak concentrations are provided for $PM_{2.5}$ each station. In Tables 69 to 76, daily peak values are only calculated when at least 75 per cent of the data for the day is valid. Data for stations with less than 15 per cent data in the year is omitted and stations with less than 75 per cent data is shown in italics. Exceedances are shown in bold.

Monitoring stations in the Port Phillip region recorded similar numbers of exceedances compared with previous years. The Traralgon monitoring station representing the Latrobe Valley region recorded an increase in the number of exceedances from two in 2018 to eight in 2019. Most of these exceedances were due to two major bushfires in eastern Victoria in early and late 2019.

Table 69: Percentiles of daily $PM_{2.5}$ at Alphington (2015-2019) Partisol

Year	Data availability (% of days)	No. of exceedances (days)	Max (µg/m³)	Percentiles (µg/m³)					
				99th	98th	95th	90th	70th	50th
2015	100	0	20.7	19.3	18.2	13.4	10.6	7.9	5.8
2016	98.4	2	26	24.1	17.6	14.1	12.1	9.4	6.2
2017	97.5	4	33.1	27.1	26.4	18.1	14.7	8.5	6.7
2018	99.2	1	31.0	21.2	18.4	15.0	11.5	8.9	6.6
2019	97.5	0	17.5	16.7	15.9	14.0	11.6	8.7	6.1

Table 70: Percentiles of daily $PM_{2.5}$ at Footscray (2015–2019) Partisol

Year	Data availability (% of days)	No. of exceedances (days)	Max (µg/m³)	Percentiles (µg/m³)					
				99th	98th	95th	90th	70th	50th
2015	100.0	0	20.8	19.0	14.0	12.3	10.5	7.8	5.5
2016	94.3	2	27	23	17.4	14.0	11.6	9.0	5.8
2017	100	2	29.2	26.2	19.5	16.0	11.8	8.6	6.4
2018	92.6	1	32.0	16.5	16.4	13.8	11.0	8.7	6.2
2019	98.4	0	18.3	17.2	15.7	13.0	11.6	8.4	5.7

Equivalence methods (continuous)

Victoria monitors $PM_{2.5}$ by the reference method specified in the Measure (on a one-day-in-three basis) at two stations (Alphington and Footscray). It also monitors $PM_{2.5}$ continuously at four stations (Alphington, Footscray, Geelong and Traralgon) using BAM.

Table 71: Percentiles of daily $PM_{2.5}$ at Alphington (2015–2019) (equivalence methods)

Year	Data availability (% of days)	No. of exceedances (days)	Max (µg/m³)	Percentiles (µg/m³)					
				99th	98th	95th	90th	70th	50th
2015	79.5	2	30.0	24.5	23.3	19.2	13.3	10.0	7.3
2016	84.4	2	33.6	23.0	22.3	14.5	11.9	8.6	6.3
2017	92.6	8	35.9	27.7	26.6	20.3	15.7	10.2	7.4
2018	87.7	8	42.0	29.7	27.2	17.4	13.4	8.8	6.5
2019	*67.95*	*2*	*30.65*	*23.69*	*18.89*	*16.18*	*13.29*	*9.27*	*6.45*

Table 72: Percentiles of daily $PM_{2.5}$ at Footscray (2015–2019) (equivalence methods)

Year	Data availability (% of days)	No. of exceedances (days)	Max (µg/m³)	Percentiles (µg/m³)					
				99th	98th	95th	90th	70th	50th
2015	*73.4*	*0*	*23.3*	*19.3*	*16.4*	*13.4*	*11.6*	*9.0*	*6.8*
2016	93.4	2	25.9	19.6	14.6	12.9	11.1	8.4	6.2
2017	96.4	4	34.8	24.5	20.7	15.5	13.1	9.2	6.8
2018	88.5	5	31.2	28.3	20.9	15.3	12.5	8.8	6.7
2019	98.36	4	29.57	23.87	20.73	14.90	12.26	8.66	6.64

Table 73: Percentiles of daily $PM_{2.5}$ at Geelong (2016–2019) (equivalence methods)

Year	Data availability (% of days)	No. of exceedances (days)	Max (µg/m³)	Percentiles (µg/m³)					
				99th	98th	95th	90th	70th	50th
2016	*51.4*	*0*	*15.5*	*12.6*	*11.6*	*10.0*	*9.0*	*6.8*	*5.3*
2017	82.7	2	26.8	22.3	18.2	13.5	10.9	8.5	6.4
2018	86.8	1	31.0	21.9	18.4	13.6	10.2	7.7	5.6
2019	95.89	1	32.01	19.20	16.96	12.86	10.41	7.56	5.56

Table 74: Percentiles of daily $PM_{2.5}$ at Traralgon (2016–2019) (equivalence methods)

Year	Data availability (% of days)	No. of exceedances (days)	Max (µg/m³)	Percentiles (µg/m³)					
				99th	98th	95th	90th	70th	50th
2016	95.1	1	25.7	22.9	20.6	15.6	12.4	9.3	6.9
2017	86.8	5	32.3	28.0	22.0	18.3	14.8	9.8	7.2
2018	87.1	2	30.1	23.2	22.3	17.7	13.4	9.7	6.8
2019	95.34	8	37.40	31.35	23.88	19.25	14.82	10.57	7.57

Population weighted concentration

For regions for which there are no Measure-compliant air quality monitoring stations present, estimated hourly $PM_{2.5}$ concentrations across a 3 x 3 km grid determined from the BOM/CSIRO air pollution modelling (AQFX system) air pollution (Figure 3) was used to determine the population weighted concentration. A population weighted concentration gives greater weight to modelled concentrations that occur where population centres are. The model was first used by the Bureau of Meteorology in May 2018. 2019 was the first year where a full year was modelled.

The modelled mean $PM_{2.5}$ shows that bushfires and land burns can have significant impact on annual $PM_{2.5}$ concentrations (Figure 3). This data was weighted against population data collected during the 2016 census to calculate a population weighted annual concentration of 7.1 µg/m^3 for Victoria in 2019. The model also estimated that approximately 52.6 per cent of the Victorian population may have experienced an annual mean concentration of 8 µg/m^3 or greater and 28.2 per cent experienced a concentration of 9 µg/m^3 or greater.

Table 75: Population weighted annual mean daily exposure concentrations

Year	Data capture (%)	Mean concentration across Victoria	Population-weighted annual mean daily exposure concentration
2019	99.72	8.18	7.92

Table 76: Population exposed to weighted annual mean daily concentrations in 2019

Concentration (µg/m^3)	Percentage of population exposed
5	99.81
6	85.99
7	68.31
8	52.61
9	28.18
10	4.00
15	0.26
20	0.11
25	0.05
35	0.01
40	0.01

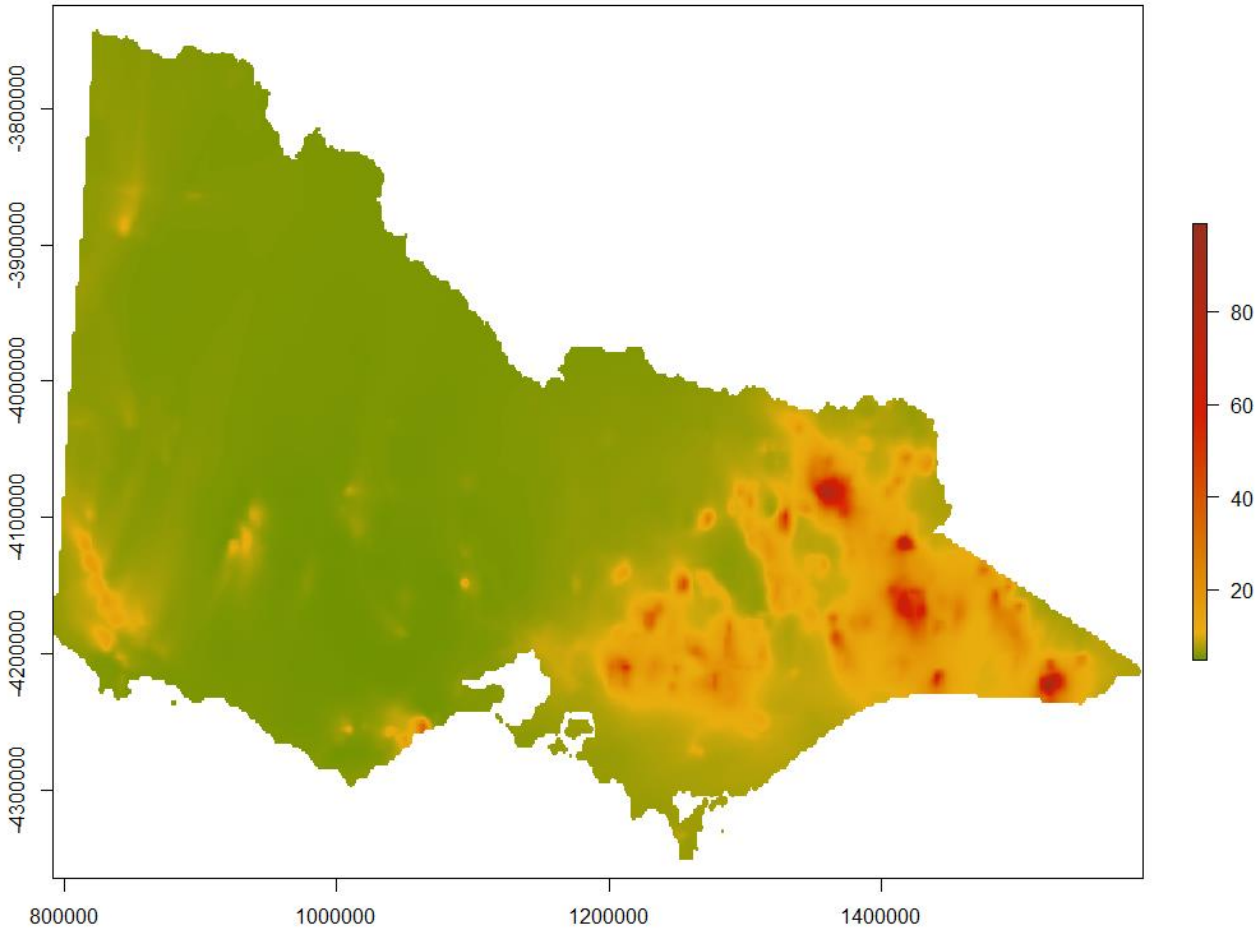

Figure 3: $PM_{2.5}$ Population weighted concentration (µg/m^3)