

AIR MONITORING REPORT, 2002
COMPLIANCE WITH THE NATIONAL ENVIRONMENT PROTECTION
(AMBIENT AIR QUALITY) MEASURE

Publication 907

June 2003

Air quality in Victoria is monitored in accordance with a monitoring plan developed under the Ambient Air Quality National Environment Protection Measure¹ (AAQ NEPM). This report assesses compliance with this Measure.

SUMMARY

Victoria's monitoring results for 2002 indicated that:

- The goal of the AAQ NEPM is to achieve by 2008 the standards to the extent specified, was met for all pollutants except particles (as PM₁₀) at Geelong.
- Exceedence of the standards occurred only for PM₁₀, on eight days. Most exceedences were caused by wind-blown dust.
- The consistently high data capture rates required by the AAQ NEPM guidelines were achieved in most cases, with ozone being a notable exception.
- Compliance with the standards and the 2008 goal could not be demonstrated at some monitoring stations because the data capture was lower. It is expected that air quality at these stations would most likely have complied.

- Victoria has an on-going program to increase data capture through improvements to systems and instrument upgrades.

Additional monitoring stations and instruments were brought into service during the year to fulfil commitments in Victoria's monitoring plan², namely:

- Outer East Metro performance monitoring station;
- Northwest Metro performance monitoring station;
- Outer Southeast Metro campaign monitoring station for ozone;
- Ballarat campaign monitoring station for particles; and
- Continuous monitoring for particles at CBD, Geelong, Latrobe Valley East Central and Latrobe Valley West Central.

Monitoring proceeded in accordance with the monitoring plan, AAQ NEPM Technical Papers and EPA's NATA accreditation.

DETAILS

Current Performance Monitoring Stations

Victoria's AAQ NEPM air monitoring plan was approved by the National Environment Protection

¹ National Environment Protection Measure for Ambient Air Quality, *National Environment Protection Council Publication*, available from www.ephc.gov.au

² Ambient Air Quality NEPM Monitoring Plan Victoria, *EPA Publication 763*, available from www.epa.vic.gov.au.

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Council (NEPC) Ministers in February 2001. Data presented in this report have been produced in accordance with the monitoring plan, except where amendments or other issues are noted.

The AAQ NEPM requires the monitoring of the pollutants carbon monoxide (CO), nitrogen dioxide (NO₂), ozone (O₃), sulfur dioxide (SO₂), lead (Pb) and

particles less than 10 micrometres in diameter (PM₁₀).

Eight regions are defined in the monitoring plan: Port Phillip, Latrobe Valley, Ballarat, Bendigo, Shepparton, Wodonga, Warrnambool and Mildura. They are shown in Figure 1. Monitoring stations in the Port Phillip region are shown in Figure 2.

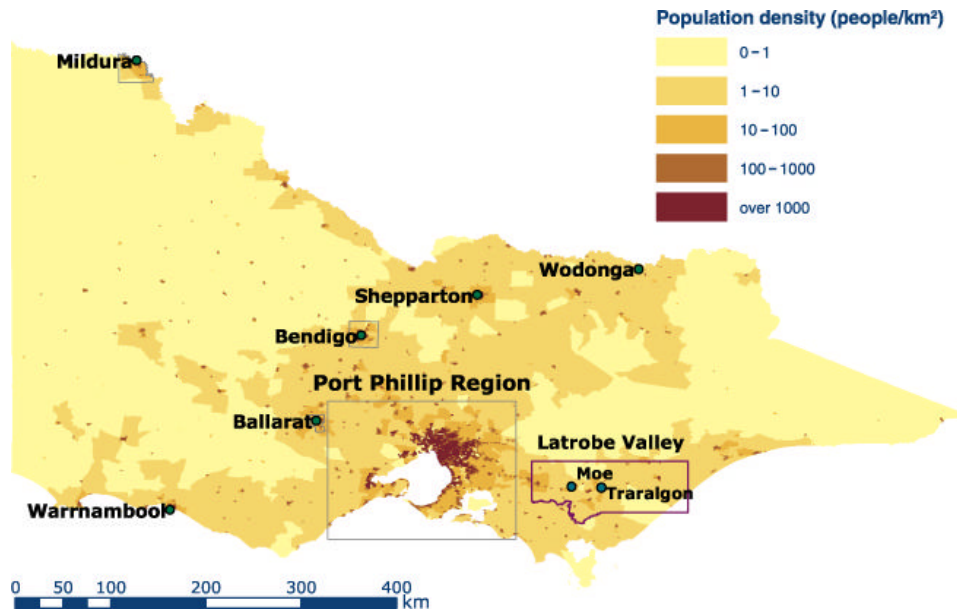


Figure 1. AAQ NEPM Regions and Population Density in Victoria

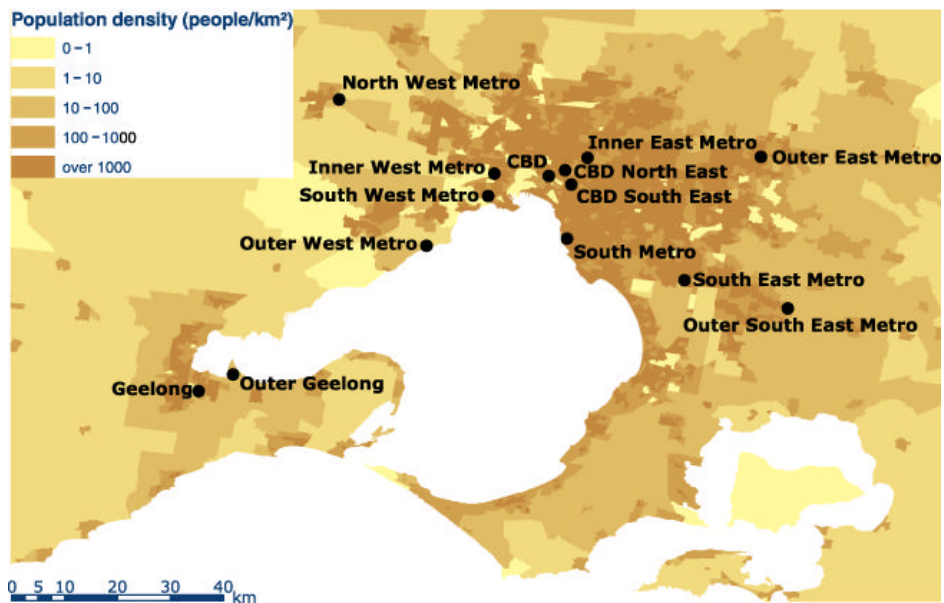


Figure 2. Monitoring Stations in Port Phillip Region

The performance monitoring stations, pollutants monitored and site types are summarised in Appendix 1.

Additions to the Monitoring Network

During 2002 Victoria established additional performance monitoring stations at:

- *Outer East Metro*: This station is located in a residential area of Mooroolbark, approximately 35km east of the CBD.
- *Northwest Metro*: This station is located in a university campus in a residential area at Melton, approximately 40km northwest of the CBD.

Campaign monitoring stations were established in 2002 at:

- *Outer Southeast Metro*: This station to monitor ozone is located in parkland containing sports grounds at Pakenham, on the urban/rural interface 55km from the CBD and 160m from a major highway.
- *Ballarat*: This station monitors PM₁₀ with a high-volume sampler operating one day in six.

New instruments were installed to continuously monitor PM₁₀ by tapered element oscillating microbalance (TEOM) at:

- *CBD and Geelong* in the Port Phillip region, replacing high-volume samplers.
- *Latrobe Valley East and West Central* (Traralgon and Moe), where PM₁₀ was not previously monitored.

Further information on these additions and other changes to the monitoring plan is given in Appendix 1.

Assessment of Compliance with Standards and 2008 Goal

Tables 1 to 6 summarise the compliance of monitoring with the standards and goal of the AAQ NEPM. Performance is assessed as meeting the standards and 2008 goal if the number of exceedences of the standard is no more than the number specified in Schedule 2 of the AAQ NEPM and data recovery was at least 75% in each quarter of the year. Regions also meet the standards and goal if they do not require monitoring on the basis that screening³ shows pollutant levels are reasonably expected to be consistently below the relevant standards.

Performance is assessed as 'not demonstrated' if there has been insufficient data collected to demonstrate that the standards and 2008 goal have been met or not met. Regions may also be assessed as 'not demonstrated' if screening has not been completed.

Additional monitoring statistics prepared in accordance with AAQ NEPM guidelines are shown in Appendix 2.

³ National Environment Protection (Ambient Air Quality) Measure Technical Paper No. 4, "Screening Procedures", available from www.ephc.gov.au.

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Table 1. 2002 compliance summary for CO in Victoria

AAQ NEPM Standard
9.0 ppm (8-hour average)

Region Performance monitoring station	Location	Data recovery rates (% of hours)					Number of exceedences (days)	Performance against the standard and 2008 goal
		Q1	Q2	Q3	Q4	Annual		
<u>Port Phillip</u>								
CBD	RMIT	88.2	83.9	89.7	76.2	84.5	0	met
CBD Southeast	Richmond	86.1	90.7	93.0	92.4	90.6	0	met
Inner East Metro	Alphington	89.5	90.4	92.6	91.2	90.9	0	met
Geelong	Geelong South	92.2	78.8	83.2	86.7	85.2	0	met

Regions which do not require monitoring on the basis that screening shows pollutant levels are reasonably expected to be consistently below the relevant AAQ NEPM standard: Latrobe Valley.

Regions for which screening has not been completed and which are therefore reported as 'Not Demonstrated': Ballarat, Bendigo, Shepparton, Warrnambool, Wodonga, Mildura.

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Table 2. 2002 compliance summary for NO₂ in Victoria

AAQ NEPM Standard

0.12 ppm (1-hour average)

0.03 ppm (1-year average)

Region Performance monitoring station	Location	Data recovery rates (% of hours)					Number of exceedences (days)	Annual mean (ppm)	Performance against the standards and 2008 goal	
		Q1	Q2	Q3	Q4	Annual			1-hour	1-year
<u>Port Phillip</u>										
CBD	RMIT	88.2	86.0	89.5	90.4	88.6	0	0.012	met	met
Inner East Metro	Alphington	92.4	80.8	88.2	90.3	87.9	0	0.013	met	met
Inner West Metro	Footscray	92.8	91.9	94.1	76.3	88.7	0	0.012	met	met
South Metro	Brighton	93.3	85.4	92.3	87.2	89.6	0	0.010	met	met
Outer West Metro	Pt Cook	88.3	85.2	93.8	92.3	89.9	0	0.005	met	met
Geelong	Geelong South	92.1	86.4	87.9	87.9	88.5	0	0.004	met	met
<u>Latrobe Valley</u>										
LV East Central	Traralgon	95.7	95.5	90.6	95.6	94.3	0	0.007	met	met
LV West Central	Moe	89.3	92.9	94.4	95.1	92.9	0	0.007	met	met

Regions for which screening has not been completed and which are therefore reported as 'Not Demonstrated': Ballarat, Bendigo, Shepparton, Warrnambool, Wodonga, Mildura.

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Table 3. 2002 compliance summary for ozone in Victoria

AAQ NEPM Standard
0.10 ppm (1-hour average)
0.08 ppm (4-hour average)

Region Performance monitoring station	Location	Data recovery rates (% of hours)					Number of exceedences (days)		Performance against the standards and 2008 goal	
		Q1	Q2	Q3	Q4	Annual	1-hour	4-hour	1-hour	4-hour
<u>Port Phillip</u>										
Inner East Metro ^a	Alphington	59.7	91.1	91.5	93.4	84.0	0	0	ND	ND
Inner West Metro	Footscray	90.9	93.8	94.5	90.7	92.5	0	0	met	met
North West Metro ^b	Melton				61.3	15.5	0	0	ND	ND
South Metro ^a	Brighton	71.2	91.0	92.3	93.2	87.0	0	0	ND	ND
South East Metro ^a	Dandenong	78.4	88.8	92.7	68.4	82.1	0	0	ND	ND
Outer East Metro ^c	Mooroolbark		46.8	88.5	94.4	57.8	0	0	ND	ND
Outer Southeast ^d	Pakenham			49.4	93.0	35.9	0	0	ND	ND
Outer West Metro	Point Cook	90.5	89.4	94.3	88.8	90.8	0	0	met	met
Geelong ^a	Geelong South	92.1	90.7	64.1	93.0	84.9	0	0	ND	ND
Outer Geelong	Point Henry	88.5	94.7	94.7	95.1	93.3	0	0	met	met
<u>Latrobe Valley</u>										
LV East Central	Traralgon	95.7	95.4	95.4	95.6	95.5	0	0	met	met
LV West Central	Moe	89.4	95.5	95.6	91.8	93.1	0	0	met	met

ND Not demonstrated.

a Compliance not demonstrated because data capture was less than 75% in one quarter. From comparisons with other stations, it is likely that complete monitoring would have shown that standards were met.

b Monitoring commenced in October.

c Monitoring commenced in May.

d Campaign monitoring commenced in August for one ozone season.

Regions for which screening has not been completed and which are therefore reported as 'Not Demonstrated': Ballarat, Bendigo, Shepparton, Warrnambool, Wodonga, Mildura.

EPA Victoria

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Table 4. 2002 compliance summary for SO₂ in Victoria

AAQ NEPM Standard
 0.20 ppm (1-hour average)
 0.08 ppm (24-hour average)
 0.02 ppm (1-year average)

Region Performance monitoring station	Location	Data recovery rates (% of hours)					Number of exceedences (days)		Annual mean (ppm)	Performance against the standards and 2008 goal		
		Q1	Q2	Q3	Q4	Annual	1-hour	24-hour		1-hour	24-hour	1-year
<u>Port Phillip</u>												
CBD	RMIT	88.2	85.9	89.4	90.5	88.5	0	0	0.000	met	met	met
Inner East Metro	Alphington	92.5	91.3	92.5	91.3	91.9	0	0	-0.001 ^b	met	met	met
Southwest Metro	Paisley	91.1	90.8	92.1	91.5	91.4	0	0	0.001	met	met	met
Geelong ^a	Geelong South	45.9	90.1	89.9	90.2	79.2	0	0	-0.001 ^b	ND	ND	ND
<u>Latrobe Valley</u>												
LV East Central	Traralgon	95.7	92.1	90.4	93.9	93.0	0	0	0.002	met	met	met
LV West Central	Moe	89.4	95.5	95.4	94.8	93.8	0	0	0.002	met	met	met

ND Not demonstrated.

a Compliance not demonstrated because data capture was less than 75% in one quarter. As all recorded values are low, it is likely that complete monitoring would have shown that standards were met.

b Negative values result from uncertainty in measurements near zero.

Regions which do not require monitoring on the basis of screening arguments that pollutant levels are reasonably expected to be consistently below the relevant AAQ NEPM standard: Ballarat, Bendigo, Shepparton, Warrnambool, Wodonga, Mildura.

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Table 5. 2002 compliance summary for lead in Victoria

AAQ NEPM Standard
0.50 µg/m³ (1-year average)

Region Performance monitoring station	Location	Data recovery rates (% of days)					Annual mean (µg/m ³)	Performance against the standard and 2008 goal
		Q1	Q2	Q3	Q4	Annual		
<u>Port Phillip</u> CBD Northeast	Collingwood	93.2	100.0	100.0	80.0	93.3	0.08	met

Regions which do not require monitoring on the basis of screening arguments that pollutant levels are reasonably expected to be consistently below the relevant AAQ NEPM standard: Latrobe Valley, Ballarat, Bendigo, Shepparton, Warrnambool, Wodonga, Mildura

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Table 6. 2002 compliance summary for PM₁₀ in Victoria

AAQ NEPM Standard
50 µg/m³ (24-hour average)

Region Performance monitoring station	Location	Data recovery rates (% of days)					Number of exceedences (days)	Performance against the standard and 2008 goal
		Q1	Q2	Q3	Q4	Annual		
<u>Port Phillip</u>								
CBD ^a	RMIT				92.4	23.3	2	ND
CBD Southeast	Richmond	90.0	93.4	94.6	92.4	92.6	1	met
Inner East Metro	Alphington	100.0	95.6	96.7	97.8	97.5	1	met
Inner West Metro	Footscray	97.8	97.8	98.9	98.9	98.4	2	met
South Metro	Brighton	92.2	100.0	98.9	97.8	97.3	1	met
Southeast Metro	Dandenong	76.7	92.3	95.7	84.8	87.4	3	met
Outer East Metro ^b	Mooroolbark		44.0	89.1	93.5	57.0	1	ND
Geelong ^c	Geelong South			27.2	100.0	32.1	6	not met
<u>Latrobe Valley</u>								
LV East Central ^d	Traralgon				60.9	15.3	0	ND
LV West Central ^d	Moe				58.7	14.8	0	ND
<u>Ballarat^e</u>	Ballarat	8.9	11.0	10.9	13.0	11.0	1	ND

Monitoring was by TEOM unless indicated otherwise.

ND Not demonstrated.

a TEOM monitoring commenced in October. In addition, PM₁₀ was monitored by high-volume sampler one day in six at CBD throughout the year - there were no exceedences.

b Monitoring commenced in May.

c TEOM monitoring commenced in September. In addition, PM₁₀ was monitored by high-volume sampler one day in six at Geelong throughout the year - there was one exceedence, which was also recorded by the TEOM.

d Monitoring commenced in November.

e Campaign monitoring by high-volume sampler one day in six.

Regions for which screening has not been completed and which are therefore reported as 'Not Demonstrated': Shepparton, Warrnambool, Wodonga, Mildura.

Progress Towards Achieving the AAQ NEPM 2008 Goal

The AAQ NEPM goal is to achieve the standards to the extent specified by the number of allowed exceedences by 2008. As assessed in accordance with the monitoring protocol, in 2002 the standards and the 2008 goal were met for all pollutants at all stations except for PM₁₀, at Geelong.

Exceedences of the standards occurred only for PM₁₀. At Geelong six PM₁₀ exceedences occurred, all in the latter part of the year, due to wind blown dust exacerbated by extended periods of dry weather and high winds.

There were instances where compliance with the standards and 2008 goal could not be demonstrated. 'Not demonstrated' assessments for ozone, SO₂ and PM₁₀ due to insufficient data recovery are detailed in Tables 3, 4 and 6.

Comparison with other monitoring suggests that the AAQ NEPM 2008 goal was most likely achieved in all cases where there was insufficient data to demonstrate compliance. Victoria has an on-going program to increase data capture through improvements to systems and instrument upgrades.

In addition, compliance is not demonstrated due to incomplete screening procedures for CO, O₃, NO₂ and PM₁₀ in the six rural regions. Campaign monitoring for PM₁₀, which has been performed at Bendigo⁴ and is currently underway at Ballarat, has indicated that ongoing monitoring will be required. It is planned to extend PM₁₀ campaign monitoring in the other regions sequentially in future years.

⁴ Air quality assessment of fine particles in Bendigo – a pilot study, EPA Publication 869, August 2002, available from www.epa.gov.au.

Screening procedures for CO, O₃ and NO₂ are being progressively implemented.

Analysis of Extent to Which Standards Are, or Are Not, Met

On the basis of available data, the following observations may be made:

- For CO, no exceedences were recorded and compliance was demonstrated at all stations.
- For NO₂, no exceedences were recorded and compliance was demonstrated at all stations.
- For O₃, no exceedences were recorded although the 4-hour standard was equalled on one occasion. Compliance was demonstrated at stations where there was adequate data capture.
- For SO₂, no exceedences were recorded. Compliance was demonstrated at all but one station, where there was inadequate data capture.
- For PM₁₀, there were exceedences on eight days in the Port Phillip region and one station (Geelong) did not meet the compliance requirements for performance against the standards and 2008 goal. No exceedences were recorded in the Latrobe Valley region but data recovery was insufficient to demonstrate compliance. One exceedence was recorded in the Ballarat region and data recovery was insufficient to demonstrate compliance. A full description of the circumstances leading to these exceedences is given in Appendix 3.
- For Pb, compliance was demonstrated at the peak station in Port Phillip region.

Compliance with the standards and 2008 goal could not be demonstrated at some stations which would most likely have complied. In particular, stations installed during the year have insufficient data to demonstrate compliance. At other stations low data recovery rates were due to monitoring instruments being unavailable, especially for ozone.

The Future

Air quality continues to be a major environmental concern for Victorians. EPA is undertaking a range of activities to ensure that the standards and 2008 goal in the Ambient Air Quality NEPM are consistently met. Victoria is also committed to an on-going review of its air monitoring to ensure that the needs of the Victorian public are being maintained. Key actions include:

- improving data capture through enhancements to our systems and instrumentation,
- employing the available resources to best meet the requirements outlined in our monitoring plan, and
- progress towards implementing our commitments to monitoring in regional Victoria.

APPENDIX 1: MONITORING DETAILS

Performance Monitoring Stations

The performance monitoring stations, pollutants monitored and site types are summarised in Table 7. Site types are defined⁵ as: generally representative upper bound for community exposure sites, population-average sites and peak sites.

Table 7. Summary of Victorian Performance Monitoring Stations

Region	Location	Location category	Site type					
			CO	NO ₂	O ₃	SO ₂	Pb	PM ₁₀
<u>Port Phillip</u>								
CBD	RMIT	CBD	G*	G*		G		G*
CBD North East	Collingwood	LI/Res					Pk*	
CBD South East	Richmond	Res	G					G
Inner East Metro	Alphington	LI/Res	G*	G*	Pop	Pop*		G*
Inner West Metro	Footscray	I/Res		G*	G*			G*
North West Metro	Melton	Res			G			
South East Metro	Dandenong	Res				Pop		Pop
South Metro	Brighton	Res		G	Pop*			Pop
South West Metro	Paisley	I/Res				G		
Outer East Metro	Mooroolbark	Res				Pop		Pop
Outer West Metro	Pt Cook	Rur		Pop*	G*			
Geelong	Geelong South	I/Res	G*	G*	Pop*	G*		G*
Outer Geelong	Point Henry	I/Rur				Pop		
<u>Latrobe Valley</u>								
LV East Central	Traralgon	Res		G*	G*	G*		G*
LV West Central	Moe	Res		Pop	G	G		G

CBD	Central business district	RMIT	RMIT University
I	Industrial	LI	Light industrial
Res	Residential	Rur	Rural
G	Generally representative upper bound	Pop	Population-average
Pk	Peak	*	Trend station

⁵ National Environment Protection (Ambient Air Quality) Measure Technical Paper No. 3, "Monitoring Strategy", available from www.ephc.gov.au.

Description of Exposed Population

The exposed population represented by each monitoring station is described qualitatively by the Location Category column in Table 7. Further information is given in Appendix C of the monitoring plan.

Implementation of the Monitoring Plan

When the monitoring plan was published, the Outer East Metro and Northeast Metro performance monitoring stations were included with sites yet to be selected. These stations came into operation at Mooroolbark and Melton in April and October 2002. Inner West Metro station was relocated to a nearby site in Footscray and operated from July 2001. Site characteristics for Inner West Metro remain as described in the monitoring plan and all three sites meet the requirements of the siting standard, as shown in Table 8.

A site for the Outer Southeast station was selected at Pakenham for campaign monitoring of O₃ and the station was installed in July 2002. The station meets all siting and monitoring method requirements and the data are included in this report.

Table 8. Summary of new stations' siting compliance with AS 2922-1987

	Height above ground	Min. distance to support structure	Clear sky angle of 120°	Unrestricted airflow of 270°/360°	20m from trees	No boiler or incinerators nearby	Minimum distance from road or traffic
Outer East Metro (Mooroolbark)	☑	☑	☑	☑	☑	☑	☑
Northwest Metro (Melton)	☑	☑	☑	☑	☑	☑	☑
Inner West Metro (Footscray)	☑	☑	☑	☑	☑	☑	☑
Outer Southeast (Pakenham)	☑	☑	☑	☑	☑	☑	☑

In the monitoring plan, SO₂ at the Southwest Metro site was planned to have been monitored using a differential optical absorption spectrometer after completion of a study to establish the equivalence of this method to the standard AAQ NEPM method. It has now been decided to continue to use the standard monitoring method at this site.

TEOM data quoted in this report have been adjusted according to the default procedure⁶, 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% at a temperature of 5°C.

All stations with non-compliant sampling heights of 6 metres were reduced to 5 metres before 2002.

Inner East Metro, CBD Southeast and Latrobe Valley West Central continue to have minor non-compliances with the Australian standard for siting of sampling units, due to the proximity of trees. In each case the trees will not be removed, because of community resistance.

NATA Status

All performance monitoring stations and AAQ NEPM campaign monitoring operated by the Environment Protection Authority are covered by its NATA accreditation (Number 1576). The NATA status of the monitoring network and laboratory was confirmed by a reaccreditation audit carried out early in 2002.

Monitoring in the Latrobe Valley region was performed by Pacific Power International. An audit for NATA accreditation was carried out in 2001 and data quality was acceptable. Accreditation (Number 4669) was formally achieved in January 2003.

Screening

For regions other than Port Phillip and Latrobe Valley, the monitoring plan presents a process to demonstrate whether levels of ozone, NO₂, PM₁₀ and CO are consistently below the standards. These screening procedures are not completed, pending data acquisition and modelling, and compliance is reported as 'Not demonstrated'.

Campaign monitoring for PM₁₀ at Bendigo and Ballarat has not met the screening criteria (based on high volume sampler monitoring, one day in six). Until resources become available for continuous monitoring in these regions PM₁₀ compliance will be reported as 'Not demonstrated'.

⁶ National Environment Protection (Ambient Air Quality) Measure Technical Paper No. 10, "Collection and Reporting of TEOM PM₁₀ Data", available from www.ephc.gov.au.

APPENDIX 2: DATA ANALYSIS

Tables of monitoring statistics presented in this Appendix have been prepared according to AAQ NEPM guidelines⁷.

Summary Statistics

Annual summary statistics that allow assessment of how close air quality was to the standards, and the extent of compliance are presented in Tables 9 to 15. The AAQ NEPM states that the short-term standards should not be exceeded on more than one day for CO, NO₂, O₃, SO₂, and on more than five days per year for PM₁₀. The second highest daily value for the year (or the sixth for PM₁₀) can indicate the extent to which the standards are, or are not, met. Concentrations exceeding the standard are highlighted in bold.

Percentiles

Tables 16 to 22 present the results of further analysis of the monitoring data. The percentiles in Tables 16 and 19 are based on all running averages, including those that overlap from one day to the next.

Trends

Previous trend analyses have shown that ozone and lead concentrations have decreased markedly over the last 10 to 20 years. Ozone has complied with AAQ NEPM standards in recent years, in contrast with many previous exceedences. Lead levels have decreased to concentrations approaching the detectable level. Environment Australia is proposing to present a detailed analysis of Australia-wide trend data to 2001 in the report of the project *Ambient Air Quality: Status and Trends in Australia* (currently in preparation).

⁷National Environment Protection (Ambient Air Quality) Measure Technical Paper No. 8, "Annual Reports", available from www.ephc.gov.au.

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Table 9. 2002 summary statistics for daily peak 8-hour CO in Victoria

AAQ NEPM standard
9.0 ppm (8-hour average)

<u>Region</u> Performance monitoring station	Location	Number of valid days	Highest (ppm)	Highest (date:hour)	2 nd highest (ppm)	2 nd highest (date:hour)
<u>Port Phillip</u> CBD	RMIT	311	3.2	Apr 11:22	3.1	Jun 3:01 Jun 3:02
CBD Southeast	Richmond	340	5.0	Apr 12:01	3.7	Jul 30:03
Inner East Metro	Alphington	342	3.8	May 28:02 Jul 30:03		
Geelong	Geelong South	318	2.3	Jun 19:02	2.0	May 08:02

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Table 10. 2002 summary statistics for daily peak 1-hour NO₂ in Victoria

AAQ NEPM standard
0.12 ppm (1-hour average)

<u>Region</u> Performance monitoring station	Location	Number of valid days	Highest (ppm)	Highest (date:hour)	2 nd highest (ppm)	2 nd highest (date:hour)
<u>Port Phillip</u>						
CBD	RMIT	344	0.079	Apr 30:13	0.067	Apr 11:18
Inner East Metro	Alphington	342	0.060	Apr 30:15	0.056	May 24:14 Oct 03:12
Inner West Metro	Footscray	335	0.059	May 07:16	0.058	Apr 11:14 May 03:17 May 07:15
South Metro	Brighton	346	0.053	May 24:13 Nov 24:19		
Outer West Metro	Pt Cook	351	0.056	Apr 23:14	0.048	May 03:11
Geelong	Geelong South	344	0.056	May 7:20	0.054	Apr 23:19
<u>Latrobe Valley</u>						
LV East Central	Traralgon	358	0.037	Aug 16:12	0.033	Apr 12:18 Nov 07:20
LV West Central	Moe	353	0.036	May 07:19	0.032	May 03:18 Jul 24:19

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Table 11. 2002 summary statistics for daily peak 1-hour O₃ in Victoria

AAQ NEPM standard
0.10 ppm (1-hour average)

<u>Region</u> Performance monitoring station	Location	Number of valid days	Highest (ppm)	Highest (date:hour)	2 nd highest (ppm)	2 nd highest (date:hour)
<u>Port Phillip</u>						
Inner East Metro	Alphington	327	0.051	Apr 01:16 Dec 15:15		
Inner West Metro	Footscray	353	0.095	Jan 19:16 Jan 19:15	0.071	Jan 20:14
Northwest Metro ^a	Melton	52	0.076	Dec 20:12	0.068	Dec 17:14
South Metro	Brighton	342	0.085	Jan 19:16	0.066	Dec 28:16
Southeast Metro	Dandenong	310	0.078	Jan 20:14	0.076	Feb 15:12
Outer East Metro ^b	Mooroolbark	210	0.089	Dec 19:16	0.082	Dec 17:14 Dec 17:15
Outer Southeast ^c	Dandenong	132	0.048	Nov 12:15 Dec 03:14		
Outer West Metro	Pt Cook	354	0.093	Jan 20:13	0.078	Jan 19:16
Geelong	Geelong South	331	0.058	Mar 05:17 Jan 20:11		
Outer Geelong	Pt Henry	354	0.069	Jan 06:15 Feb 01:16		
<u>Latrobe Valley</u>						
LV East Central	Traralgon	365	0.057	Dec 21:14	0.054	Dec 15:17
LV West Central	Moe	352	0.059	Apr 09:15	0.058	Dec 15:16

a Monitoring commenced in October.

b Monitoring commenced in May.

c Campaign monitoring commenced in August.

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Table 12. 2002 summary statistics for daily peak 4-hour O₃ in Victoria

AAQ NEPM standard
0.08 ppm (4-hour average)

<u>Region</u> Performance monitoring station	Location	Number of valid days	Highest (ppm)	Highest (date:hour)	2 nd highest (ppm)	2 nd highest (date:hour)
<u>Port Phillip</u>						
Inner East Metro	Alphington	326	0.046	Apr 01:17 Apr 01:16	0.045	Dec 15:16
Inner West Metro	Footscray	353	0.080	Jan 19:19	0.060	Dec 28:17
Northwest Metro ^a	Melton	53	0.059	Dec 17:17	0.056	Dec 21:17
South Metro	Brighton	340	0.072	Jan 19 18	0.061	Dec 28:17
Southeast Metro	Dandenong	311	0.063	Jan 19 20 Nov 23:19		
Outer East Metro ^b	Mooroolbark	210	0.075	Dec 17:15 Dec 19:17		
Outer Southeast ^c	Pakenham	132	0.047	Nov 12:16	0.044	Nov 23:17
Outer West Metro	Pt Cook	352	0.070	Mar 05:18	0.067	Jan 19 19 Jan 20:20
Geelong	Geelong South	326	0.053	Jan 25:17	0.050	Mar 05:17
Outer Geelong	Pt Henry	353	0.064	Mar 05:16 Feb 1: 20		
<u>Latrobe Valley</u>						
LV East Central	Traralgon	365	0.049	Dec 21:16	0.048	Jan 20:9
LV West Central	Moe	353	0.056	Apr 09:17	0.052	Dec 15:17 Dec 15:18

a Monitoring commenced in October.

b Monitoring commenced in May.

c Campaign monitoring commenced in August.

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Table 13. 2002 summary statistics for daily peak 1-hour SO₂ in Victoria

AAQ NEPM standard
0.20 ppm (1-hour average)

<u>Region</u> Performance monitoring station	Location	Number of valid days	Highest (ppm)	Highest (date:hour)	2 nd highest (ppm)	2 nd highest (date:hour)
<u>Port Phillip</u>						
CBD	RMIT	344	0.024	Mar 12:07	0.020	Apr 26:22 Apr 26:23
Inner East Metro	Alphington	359	0.012	May 24:14	0.009	Feb 04:16 Apr 10:12
Southwest Metro	Paisley	355	0.122	Jan 12:07	0.073	Jan 11:14
Geelong	Geelong South	310	0.040	Mar 05:10	0.030	Apr 01:12
<u>Latrobe Valley</u>						
LV East Central	Traralgon	353	0.062	Dec 27:13	0.041	Sep 12:11
LV West Central	Moe	356	0.046	Feb 17:12	0.037	Apr 15:10

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Table 14. 2002 summary statistics for daily peak 24-hour SO₂ in Victoria

AAQ NEPM standard
0.08 ppm (24-hour average)

<u>Region</u> Performance monitoring station	Location	Number of valid days	Highest (ppm)	Highest (date)	2 nd highest (ppm)	2 nd highest (date)
<u>Port Phillip</u>						
CBD	RMIT	344	0.005	Mar 12	0.004	Apr 10 May 06 May 21 May 29
Inner East Metro	Alphington	359	0.002	Jul 29 Jul 30		
Southwest Metro	Paisley	355	0.019	Jan 12	0.011	Jan 02
Geelong	Geelong South	310	0.004	Nov 29	0.003	Apr 01 Apr 23
<u>Latrobe Valley</u>						
LV East Central	Traralgon	353	0.009	Jan 09 Dec 27		
LV West Central	Moe	356	0.010	Jan 10 Feb 17		

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Table 15. 2002 summary statistics for 24-hour PM₁₀ in Victoria

AAQ NEPM standard
50 µg/m³ (24-hour average)

<u>Region</u>	Location	Number of valid days	Highest (µg/m ³)	Highest (date)	6 th highest (µg/m ³)	6 th highest (date)
<u>Port Phillip</u>						
CBD ^a	RMIT	85	82.9	Dec 29	37.3	Oct 18
CBD Southeast	Richmond	338	70.0	Dec 29	36.8	Mar 12
Inner East Metro	Alphington	356	66.2	Dec 29	35.5	May 07
Inner West Metro	Footscray	359	79.1	Nov 12	40.7	Oct 18
South Metro	Brighton	355	69.1	Dec 29	34.4	Nov 17
Southeast Metro	Dandenong	319	84.8	Nov 09	39.0	Oct 03
Outer East Metro ^b	Mooroolbark	208	66.7	Dec 29	44.0	Aug 19
Geelong ^c	Geelong South	117	81.1	Nov 12	50.6	Nov 13
<u>Latrobe Valley</u>						
LV East Central ^d	Traralgon	56	37.1	Nov 18	26.6	Nov 19
LV West Central ^d	Moe	54	42.1	Nov 12	33.4	Dec 29
<u>Ballarat^e</u>						
	Ballarat	40	50.6	Sep 15	31.5	Nov 02

Monitoring was by TEOM unless indicated otherwise.

- a TEOM monitoring commenced in October. In addition, PM₁₀ was monitored by high-volume sampler (HiVol) one day in six at CBD throughout the year. The highest HiVol reading was 41.2 µg/m³.
- b Monitoring commenced in May.
- c TEOM monitoring commenced in September. In addition, PM₁₀ was monitored by high-volume sampler (HiVol) one day in six at Geelong throughout the year. The highest HiVol reading was 52.6 µg/m³.
- d Monitoring commenced in November.
- e Campaign monitoring by high-volume sampler one day in six, February to December.

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Table 16. Percentiles of daily peak 8-hour CO concentrations for 2002

AAQ NEPM standard
9.0 ppm (8-hour average)

<u>Region</u>	Location	Data availability (% of days)	Max conc. (ppm)	99 th %ile (ppm)	98 th %ile (ppm)	95 th %ile (ppm)	90 th %ile (ppm)	75 th %ile (ppm)	50 th %ile (ppm)
<u>Port Phillip</u>									
Performance monitoring station									
CBD	RMIT	85.2	3.2	2.9	2.7	1.8	1.5	0.9	0.5
CBD South East	Richmond	93.2	5.0	3.1	2.8	2.4	1.9	0.8	0.3
Inner East Metro	Alphington	93.7	3.8	3.5	3.1	2.7	2.0	0.9	0.4
Geelong	Geelong South	87.1	2.3	1.8	1.4	1.0	0.6	0.3	0.1

Table 17. Percentiles of daily peak 1-hour NO₂ concentrations for 2002

AAQ NEPM standard
0.12 ppm (1-hour average)

<u>Region</u>	Location	Data availability (% of days)	Max conc. (ppm)	99 th %ile (ppm)	98 th %ile (ppm)	95 th %ile (ppm)	90 th %ile (ppm)	75 th %ile (ppm)	50 th %ile (ppm)
<u>Port Phillip</u>									
Performance monitoring station									
CBD	RMIT	94.2	0.079	0.053	0.046	0.039	0.035	0.028	0.023
Inner East Metro	Alphington	93.7	0.060	0.048	0.046	0.038	0.034	0.030	0.023
Inner West Metro	Footscray	91.8	0.059	0.055	0.049	0.040	0.035	0.029	0.022
South Metro	Brighton	94.8	0.053	0.049	0.044	0.038	0.033	0.028	0.021
Outer West Metro	Pt Cook	96.2	0.056	0.045	0.041	0.031	0.027	0.021	0.013
Geelong	Geelong South	94.2	0.056	0.036	0.031	0.027	0.025	0.019	0.012
<u>Latrobe Valley</u>									
LV East Central	Traralgon	98.1	0.033	0.031	0.030	0.027	0.025	0.020	0.015
LV West Central	Moe	96.7	0.036	0.030	0.029	0.027	0.026	0.021	0.014

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Table 18. Percentiles of daily peak 1-hour ozone concentrations for 2002

AAQ NEPM standard
0.10 ppm (1-hour average)

<u>Region</u> Performance monitoring station	Location	Data availability (% of days)	Max conc. (ppm)	99 th %ile (ppm)	98 th %ile (ppm)	95 th %ile (ppm)	90 th %ile (ppm)	75 th %ile (ppm)	50 th %ile (ppm)
<u>Port Phillip</u>									
Inner East Metro	Alphington	89.6	0.051	0.048	0.046	0.040	0.036	0.027	0.023
Inner West Metro	Footscray	96.7	0.095	0.066	0.047	0.042	0.038	0.028	0.024
North West Metro ^a	Melton	14.2	0.076	0.069	0.062	0.060	0.048	0.036	0.029
South Metro	Brighton	93.7	0.085	0.063	0.053	0.043	0.036	0.029	0.025
Southeast Metro	Dandenong	84.9	0.078	0.064	0.054	0.047	0.040	0.032	0.027
Outer East Metro ^b	Mooroolbark	57.5	0.089	0.070	0.055	0.046	0.038	0.033	0.028
Outer Southeast ^c	Pakenham	36.2	0.048	0.047	0.045	0.040	0.036	0.032	0.029
Outer West Metro	Pt Cook	97.0	0.093	0.068	0.063	0.048	0.039	0.030	0.027
Geelong	Geelong South	90.7	0.058	0.056	0.053	0.043	0.032	0.025	0.021
Outer Geelong	Pt Henry	97.0	0.069	0.065	0.059	0.045	0.040	0.030	0.027
<u>Latrobe Valley</u>									
LV East Central	Traralgon	100.0	0.057	0.048	0.043	0.036	0.033	0.029	0.024
LV West Central	Moe	96.4	0.059	0.050	0.046	0.041	0.036	0.031	0.027

a Monitoring commenced in October.

b Monitoring commenced in May.

c Campaign monitoring commenced in August.

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Table 19. Percentiles of daily peak 4-hour ozone concentrations for 2002

AAQ NEPM standard
0.08 ppm (4-hour average)

<u>Region</u> Performance monitoring station	Location	Data availability (% of days)	Max conc. (ppm)	99 th %ile (ppm)	98 th %ile (ppm)	95 th %ile (ppm)	90 th %ile (ppm)	75 th %ile (ppm)	50 th %ile (ppm)
<u>Port Phillip</u>									
Inner East Metro	Alphington	89.3	0.046	0.044	0.043	0.038	0.033	0.026	0.021
Inner West Metro	Footscray	96.7	0.080	0.051	0.046	0.038	0.034	0.027	0.023
North West Metro ^a	Melton	14.5	0.056	0.055	0.053	0.052	0.044	0.033	0.029
South Metro	Brighton	93.2	0.072	0.056	0.048	0.039	0.034	0.028	0.023
Southeast Metro	Dandenong	85.2	0.063	0.053	0.052	0.043	0.038	0.030	0.025
Outer East Metro ^b	Mooroolbark	57.5	0.075	0.063	0.047	0.041	0.036	0.030	0.026
Outer Southeast ^c	Pakenham	36.2	0.047	0.043	0.041	0.038	0.034	0.031	0.028
Outer West Metro	Pt Cook	96.4	0.070	0.062	0.056	0.044	0.036	0.029	0.025
Geelong	Geelong South	89.3	0.053	0.048	0.046	0.038	0.031	0.024	0.020
Outer Geelong	Pt Henry	96.7	0.064	0.058	0.052	0.042	0.036	0.029	0.026
<u>Latrobe Valley</u>									
LV East Central	Traralgon	100.0	0.049	0.046	0.038	0.034	0.031	0.027	0.022
LV West Central	Moe	96.7	0.056	0.046	0.041	0.037	0.035	0.030	0.026

a Monitoring commenced in October.

b Monitoring commenced in May.

c Campaign monitoring commenced in August.

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Table 20. Percentiles of daily peak 1-hour SO₂ concentrations for 2002

AAQ NEPM standard
0.20 ppm (1-hour average)

<u>Region</u> Performance monitoring station	Location	Data availability (% of days)	Max conc. (ppm)	99 th %ile (ppm)	98 th %ile (ppm)	95 th %ile (ppm)	90 th %ile (ppm)	75 th %ile (ppm)	50 th %ile (ppm)
<u>Port Phillip</u>									
CBD	RMIT	94.2	0.024	0.017	0.013	0.012	0.010	0.006	0.002
Inner East Metro	Alphington	98.4	0.012	0.008	0.007	0.006	0.004	0.002	0.000
South West Metro	Paisley	97.3	0.122	0.045	0.037	0.024	0.019	0.010	0.004
Geelong	Geelong South	84.9	0.040	0.029	0.024	0.016	0.012	0.005	0.001
<u>Latrobe Valley</u>									
LV East Central	Traralgon	96.7	0.062	0.032	0.022	0.016	0.012	0.008	0.005
LV West Central	Moe	97.5	0.046	0.022	0.020	0.014	0.010	0.005	0.003

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Table 21. Percentiles of daily SO₂ concentrations for 2002

AAQ NEPM standard
0.08 ppm (24-hour average)

<u>Region</u>	Location	Data availability (% of days)	Max conc. (ppm)	99 th %ile (ppm)	98 th %ile (ppm)	95 th %ile (ppm)	90 th %ile (ppm)	75 th %ile (ppm)	50 th %ile (ppm)
<u>Port Phillip</u>									
Performance monitoring station									
CBD	RMIT	94.2	0.005	0.004	0.003	0.003	0.002	0.001	0.000
Inner East Metro	Alphington	98.4	0.003	0.001	0.009	0.005	0.001	0.000	0.000
South West Metro	Paisley	97.3	0.019	0.008	0.008	0.005	0.003	0.001	0.001
Geelong	Geelong South	84.9	0.004	0.002	0.002	0.001	0.001	0.000	0.000
<u>Latrobe Valley</u>									
LV East Central	Traralgon	96.7	0.009	0.008	0.005	0.004	0.004	0.003	0.002
LV West Central	Moe	97.5	0.010	0.007	0.006	0.004	0.004	0.002	0.001

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Table 22. Percentiles of daily PM₁₀ concentrations for 2002

AAQ NEPM standard
50 µg/m³ (24-hour average)

Region Performance monitoring station	Location	Data availability (% of days)	Max conc. (µg/m ³)	99 th %ile (µg/m ³)	98 th %ile (µg/m ³)	95 th %ile (µg/m ³)	90 th %ile (µg/m ³)	75 th %ile (µg/m ³)	50 th %ile (µg/m ³)
<u>Port Phillip</u>									
CBD ^a	RMIT	23.3	82.9	66.3	52.5	37.6	33.3	27.2	21.1
CBD South East	Richmond	92.6	70.0	40.3	34.7	29.2	26.5	21.2	16.5
Inner East Metro	Alphington	97.5	66.2	35.9	34.5	30.4	27.9	22.4	17.2
Inner West Metro	Footscray	98.4	79.1	42.9	38.7	32.2	28.3	22.1	17.5
South Metro	Brighton	97.3	69.1	34.7	31.1	28.2	24.8	19.6	14.7
Southeast Metro	Dandenong	87.4	84.8	45.6	37.6	31.5	26.5	21.0	15.8
Outer East Metro ^b	Mooroolbark	57.0	66.7	44.9	44.3	39.7	33.2	27.0	19.9
Geelong ^c	Geelong South	32.1	81.1	73.2	56.8	49.5	35.8	27.4	20.1
<u>Latrobe Valley</u>									
LV East Central ^d	Traralgon	15.3	37.1	33.2	29.9	28.8	26.4	23.5	18.7
LV West Central ^d	Moe	14.8	42.1	40.4	38.9	37.7	33.2	27.1	21.9
<u>Ballarat</u> ^e	Ballarat	11.0	50.6	43.5	36.4	31.5	27.1	18.0	12.4

- a TEOM monitoring commenced in October.
- b Monitoring commenced in May.
- c TEOM monitoring commenced in September.
- d Monitoring commenced in November.
- e Campaign monitoring by high-volume sampler one day in six.

APPENDIX 3: DESCRIPTION OF CIRCUMSTANCES WHICH LED TO EXCEEDENCES

In the Port Phillip region the only exceedences of the standards were for PM₁₀. Measurements were by TEOM, adjusted for loss of volatiles at low temperatures. The circumstances leading to the exceedences are described below.

- A dust storm on 29 December caused exceedences at all operating stations:

Inner East Metro	66.2 µg/m ³
Inner West Metro	78.3 µg/m ³
South Metro	69.1 µg/m ³
Southeast Metro	67.3 µg/m ³
CBD	82.9 µg/m ³
CBD Southeast	70.0 µg/m ³
Outer East Metro	66.7 µg/m ³
Geelong	76.2 µg/m ³

- A widespread wind blown dust event on 12 November caused elevated concentrations throughout the region, with exceedences at:

Inner West Metro	79.1 µg/m ³
CBD	63.1 µg/m ³
Geelong	81.1 µg/m ³

- Four other exceedences at Geelong were also caused by wind blown dust:

18 October	57.5 µg/m ³	
8 November	54.3 µg/m ³	(On this day the high-volume sampler at Geelong recorded 52.6 µg/m ³ .)
13 November	50.6 µg/m ³	
14 November	55.4 µg/m ³	

- Two exceedences at Southeast Metro coincided with local activities in the showgrounds where the station is located:

9 November	84.8 µg/m ³
10 November	56.8 µg/m ³

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Drought conditions increased PM₁₀ concentrations so that PM₁₀ exceedences occurred on eight days throughout the Port Phillip region, compared with three days in 2001. Extended periods of dry weather and high winds caused exceedences late in the year, rather than during autumn and winter, when the effects of open fires and wood heaters are expected.

No exceedences were recorded in the Latrobe Valley region.

One PM₁₀ exceedence was recorded at Ballarat during campaign monitoring (one day in six, with high-volume sampler). This concentration of 50.6 µg/m³ occurred on 15 September and is attributed to wind-blown dust.