

## AIRBORNE PARTICLE MONITORING AT SHEPPARTON, DECEMBER 2003 TO DECEMBER 2004

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### SUMMARY

Airborne particles affect air quality throughout Victoria. Particles smaller than 10 micrometres ( $PM_{10}$ ) are one of the seven main air pollutants for which Victoria has set air quality objectives and goals.

A study was conducted at Shepparton in 2004 to investigate airborne particle levels.

Air quality in Shepparton was relatively good. There was one day that did not meet the  $PM_{10}$  objective, due to wind-blown dust.

Because of common weather influences,  $PM_{10}$  levels in Shepparton were similar to those in Melbourne and Bendigo on any given day.

### BACKGROUND

Particles are considered to be the main pollutant that may affect a regional city. Whilst particle pollution is generally well understood in Melbourne, further research is needed in rural centres.

EPA's air monitoring plan<sup>1</sup>, developed in 2001 in accordance with national guidelines, proposed 'campaign' (exploratory) monitoring of fine particles ( $PM_{10}$ ) in regional cities<sup>2</sup>. Victoria's major regional

cities are to be monitored sequentially for one year. Monitoring has already been conducted at Bendigo (2000–01) and Ballarat (2002–03)<sup>3</sup>. Campaign monitoring has also recently commenced at Mildura (December 2004).

At Shepparton, a high-volume sampler was used to monitor  $PM_{10}$ . This instrument collects particles on a filter, which is then weighed to determine the concentration of  $PM_{10}$  in the air during the exposure time. Twenty-four hour samples were collected on every sixth day.

### MONITORING OF PARTICLES

As particles have been associated with health effects on humans,  $PM_{10}$  is one of the seven air pollutants for which Victoria has set air quality objectives and goals.<sup>4</sup> The objectives are pollutant concentrations (set to protect human health) against which air quality can be assessed. Goals specify the maximum permissible number of readings above the objective per year and a time frame in which this goal must be met. The  $PM_{10}$  objective is a 24-hour average of 50 micrograms per cubic metre ( $\mu\text{g}/\text{m}^3$ ).

<sup>1</sup> *Ambient air quality NEPM monitoring plan Victoria*, EPA Publication 763, available from [www.epa.vic.gov.au](http://www.epa.vic.gov.au) – click on 'Publications & Legislation'.

<sup>2</sup> Bendigo, Ballarat, Wodonga (covered by monitoring at Albany), Shepparton, Mildura, Warrnambool.

<sup>3</sup> *Air quality assessment of fine particles in Bendigo – a pilot study*, EPA Publication 869, and *Particles ( $PM_{10}$ ) monitoring at Ballarat*, EPA Publication 936, available from [www.epa.vic.gov.au](http://www.epa.vic.gov.au) – click on 'Publications & Legislation'.

<sup>4</sup> State Environment Protection Policy (Ambient Air Quality), *Victoria Government Gazette No. S19*, 9 February 1999, available from [www.epa.vic.gov.au](http://www.epa.vic.gov.au) – click on 'Publications & Legislation'.

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The goal is, by 2008, to not exceed this objective more than five times per year.

## SOURCES OF PARTICLES IN SHEPPARTON

The National Pollutant Inventory indicates that wind-blown dust is the main source of PM<sub>10</sub> emissions in the Shepparton urban area, followed by agricultural activities, motor vehicles, domestic wood fires and fuel combustion sub-thresholds (such as small and medium enterprises)<sup>5</sup>. Industrial sources in Shepparton are relatively small and few in number. Particle levels could also be influenced by dust and fires elsewhere in Victoria.

## WHERE AND WHEN DID EPA MONITOR?

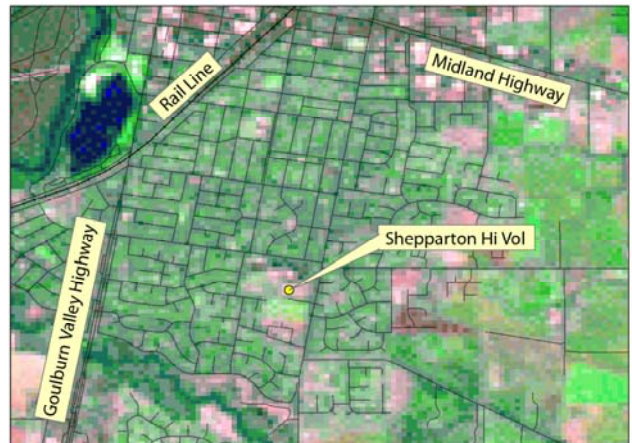
The high-volume sampler was located in McGuire College, Wilmot Road, approximately 1 km south-east of the centre of Shepparton (Figure 1). This site is considered to experience typical residential exposure to particles in Shepparton.

The first sample was obtained on 9 December 2003 and monitoring continued until 15 December 2004 (with 56 samples collected). During this period, results were shown progressively on EPA's website.

## AIR QUALITY AT SHEPPARTON IS RELATIVELY GOOD

During the 12 months of monitoring at Shepparton, Good to Very Good air quality (as defined by EPA's

<sup>5</sup> Emissions in the National Pollutant Inventory can be viewed at [www.npi.gov.au](http://www.npi.gov.au).



**Figure 1: Shepparton monitoring site**

Air Quality Index<sup>6</sup>) was recorded most of the time (52 out of 56 days). Results are shown in Figure 2.

The particles objective of 50 µg/m<sup>3</sup> was exceeded on one day during the 12 months. Comparing levels to other stations over the same 12 months, Geelong and Collingwood also experienced one day on which levels were above the PM<sub>10</sub> objective.

The average PM<sub>10</sub> at Shepparton is similar to Melbourne and other regional centres across Victoria, as shown in Table 1.

Site	PM <sub>10</sub> (µg/m <sup>3</sup> )	Year
Shepparton	18	2003–04
Melbourne	16–21	2003–04
Bendigo	16	2000–01
Ballarat	15	2002–03

**Table 1: Average PM<sub>10</sub> readings**

<sup>6</sup> The EPA Air Quality Index – Overview available from [www.epa.vic.gov.au](http://www.epa.vic.gov.au) - click on 'Current Air Quality'.

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## METEOROLOGICAL INFLUENCES

The Shepparton particle levels had a tendency to follow the highs and lows observed at other stations in the EPA monitoring network.

This pattern occurs because the weather conditions influencing particle levels tend to be widespread across Victoria. These include:

- high winds – generating dust from the ground
- calm conditions – allowing pollution to accumulate, particularly overnight
- rain – which settles dust.

Similar regional influences were found during the monitoring studies conducted at Bendigo and Ballarat.

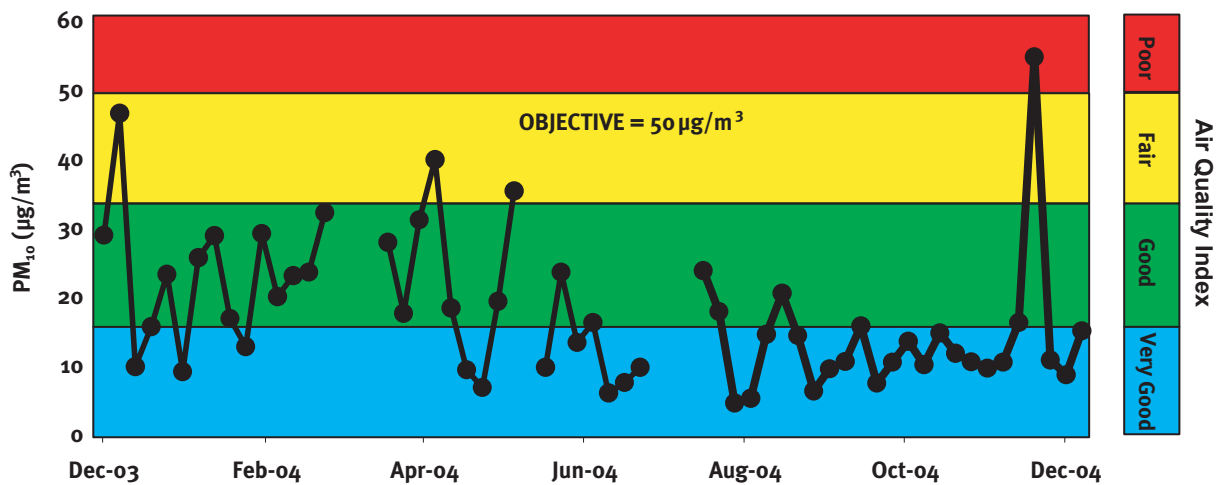


Figure 2: Shepparton's daily average PM<sub>10</sub> and EPA's Air Quality Index

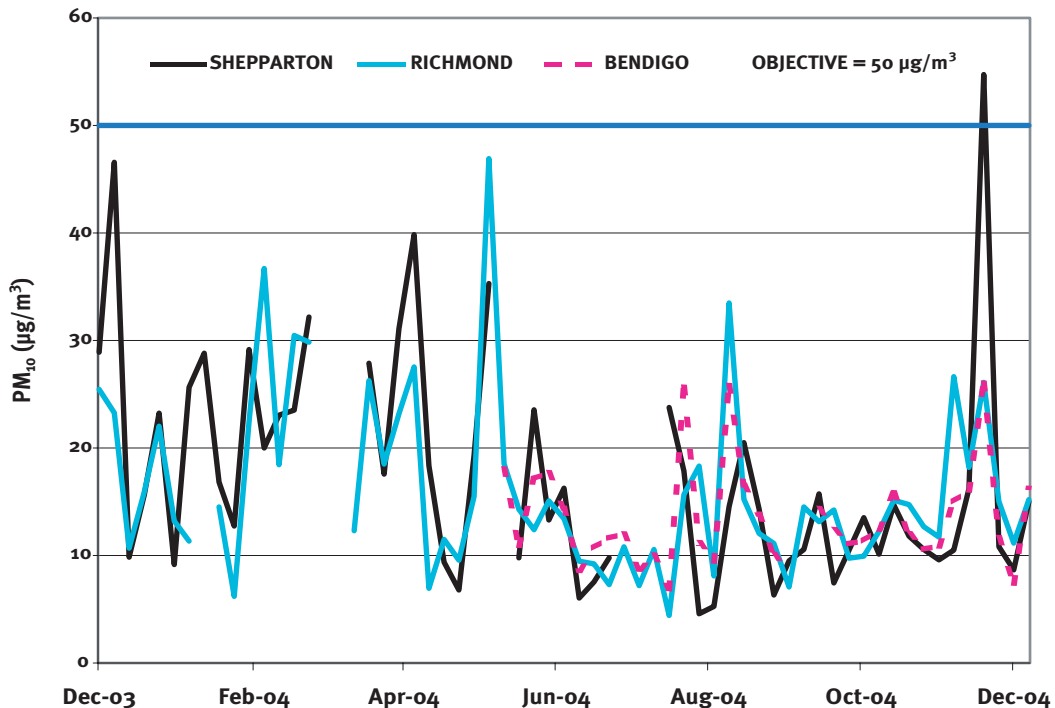


Figure 3: Daily average PM<sub>10</sub> in Shepparton, Richmond and Bendigo

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## CAUSES OF HIGHEST READINGS

The highest PM<sub>10</sub> levels measured at Shepparton are shown in Table 2. The likely causes have been identified by examining the filters and meteorological conditions.

On 27 November 2004, strong north-west winds and an orange tint on the filter paper implicated windborne dust as the cause of the highest reading. Elevated levels were measured at two of the

metropolitan Melbourne stations (Paisley and Collingwood) on this day.

On 15 December 2003, moderate winds and an orange tint on the filter paper indicated that the main cause was also windborne dust.

13 April and 13 May 2004 had lower winds and darker filters smelling of combustion products. The 13 April reading was probably caused by burning off. The 13 May reading was likely to be due to wood fires, as it was a cold day.

PM <sub>10</sub> (µg/m <sup>3</sup> )	Date	Likely cause	Daily temperature range (°C)	Maximum wind speed (km/h)	Predominant wind direction
55	27/11/04	Dust	16–36	30	NW
47	15/12/03	Dust	12–34	18	S then NE
40	13/04/04	Burn Off	10–26	17	NE
35	13/05/04	Wood Fire	1–17	13	W

**Table 2: Highest readings at Shepparton**

## CONCLUSION

Monitoring conducted at Shepparton for a 12-month period during 2003–04 indicated that air quality was relatively good, with particle levels being on average within the range of stations in Melbourne. Only one reading was above the objective level, as a result of wind-blown dust. Due to the influence of common regional weather patterns, levels at Shepparton were similar to levels in Melbourne.

EPA intends to return to Shepparton in the coming years to conduct a more extensive monitoring campaign, including continuous particle monitoring, as is currently occurring at Bendigo and is planned for Ballarat in 2005–06.

## ACKNOWLEDGEMENTS

EPA gratefully acknowledges the assistance of McGuire College, which collected filter papers from the high-volume sampler and which provided the monitoring site.