South Australia's Air Quality 2005

EPA
South Australia

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EPA Air & Noise Branch; principal author Gavin Dougherty

Other contributors: John Agar, Konrad Banasiak, Daniel Bellifemine, Paul Compton, Shiloh Gerrity, Matthew Hartley, Rob Mitchell, Christopher Powell and Kelly Rivett.

For further information please contact:

Information Officer
Environment Protection Authority
GPO Box 2607
Adelaide SA 5001

Telephone: (08) 8204 2004
Facsimile: (08) 8204 9393
Free call (country): 1800 623 445

Web site: <www.epa.sa.gov.au>

E-mail: <epainfo@epa.sa.gov.au>

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ABBREVIATIONS

Air NEPM	National Environment Protection (Ambient Air Quality) Measure
AQI	air quality index
EPA	South Australian Environment Protection Authority
PM_{10}	particulate matter, as particles of equivalent aerodynamic diameter 10 μm or less
$PM_{2.5}$	particulate matter, as particles of equivalent aerodynamic diameter 2.5 μm or less
ppm	parts per million
TEOM	tapered element oscillating microbalance, used for monitoring particulate matter
TSP	particulate matter, as total suspended particles
$\mu g/m^3$	micrograms per cubic metre
μm	micrometres

OVERVIEW

This report is to be read in conjunction with *South Australia's Air Quality Monitoring Data Tables 2005.*

Adelaide

Adelaide air was generally of good to very good quality in 2005. The goals of the National Environment Protection (Ambient Air Quality) Measure (the Air NEPM) were met for the pollutants carbon monoxide, nitrogen dioxide, ozone and sulfur dioxide. However airborne particulate matter, as PM_{10}, exceeded the Air NEPM goal—by one day—at the Elizabeth Downs and Netley monitoring sites.

In 2005, the air quality index (AQI) indicated that Adelaide's air was 'very good' 37% of the time and 'good' 50% of the time.

Port Augusta

In Port Augusta, particulate matter, as PM_{10}, is measured by high volume sampling on one day in six. The highest value obtained during the year was 38.3 $\mu g/m^3$.

Port Pirie

The South Australian Environment Protection Authority (EPA), in conjunction with the South Australian Department of Health, has been monitoring airborne lead pollution in Port Pirie for many years. The EPA also monitors for sulfur dioxide and particulate matter, as PM_{10}.

The AQI for Port Pirie (using data collected at the Oliver Street, Port Pirie South monitoring site) indicated that air quality in 2005 was 'very good' 35% of the time and 'good' 38% of the time. However, the Air NEPM one-hour goal for sulfur dioxide and the Air NEPM 24-hour goal for particulate matter, as PM_{10}, were not met at this monitoring site.

The Port Pirie AQI calculation does not include lead. Annual average airborne lead values recorded at the Oliver Street, Port Pirie South monitoring site and at the site in Port Pirie West, exceeded the Air NEPM Standard of 0.5 $\mu g/m^3$ as an annual average. At the monitoring site in Risdon Park, which is further away from the lead smelter than the other monitoring sites, the annual average lead concentration was 0.25 $\mu g/m^3$, which is below the Air NEPM standard .

At the monitoring site in Ellen Street, placed close to the lead smelter to evaluate industry performance and thus not meeting the criteria for a site under the Air NEPM, the annual average lead concentration was 3.46 $\mu g/m^3$.

Whyalla

In Whyalla, the EPA monitored particulate matter pollution and the gaseous pollutants nitrogen dioxide, ozone and sulfur dioxide. For gaseous pollutants, the air quality in Whyalla was predominantly very good.

At Civic Park towards the western end of Whyalla, particulate matter, as PM_{10}, complies with the Air NEPM. At the eastern end, there continues to be pollution by particulate matter from industrial sources. At the industrial monitoring site at Hummock Hill, 27 of the 117 24-hour measurements (23%) exceeded 50 $\mu g/m^3$.

AIR QUALITY

The South Australian Environment Protection Authority (EPA) monitors air quality to protect the health and wellbeing of South Australians. Monitoring the concentration of pollutants in the air provides data to support the development of air quality management strategies and to evaluate the effectiveness of air quality and environmental management activities.

Atmospheric monitoring over a number of years can indicate whether the air quality in a region is improving or deteriorating. Comparisons can be difficult because monitoring sites may be relocated from time to time.

South Australia has enacted the 1998 *National Environment Protection (Ambient Air Quality) Measure* (Air NEPM) as the required standard for seven common pollutants. It sets standards and goals for carbon monoxide, nitrogen dioxide, ozone, sulfur dioxide, lead and particles of equivalent aerodynamic diameter 10 micrometres (μm) in diameter or less (PM_{10}). The Air NEPM was modified in 2004 to include an advisory reporting standard for particles of equivalent aerodynamic diameter 2.5 μm or less ($PM_{2.5}$).

Health effects

The following statements on the health effects of these pollutants are summarised from 'Health effects of criteria pollutants', an appendix to a report by the National Environment Protection Council (2000).

Carbon monoxide

Carbon monoxide is a gas generated by the incomplete combustion of fuels that contain carbon. It is readily absorbed into the bloodstream. Exposure to carbon monoxide is associated with a range of health effects including increases in daily mortality and hospital admissions primarily for people with existing cardiovascular disease.

Nitrogen dioxide

The gas nitrogen dioxide is also generated by combustion processes. Exposure to nitrogen dioxide has been associated with increases in daily mortality, hospital admissions and emergency room attendances for cardiovascular and respiratory disease, increases in respiratory illness and symptoms, and decreases in lung function. The elderly, asthmatics, children and people with existing disease are particularly susceptible to the effects of nitrogen dioxide.

Ozone

Ozone is an oxidising gas, created by the interaction of sunlight, nitrogen oxide pollutants and volatile organic compounds in the atmosphere. Exposure to ozone has been associated with increases in daily mortality, increases in hospital admissions and emergency room visits (respiratory and cardiovascular disease), decreases in lung function, increases in symptoms of respiratory illness such as cough, phlegm and wheeze, and increases in bronchodilator usage. These effects are observed in sensitive subpopulations, although effects on lung function have been observed in the healthy normal population.

Sulfur dioxide

Sulfur dioxide is generated by the combustion of sulfur-containing fuels or by the processing of sulfide ores. Ambient levels of sulfur dioxide have been associated with increases in daily mortality, hospital admissions and emergency room attendances for respiratory and

cardiovascular disease and respiratory symptoms and decreases in lung function. The high correlation between ambient sulfur dioxide levels and other pollutants, especially particles, makes it difficult to confidently attribute the observed effects to sulfur dioxide alone.

Lead

Lead is a heavy metal pollutant originating from industrial sources, particularly in Port Pirie where the world's largest primary lead smelter is located. Leaded fuel for motor vehicles was once the principal source of lead but it has not been sold in Australia since late 2000. Some recent studies have indicated that adverse health effects, especially impairment of neural development and intellectual capacity leading to behavioural and learning difficulties, may be observed at blood lead levels lower than those previously considered to be safe. The effects of lead exposure during childhood have been shown to continue into later life, with mortality in adult life attributed to childhood lead poisoning. Lead exposure has also been associated with increased body mass index and short stature. Pre-term delivery, congenital abnormalities, growth stature and birth weight have all been identified as being affected by maternal blood lead levels. Associations between blood pressure and blood lead levels have also been observed, and may result in the longer term in increased mortality from stroke and myocardial infarction.

Particulate matter

Particulate matter is measured as total suspended particles (TSP), as PM_{10} and as $PM_{2.5}$.

Unlike the other criteria pollutants, which are each a single substance, particles are a broad class of chemically and physically diverse substances. They are emitted from a wide range of sources including natural sources such as dusts and pollens. The biological effects of particles are determined by the:

- physical and chemical nature of the particles
- physics of deposition and distribution in the respiratory tract
- physiological responses to the presence of the particle.

The health effects of particles include increases in daily mortalities, hospital admissions and emergency room attendances, and exacerbation of respiratory symptoms and asthma. There is no conclusive evidence on the role of particle size in the response but it is thought that different sizes may be important for different health outcomes, for example $PM_{2.5}$ for mortality and PM_{10} for asthma.

Assessing air monitoring results

The results of air quality monitoring in 2005 have been assessed against the standards and goals set in the Air NEPM (Table 1).

The standards are set as concentrations in parts per million (ppm) or as micrograms per cubic metre ($\mu g/m^3$) against which air quality can be assessed. They are set at levels that protect human health and wellbeing, aesthetic enjoyment and local amenity.

The goals in the Air NEPM specify a maximum permissible number of days per year when the standards can be exceeded and a timeframe of 10 years (1998–2008) within which these goals must be met.

Table 1: Air NEPM standards and goals for pollutants other than particles as $PM_{2.5}$

Pollutant	Averaging period	Maximum concentration	10 years goal: maximum allowable exceedences
Carbon monoxide	8 hours	9 ppm	1 day a year
Nitrogen dioxide	1 hour	0.12 ppm	1 day a year
	1 year	0.03 ppm	None
Photochemical oxidants (as ozone)	1 hour	0.10 ppm	1 day a year
	4 hours	0.08 ppm	1 day a year
Sulfur dioxide	1 hour	0.20 ppm	1 day a year
	1 day	0.08 ppm	1 day a year
	1 year	0.02 ppm	None
Lead	1 year	0.50 $\mu g/m^3$	None
Particulate matter, as PM_{10}	1 day	50 $\mu g/m^3$	5 days a year

In addition to these goals, the Air NEPM has advisory reporting standards for particulate matter, as $PM_{2.5}$ (Table 2). The EPA uses the tapered element oscillating microbalance (TEOM) method to monitor particulate matter as $PM_{2.5}$. Values obtained by this method cannot be used for comparison with the advisory reporting standards until the equivalence of this method has been established and formally included in the Air NEPM.

Table 2: Air NEPM advisory reporting standards for particles as $PM_{2.5}$

Pollutant	Averaging period	Maximum concentration
Particulate matter, as $PM_{2.5}$	1 day	25 $\mu g/m^3$
	1 year	8 $\mu g/m^3$

Air quality index

The air quality index (AQI) for a region is generated by calculating the index for each individual pollutant (the measured value for that pollutant expressed as a percentage of the standard set by the Air NEPM) for each monitoring site in the region. The highest of these indices is then taken to be the AQI for the particular monitoring site and the highest of the indices from all monitoring sites in the region is used as the AQI for the regions[1]. The categories of 'very good', 'good', fair', 'poor' and 'very poor' for AQIs are defined in Table 3.

[1] The AQIs quoted in the report are not directly comparable to the AQIs quoted in the 2004 report as a modified method of calculation has been adopted to give greater consistency with the AQI displayed on the EPA webside.

Table 3: Definition of categories used in the air quality index

AQI Category	Definition
Very good	The highest individual air quality parameter in the region is at most 33% of the Air NEPM standard
Good	The highest individual air quality parameter is at most 66% of the Air NEPM standard
Fair	The highest individual air quality parameter is between 66% and 99% of the Air NEPM standard
Poor	An Air NEPM standard has been exceeded
Very poor	The highest individual air quality parameter is at least 50% higher than the Air NEPM standard

EPA monitoring locations

In 2005, the EPA conducted air quality monitoring at seven sites in the Adelaide airshed (Figure 1) and at 10 sites in the Spencer Gulf airshed (Figure 2).

In Adelaide, the monitoring sites were located in Adelaide, Birkenhead, Elizabeth Downs, Kensington Gardens, Netley, Northfield and Osborne. Of these sites, Adelaide, Elizabeth Downs, Netley and Northfield were designated as performance monitoring sites for reporting compliance with the Air NEPM.

In the Spencer Gulf airshed, monitoring was conducted at Port Augusta (one site), Port Pirie (five sites, two designated as NEPM performance monitoring sites) and Whyalla (four sites, one designated as a NEPM performance monitoring site).

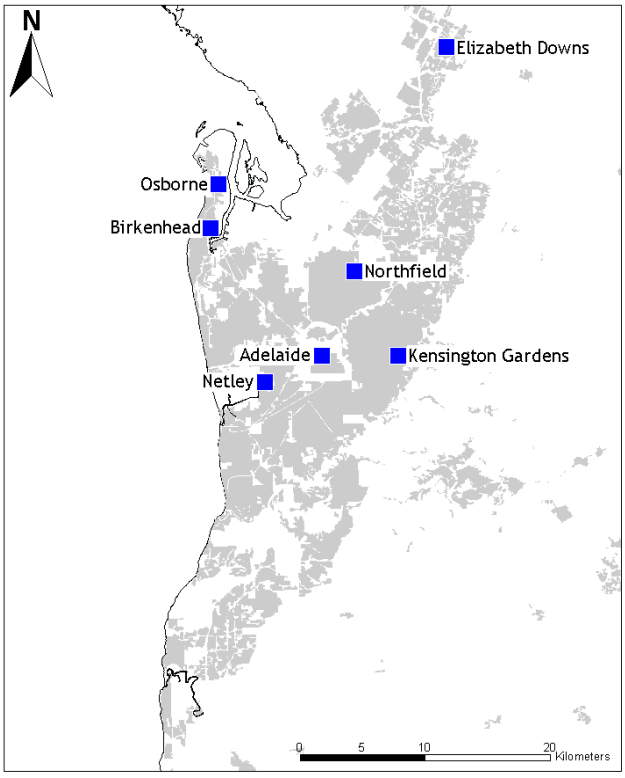
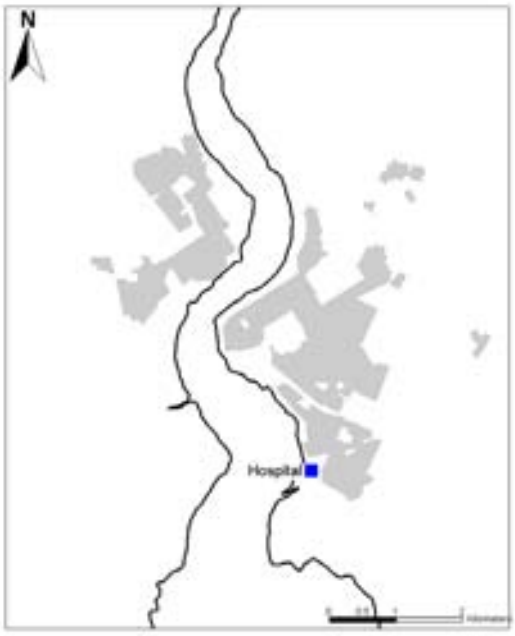


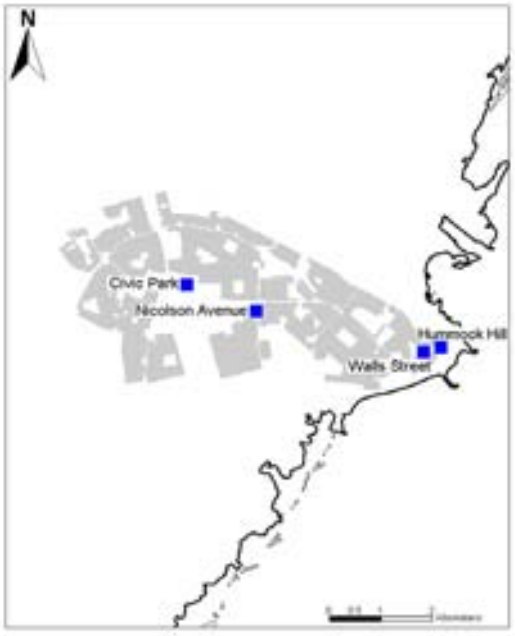
Figure 1: Air quality monitoring sites in the Adelaide airshed

Cities in the Spencer Gulf airshed



Monitoring site in Port Augusta

Monitoring sites in Port Pirie



Monitoring sites in Whyalla

Figure 2: Air quality monitoring sites in the Spencer Gulf airshed

The EPA continued to review and extend the air quality monitoring program in 2005 and the changes are listed below:

Adelaide	A site in Hindley Street used to monitor carbon monoxide levels in the inner city since March 1988 was closed in June 2005. A replacement site is to be established in the East End of Adelaide.
Birkenhead	A new industrial monitoring site was established in the grounds of the Le Fevre Peninsula Primary School, Hughes Street, Birkenhead to continuously monitor particulate matter, as PM_{10}, using a TEOM monitor.
Christies Beach	A suburban monitoring site established in Winnerah Road in 1992 to monitor sulfur dioxide in the air near the Port Stanvac oil refinery was closed in December 2004, following the refinery's shutdown. A new performance monitoring site for nitrogen oxides, ozone and particulate matter, as PM_{10}, has been established at Christies Beach High School.
Gawler East	A monitoring campaign was completed in October 2004 and a report was published on the outcomes of the monitoring campaign.
Kensington Gardens	A monitoring campaign for sulfur dioxide was completed in January 2005. Monitoring for ozone, nitrogen oxides and particulate matter, as PM_{10}, continues.
Kilburn, Gepps Cross	'Hot spot' monitoring has been undertaken to investigate odour and particulate emissions from local industry in the Kilburn/Gepps Cross area.
Netley	A study of particulate matter, as $PM_{2.5}$, is in progress at the EPA laboratory using a TEOM and a 'Partisol' low-volume sampler.
Northfield	High volume sampling for particulate matter, as PM_{10} and TSP, was terminated at this monitoring site in September 2005.
Osborne	This industrial monitoring site, measuring particulate matter, as PM_{10} and TSP, by high volume sampling, was closed in September 2005.
Port Pirie	In Port Pirie South, at the Oliver Street monitoring site, a monitoring campaign for sulfur dioxide, nitrogen oxides and ozone was concluded in July 2005 and a report drafted on the outcomes of the campaign. A sulfur dioxide monitor and a TEOM measuring particulate matter, as PM_{10}, have continued in operation at the site. A TEOM unit, monitoring particulate matter as PM_{10}, was installed at a residential site at 58 The Terrace, Port Pirie West in August 2005 and is being operated by EPA on behalf of the Department of Health.
Whyalla	A monitoring campaign for ozone, nitrogen dioxide and sulfur dioxide at the Nicolson Avenue monitoring site in Whyalla Norrie was concluded in June 2006 and a report drafted.

Earlier ambient air quality monitoring data has been compiled in the following EPA reports *Ambient Air Quality Monitoring South Australia 1979–2003* (2004), *South Australia's Air Quality, 2004* (2005a) and *South Australia's Air Quality, 2004: Air Quality Monitoring Data Tables* (2005b).

In June 2001, the EPA published the *Ambient Air Quality Monitoring Plan for South Australia* to ensure that ambient air quality monitoring in South Australia would be consistent with other states. A review of the monitoring plan, *South Australian Ambient Air Quality Monitoring Program—A Review,* was published in May 2005 (2005c).

These reports can be accessed at <www.epa.sa.gov.au/pub.html>.

SOUTH AUSTRALIA'S AIR QUALITY IN 2005

Table 4 summarises South Australia's performance against the air quality standards and goals of the Air NEPM at designated performance monitoring sites. The complete set of air quality monitoring data tables will also be available on the EPA website.

Table 4: Assessment of South Australian air quality

Site	Carbon monoxide	Nitrogen dioxide		Ozone		Sulfur dioxide			Lead	PM_{10}
	8h	1h	1y	1h	4h	1h	1d	1y	1y	1d
Adelaide airshed										
Adelaide[1]	0									
Elizabeth	0	0	✓	0	0					6
Kensington Gardens		0	✓	0	0					2
Netley		0	✓	0	0					6
Northfield		0	✓	0	0	0	0	✓		
Spencer Gulf airshed										
Port Pirie South[2]: Oliver St		0				29	0	✓	×	6
Port Pirie: Risdon Park									✓	
Whyalla Norrie: Civic Park[3]										1
Whyalla Norrie: Nicolson Avenue		0	✓	0	0	0	0	✓		

Key:

- 0 — Standard and goal met on all days
- ✓ — Standard met for year
- Insufficient data to assess performance
- Exceeded standard but met goal
- Pollutant not monitored at this site
- Goal not met
- × — Standard not met for year

Notes:

h: hour; d: day; y: year

The numbers in the table indicate the number of days on which the standard was not met.

Under the requirements of the Air NEPM, compliance with the goal can only be demonstrated if the data recovery rate for each quarter of the year is greater than 75%.

1 Incomplete data for 2005; monitoring at Adelaide site concluded on 30 June 2005

2 Incomplete data for nitrogen dioxide for 2005: monitoring at Port Pirie South site concluded on 11 August 2005

3 The Civic Park site uses high volume sampling with samples taken one day in three so data recovery rate does not meet Air NEPM requirements

Adelaide

In 2005, the air quality in Adelaide, as indicated by the AQI, was predominantly good to very good. The recorded levels of carbon monoxide, nitrogen dioxide, ozone and sulfur dioxide were at all times within the Air NEPM standards. The Elizabeth and Netley monitoring sites each recorded six days—one day in excess of the Air NEPM goal—when the level of particulate matter, as PM_{10}, exceeded the Air NEPM standard.

Carbon monoxide

Carbon monoxide was monitored at an urban site in Elizabeth Downs, and at a site in Hindley Street in the Adelaide central business district until June 2005. Levels of carbon monoxide are generally low at both sites. At the Hindley Street site, the Air NEPM standard (9 ppm for an 8-hour average) was last exceeded in 1997.

Nitrogen dioxide

Nitrogen dioxide was monitored at Elizabeth Downs, Kensington Gardens, Netley and Northfield. The Air NEPM standards for the one-hour average and the yearly average were not exceeded at these monitoring sites.

Ozone

Ozone was monitored at Elizabeth Downs, Kensington Gardens, Netley and Northfield. The Air NEPM standards for the one-hour average and the four-hour average were not exceeded at any time at these sites.

Sulfur dioxide

Sulfur dioxide was monitored at Northfield. The Air NEPM standards for one-hour average, one-day average and yearly average were not exceeded at any time.

Particulate matter, PM_{10}

The TEOM method was used to continuously monitor for particulate matter, as PM_{10}, at Elizabeth Downs, Kensington Gardens, and Netley. A new monitoring site, located at the Le Fevre Peninsula Primary School, Hughes Street, began operation in June 2005.

The Air NEPM sets a standard of 50 $\mu g/m^3$ for the one-day average for PM_{10}, and specifies that this standard may be exceeded on not more than five days per year. At both the Elizabeth Downs and Netley sites, there were six days on which the standard was exceeded, so these sites did not comply with the Air NEPM. At Kensington Gardens, there were two days on which the standard was exceeded. In the six-month period of monitoring at Birkenhead, the standard was not exceeded.

In dry weather, Adelaide can be subjected to elevated levels of airborne dust carried from rural areas by strong winds. On 31 December, all the sites except Birkenhead recorded one-day averages that exceeded the Air NEPM standard of 50 $\mu g/m^3$; Birkenhead recorded its highest value (49.9 $\mu g/m^3$) since monitoring began in June 2005.

High volume sampling (one day in six) was used to monitor particulate matter, as PM_{10}, at Netley, and also at Northfield and at an industrial site in Osborne until these sites were closed in September 2005. At Netley, there were two occasions on which the 24-hour sample exceeded the Air NEPM standard. At Northfield, before its closure, there was one occasion on which the 24-hour sample exceeded the Air NEPM standard. As the site at Osborne was an industrial monitoring site, the Air NEPM standard was not applicable.

Particulate matter, $PM_{2.5}$

Particulate matter, as $PM_{2.5}$, was monitored by the TEOM method at the Netley monitoring site but the data cannot be used for comparison to the Air NEPM advisory reporting standard until the equivalence of this method has been established and formally included in the Air NEPM.

The Air NEPM has advisory reporting standards of 25 $\mu g/m^3$ for the 24-hour average and 8 $\mu g/m^3$ for the yearly average. At Netley in 2005, the annual average was 7.9 $\mu g/m^3$ and the highest 24-hour average during the year was 16.9 $\mu g/m^3$.

Total suspended particles

TSP were measured at monitoring sites in Northfield and Osborne until their closure in September 2005. Maximum TSP values recorded during the year were 202.9 $\mu g/m^3$ at Northfield and 124.5 $\mu g/m^3$ at Osborne.

Air quality index

In 2005, the air quality in Adelaide, as indicated by the AQI, was 'very good' 37% of the time, 'good' 50% of the time, 'fair' 10% of the time and 'poor' to 'very poor' 3% of the time (Figure 3). The occasions when the air quality was rated as 'fair', 'poor' or 'very poor' were caused by elevated levels of PM_{10} particulate matter. This AQI was calculated using validated air quality data from the monitoring sites operated by the EPA in the suburbs of Elizabeth Downs, Kensington Gardens, Netley and Northfield.

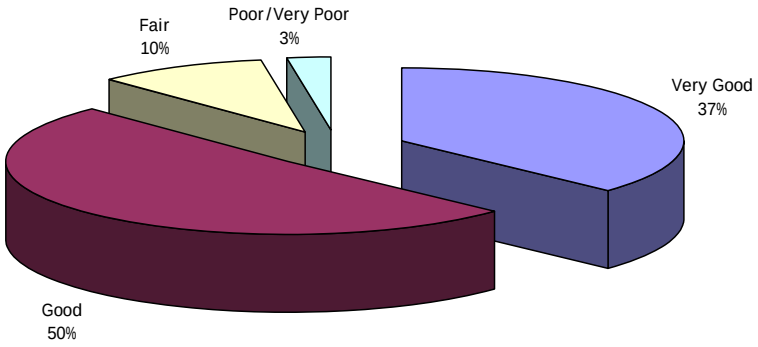


Figure 3: Air quality index for Adelaide 2005

In 2005, the Air NEPM standard of 50 $\mu g/m^3$ for PM_{10} particulate matter as a 24-hour average was exceeded six times at the Elizabeth Downs monitoring site, six times at the Netley monitoring site and twice at the Kensington Gardens monitoring site. Since the goal of the Air NEPM is that the standard should not be exceeded more than five times per year, the Elizabeth Downs and Netley sites did not meet the Air NEPM goal.

Port Augusta

In Port Augusta, particulate matter, as PM_{10}, is monitored by high volume sampling (one day in six) at a monitoring site located at the hospital. The highest 24-hour sample obtained during the year was 38.3 $\mu g/m^3$.

Port Pirie

The major industry in Port Pirie is the Zinifex lead smelter, which processes lead sulfide ores that give rise to lead and sulfur dioxide pollution in the area.

The EPA and the Department of Health have measured lead levels and particulate matter levels in Port Pirie for many years. Currently, lead and particulate matter is monitored at four sites, located at Port Pirie South, Port Pirie West, Risdon Park and Port Pirie. The Port Pirie site is an industrial monitoring site located in Ellen Street near the boundary of the lead smelter.

Concentrations of airborne lead at most of these sites continue to be measured at levels exceeding the 0.5 $\mu g/m^3$ standard set by the Air NEPM for the annual average.

In 2005, the annual average and the one-day average sulfur dioxide levels recorded at the monitoring site in Port Pirie South met the standards and goals of the Air NEPM. However, the one-hour standard set by the Air NEPM was exceeded on 29 days.

The Air NEPM standard of 50 $\mu g/m^3$ for the one-day average concentration of particulate matter, as PM_{10}, was exceeded at the Port Pirie South monitoring site on six occasions, one more than the five allowed to meet the Air NEPM goal.

Lead

Airborne particulate lead values are obtained by chemical analysis of samples of TSP matter collected by high volume sampling.

In 2005, the annual average lead concentration was 0.60 $\mu g/m^3$ at the monitoring site in Port Pirie South, 0.73 $\mu g/m^3$ at the monitoring site in Port Pirie West and 0.25 $\mu g/m^3$ at the monitoring site in Risdon Park. Only the Risdon Park monitoring site had an annual average lead concentration that complied with the Air NEPM standard of 0.50 $\mu g/m^3$.

At the monitoring site in Ellen Street, Port Pirie, the annual average lead concentration was 3.46 $\mu g/m^3$. As this site is located in an industrial area close to the lead smelter to evaluate industry performance, it does not meet the criteria for an Air NEPM site.

Sulfur dioxide

Sulfur dioxide is monitored at the site in Port Pirie South.

The Air NEPM standard of 0.20 ppm for the one-hourly average sulfur dioxide concentration was exceeded on 29 days during the year; in 2004 it had been exceeded 31 times. The Air NEPM sets a goal of not more than one day a year on which the standard may be exceeded.

The Air NEPM standards of 0.02 ppm for the yearly average sulfur dioxide concentration and 0.08 ppm for the one-day average concentration were not exceeded at this monitoring site in 2005.

Figure 4 shows the daily maximum one-hourly average sulfur dioxide levels recorded at the monitoring site in Port Pirie South. The horizontal line marks the Air NEPM standard of 0.20 ppm.

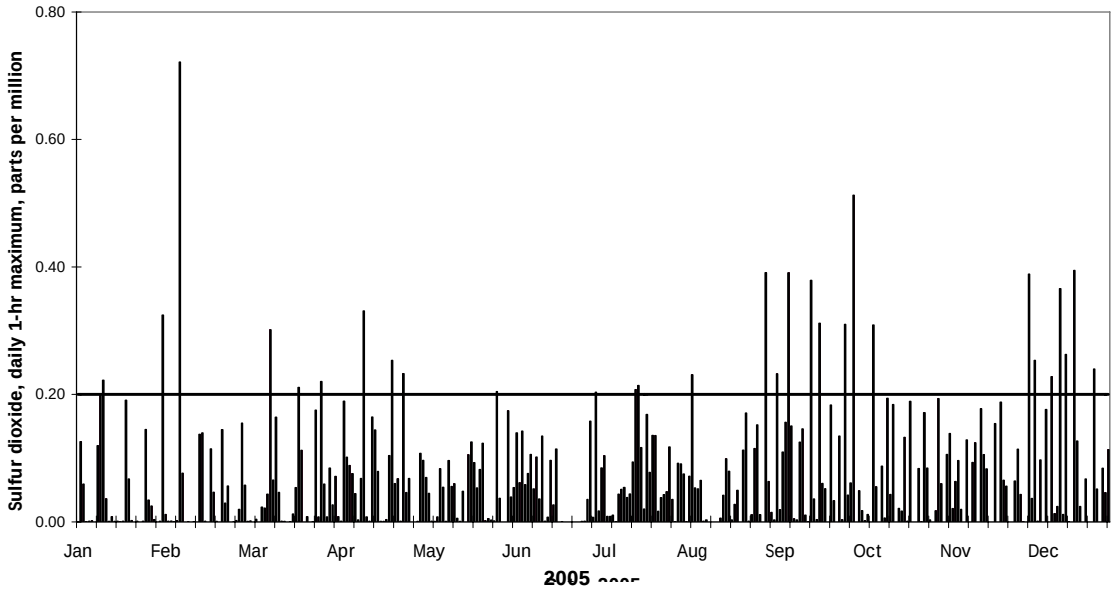


Figure 4: Sulfur dioxide, daily maximum one-hour averages, Port Pirie South, 2005

Particulate matter, PM_{10}

Monitoring for particulate matter, as PM_{10}, was undertaken at the monitoring site in Port Pirie South, using both the TEOM continuous monitoring method and high volume sampling (one day in six).

From the data obtained by the TEOM method, the Air NEPM standard of 50 $\mu g/m^3$ for a one-day average was exceeded on six days in 2005. This exceeded the Air NEPM goal of not more than five days per year on which the standard may be exceeded.

During the year 60 samples were taken using the high volume sampling method; only one exceeded the Air NEPM standard.

Total suspended particles

TSP were monitored by high volume sampling, one day in six, at the four monitoring sites in Port Pirie, primarily to determine the airborne lead content of the collected material. Maximum TSP values recorded during the year were 268.7 $\mu g/m^3$ at the Port Pirie South site, 483.8 $\mu g/m^3$ at the Port Pirie West site, 337.6 $\mu g/m^3$ at the Risdon Park site and 514.0 $\mu g/m^3$ at the Port Pirie site.

Nitrogen dioxide

Nitrogen dioxide was monitored until August 2005 as part of a monitoring campaign at the site in Port Pirie South. The average for the period of monitoring in 2005 was less than the annual average set by the Air NEPM and the hourly averages were less than the one-hour standard set by the Air NEPM.

Air quality index

The AQI for Port Pirie was calculated using validated hourly data for sulfur dioxide and particulate matter, as PM_{10}, collected for the full year from the EPA monitoring site in Oliver Street, Port Pirie South[2]. It indicated that the air quality in Port Pirie in 2005 was 'very good' 35% of the time, 'good' 38% of the time, 'fair' 17% of the time, 'poor' 5% of the time and 'very poor' 5% of the time. Figure 5 illustrates these results.

[2] The AQIs quoted in this report are not directly comparable to the AQIs quoted in the 2004 report as the latter included data for nitrogen dioxide and ozone, and a modified method of calculation has been adopted to give greater consistency with the AQI displayed on the EPA website.

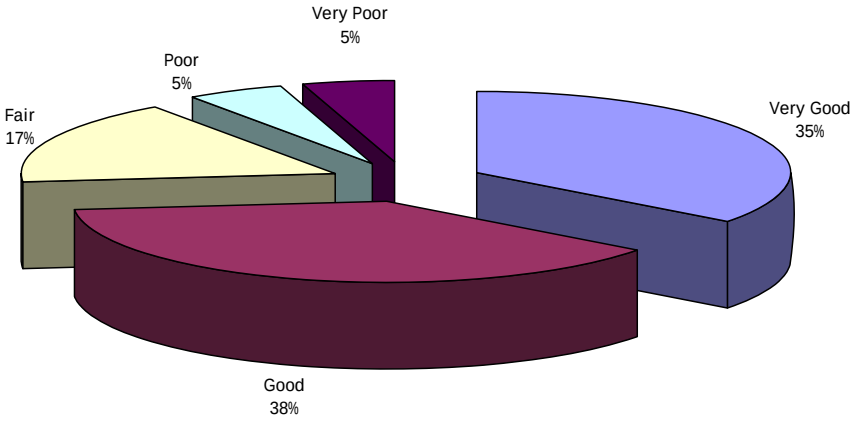


Figure 5: Air quality index for Port Pirie, 2005

This AQI calculation does not include lead because the Air NEPM standard for lead is defined as an annual average; the annual average airborne lead value recorded at this monitoring site exceeded the Air NEPM Standard.

The 'fair', 'poor' and 'very poor' AQIs at Port Pirie resulted from pollution by sulfur dioxide and particulate matter.

Whyalla

The major industry in Whyalla involves the activities of ore transport along a railway system, iron ore pelletising and metal smelting. The iron ore pelletising plant is located close to the eastern end of Whyalla and the EPA monitoring sites at Hummock Hill and Walls Street show that particulate pollution from this industrial source continues to be a problem in that area.

Sulfur dioxide, nitrogen dioxide and ozone have been the subject of a monitoring campaign at a site in Nicolson Avenue, Whyalla Norrie.

Particulate matter, PM_{10}

Particulate matter, as PM_{10}, is monitored at three sites. At Walls Street, a TEOM unit continuously monitors particulate matter, as PM_{10}. At Hummock Hill, close to the pelletising plant, and at Civic Park, PM_{10} and TSP are monitored by high volume sampling, with samples being taken on one day in three.

The monitoring site at Civic Park, Whyalla Norrie, is used to monitor background levels of particulate matter. In 2005, one sample taken at the site on 27 December exceeded the Air NEPM Standard of 50 $\mu g/m^3$. On this date the TEOM unit at the Walls Street monitoring site and monitoring sites in Port Pirie also recorded particulate matter levels exceeding the Air NEPM standard. High dust levels were also recorded on this day at EPA monitoring sites in Adelaide.

At Civic Park towards the western end of Whyalla, where high volume sampling program for particulate matter, as PM_{10}, is conducted on one day in three, there was one day on which the Air NEPM standard of 50 $\mu g/m^3$ was exceeded. This complies with the Air NEPM as the Air NEPM goal allows up to five days on which the standard may be exceeded.

At Walls Street in 2005, of the 365 one-day average PM_{10} values recorded by the TEOM unit, 30 (8%) exceeded 50 $\mu g/m^3$ (see Figure 6). At Hummock Hill, of the 117 one-day samples obtained by high volume sampling, 27 (23%) exceeded 50 $\mu g/m^3$.

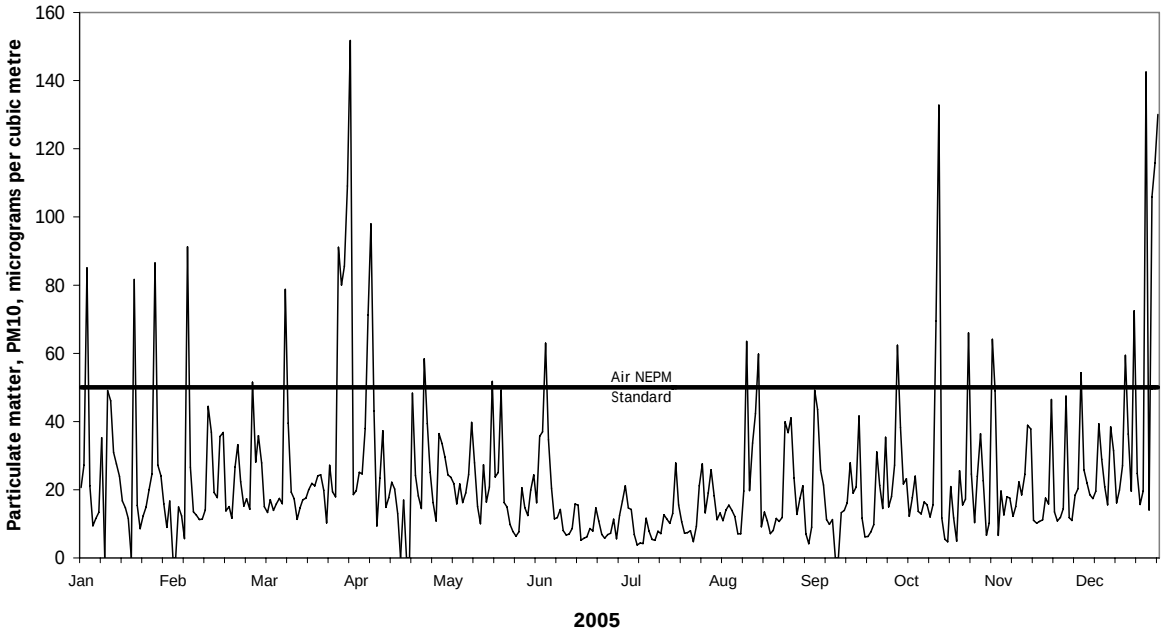


Figure 6: Particulate matter, as PM_{10}, 24-hour averages, Walls Street, Whyalla, 2005

Total suspended particles

TSP have been measured by high volume sampling at Civic Park and Hummock Hill since 1989. The maximum TSP values recorded in 2005 were 211.0 $\mu g/m^3$ at Civic Park and 944.1 $\mu g/m^3$ at Hummock Hill.

Nitrogen dioxide

Nitrogen dioxide is measured at the Nicolson Avenue monitoring site, where a NEPM monitoring campaign began in January 2004. The annual average in 2005 was less than the annual average set by the Air NEPM and the hourly averages were at all times less than the one-hour standard set by the Air NEPM.

Ozone

Nitrogen dioxide is measured at the Nicolson Avenue monitoring site, where a NEPM monitoring campaign began in January 2004. The hourly averages and four-hourly averages in 2005 were at all times less than the one-hour standard set by the Air NEPM.

Sulfur dioxide

Nitrogen dioxide is measured at the Nicolson Avenue monitoring site, where a NEPM monitoring campaign began in January 2004. The annual average in 2005 was less than the annual average set by the Air NEPM and the one-day averages and hourly averages were at all times less than the one-hour standard set by the Air NEPM.

Air quality index

For the gaseous pollutants, nitrogen dioxide, ozone and sulfur dioxide, the air quality in Whyalla was predominantly very good.

It is not appropriate to calculate an air quality index for Whyalla in the same format as for Adelaide and Port Pirie because in Whyalla particulate matter pollution is not continuously monitored at the sites designated as performance monitoring sites for the Air NEPM.

IMPROVING SOUTH AUSTRALIA'S AIR QUALITY

The EPA will continue to maintain and review its program of ambient air quality monitoring in South Australia.

The EPA has an ongoing 'hot spot' program to conduct monitoring in areas of interest and concern where the existing network of ambient air quality monitoring sites does not provide sufficient coverage. The 'hot spot' program deals with localised air quality issues, for example concerns about odours or particulate pollution, that may occur in residential areas adjacent to industrial areas. Reports from this program are published on the EPA website <www.epa.sa.gov.au>.

The EPA Air Quality Unit's laboratory at Netley has now been accredited by the National Association of Testing Authorities in the field of chemical testing. The laboratory is the third Australian EPA laboratory to achieve accreditation.

Other activities of the EPA that will contribute to improving air quality in South Australia are:

- developing capabilities for air quality modelling to supplement the ambient air quality monitoring capabilities
- developing, in conjunction with the Bureau of Meteorology and CSIRO Marine and Atmospheric Research, an ambient air quality forecasting model for South Australia
- completing a report on 'air toxics' as required by the National Environment Protection (Air Toxics) Measure
- contributing to the development, establishment and review of the National Environment Protection Measures for air quality.

The EPA strategy for controlling airborne emissions from industrial sites is to seek the minimisation of emissions to air by either reduction or destruction of the pollutants contained in the exhaust air. For example, regenerative thermal oxidisers to eliminate volatile organic compounds from exhaust streams are increasingly being used by industry.

Where it is appropriate to minimise airborne pollutants, the EPA considers the broader effects of the pollutants using, for example, EPA guidelines for managing nitrogen oxides and ensuring that industrial emissions are dispersed without causing localised pollution. The EPA is keeping up to date with changes in Australia and overseas and is currently updating the guidelines for design ground level concentrations. The EPA is also reviewing the guidelines for odour management and will evaluate whether the current trend to consider the character of odour emissions can usefully be applied in the South Australian context.

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