NATIONAL ENVIRONMENT PROTECTION (AMBIENT AIR QUALITY) MEASURE

NEW SOUTH WALES ANNUAL COMPLIANCE REPORT 2005

(Prepared July 2006)

Department of
Environment and Conservation (NSW)

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Contents

Acronyms, abbreviations and glossary

Following is a list of acronyms, abbreviations and terms used in this report.

AAQ NEPM	Ambient Air Quality – National Environment Protection Measure
ABS	Australian Bureau of Statistics
Ambient air	The external air environment (does not include the air environment inside buildings or structures)
AQMP	Air Quality Monitoring Plan
AS	Australian Standards
BAM	Beta Attenuation Monitor
CO	Carbon monoxide
DEC	Department of Environment and Conservation (NSW)
EPA	Environment Protection Authority
FDMS	Filter Dynamics Measurement System (used with TEOM)
FRM	Federal Reference Method (USEPA)
GRUB	Generally Representative Upper Bound
ICP-AES	Inductively Coupled Plasma-Atomic Emission Spectroscopy
Monitoring station	A facility for measuring the concentration of one or more pollutants in the ambient air in a region or sub-region
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
NO_2	Nitrogen dioxide
NO_x	Oxides of nitrogen
O_3	Ozone
Pb	Lead
$PM_{2.5}$	Particulate Matter with aerodynamic diameter of 2.5 microns or less
PM_{10}	Particulate Matter with aerodynamic diameter of 10 microns or less
POEO	Protection of the Environment Operations Act (1997) – key piece of environmental protection legislation in NSW
ppm	Parts per million by volume – parts of pollutant per million parts of air
PRC	Peer Review Committee
RAAS	Reference Ambient Air Sampler
SO_2	Sulfur dioxide
TEOM	Tapered Element Oscillating Microbalance
USEPA	United States Environment Protection Agency
$\mu g/m^3$	microgram (1 millionth of a gram) per cubic metre referenced to a temperature of 0°C and an absolute pressure of 101.325 kilopascals
VOC	Volatile Organic Compounds – compounds that vaporise, that is become a gas, at normal atmospheric temperatures

Introduction

The goal of the National Environment Protection Measure for Ambient Air Quality (AAQ NEPM) is to meet the NEPM standards (within the maximum number of allowable exceedences) by 2008.

This report, required under Clause (18) of the Ambient Air Quality NEPM, demonstrates that in 2005 NSW has met the requirements of the Ambient Air Quality NEPM for most pollutants. Levels of carbon monoxide, nitrogen dioxide, lead and sulfur dioxide continue to be well below the NEPM standards. Levels of ozone exceeded the NEPM standards in the Sydney and Illawarra regions and exceedences of the PM_{10} standard were recorded in Sydney, the Illawarra, lower Hunter, Albury, Tamworth and Wagga Wagga.

The NSW air quality management plan, *Action for Air*, outlines a broad range of strategies used to manage air quality in NSW such as integrating air quality goals and urban transport planning; providing more and better transport choices; making cars, trucks and buses cleaner; promoting cleaner homes and business; and managing the impact of open burning. Action for Air is a 25-year plan that is reviewed regularly to assess achievements and the need for adaptation of control strategies. A review of the plan is taking place in 2006-07.

Meeting the Ambient Air Quality NEPM goal for ozone will be a challenge for the major urban areas of NSW given pressures from a growing population, urban expansion and associated increase in motor vehicle use. However, NSW has a broad range of strategies to reduce precursor pollutants in place, and being developed, under Action for Air. These include the requirement for Stage 1 vapour controls at service stations in Sydney, mandatory limits for petrol volatility in summer, the NSW Cleaner Vehicles Action Plan as well as initiatives to assist local councils to manage precursor emissions from smaller, commercial/industrial sources and domestic sources. A regulatory framework, which restricts emissions from larger industry through licence limits and load-based fees, is in place. The regulations limiting industrial emissions were reviewed and strengthened in 2005. These measures, together with stricter motor vehicle emission standards, tighter fuel regulations, and NSW Diesel NEPM programs will help move NSW towards meeting the NEPM goal for ozone in the longer term.

Over and above the impacts of drought, bushfires and dust storms, meeting the goal of the Ambient Air Quality NEPM for particles, measured as PM_{10}, presents a challenge for NSW. This is particularly the case in rural population centres where a combination of topography, climate and relatively high use of solid fuel heaters, combine to produce elevated levels of particles in winter. Similarly, bringing $PM_{2.5}$ levels in line with the $PM_{2.5}$ advisory reporting standards is an area of difficulty for NSW.

As is the case for ozone, Action for Air includes a broad range of strategies for managing particle emissions (both PM_{10} and $PM_{2.5}$) across mobile, industry and domestic sources. Some of the more significant initiatives are:

- National vehicle emission and fuel quality standards;
- Actions under the Diesel National Environment Protection Measure which requires jurisdictions to assess the impact of emissions from in service diesel vehicles and where necessary to implement programs to reduce them. NSW programs include the Smoky Vehicle Enforcement program;
- Particle emissions limits for industrial combustion processes under the Protection of the Environment (Clean Air) Regulation;
- Environmental Impact Assessment processes for new developments;
- Emission limits for particles from solid fuel heaters; and
- The introduction of a new offence for excessive smoke emissions from residential chimneys.

Ambient Air Quality NEPM Monitoring

The NSW Ambient Air Quality NEPM Monitoring Plan details the monitoring that NSW performs to assess compliance with the Ambient Air Quality NEPM. The majority of monitoring occurs in the high population regions of Sydney, Newcastle and Wollongong. These regions contain over 60% of the NSW population. Campaign monitoring is also performed at a number of rural population centers.

The network is designed to characterise general air quality and frequently will pick up individual pollutant events. This approach ensures that there is adequate coverage of the populated areas and of the broad differences in pollutant distribution within a region. The choice of stations in each region was made to optimise both population coverage and representation of the occurrences of higher pollutant concentration.

NSW characterises the air quality to which the general population is exposed in a region by monitoring all air pollutants of interest at a network of trend stations. These stations capture the majority of pollution events that occur from time to time, but are supplemented by additional permanent upper bound stations at which selected pollutants only will be monitored to ensure that all major pollutant events are captured and reported.

Campaign monitoring will be undertaken in regional centres. Initial monitoring is occurring at Albury, Wagga Wagga, Bathurst and Tamworth. Data from these stations will be used to validate and review the screening measures applied to the urban centres outside the Sydney-Wollongong-Newcastle regions.

In total, NSW currently monitors the majority of pollutants at nine trend stations (T), selected individual pollutants at five additional permanent upper bound stations or performance stations (P), and selected pollutants on a campaign basis at a further eight stations (C) in Sydney, the lower Hunter and provincial cities.

In addition NSW also maintains a number of air quality monitoring stations that are not designated for NEPM monitoring. Some stations that are designated NEPM stations for particular pollutants are not designated for other pollutants. For instance St Marys is designated as a NEPM station for ozone however nitrogen dioxide and PM_{10} are also measured at this station. Data from stations that are not designated as NEPM stations for a particular pollutant are not presented in this report.

The NSW monitoring network for the Ambient Air Quality NEPM is outlined in table 1. More detailed information on NEPM monitoring in NSW is provided in Appendix A.

New sites and site closures

After continued vandalism the Albion Park station was closed in January 2005 and relocated to a nearby site in December 2005. The new site is called Albion Park South.

The Blacktown monitoring station was closed in June 2004 as the land where the station was located was sold for residential development. The location of this monitoring station, directly on the Blacktown Ridge provided valuable data that contributed to a better understanding of air movements between the Hawkesbury basin and the Parramatta River valley. The Department of Environment and Conservation is currently in the process of locating a site suitable for re-establishing monitoring in the Blacktown Ridge area.

Table 1: NSW Ambient Air Quality NEPM monitoring network

Station	Station type [1]	Year established	Number of parameters	Ozone	Nitrogen dioxide	PM_{10}	Carbon monoxide	Sulfur dioxide	Lead
Sydney									
Blacktown	T	1992 – 2004 (new site to be established)	5	X	X	X	X	X	
Bringelly	T	1992	4	X	X	X		X	
Central Coast [2]	C	To be established	4	X	X	X		X	
Chullora [3]	T	2003	5	X	X	X	X	X	
Liverpool [4]	C	1990	5	X	X	X	X		
Macarthur	T	2003	5	X	X	X	X	X	
Oakdale	P	1996	2	X		X			
Richmond	T	1992	4	X	X	X		X	
Rozelle	T	1978	4	X	X	X	X		
St Marys	P	1992	1	X					
Lower Hunter									
Newcastle	T	1992	5	X	X	X	X	X	
Maitland [5]	T	To be established	4	X	X	X		X	
Beresfield [6]	C	1993	1			X			
Wallsend [6]	C	1992	3	X	X			X	
Illawarra									
Albion Park	P	1978 – 2005	4	X	X	X		X	
Albion Park South	P	2005	4	X	X	X		X	
Kembla Grange	P	1994	2	X		X			
Warrawong	P	1993	1					X	
Wollongong	T	1993	5	X	X	X	X	X	
Regional NSW									
Albury	C	2000	1			X			
Bathurst	C	2000	2	X		X			
Dubbo [7]	C	Dependent on campaign monitoring results	1			X			
Lismore [7]	C		1			X			
Orange [7]	C		1			X			
Tamworth	C	2000	1			X			
Wagga Wagga	C	2001	1			X			

(1) P denotes performance; T denotes trend; C denotes campaign.

(2) Scheduled to begin operation in 2006.

(3) Replaced the Lidcombe trend station.

(4) Data from the Liverpool station will be reported at least until the Macarthur station is fully established.

(5) Scheduled to begin operation in 2004, but delayed.

(6) Data from Beresfield and Wallsend will be reported at least until the Maitland station is established.

(7) Monitoring subject to results from initial campaign monitoring.

Note: As reported in the 2004 compliance report the CBD (C) and Woolooware (T) stations were closed in August 2004.

Assessment of compliance with standards and goal

The following tables summarise compliance with Ambient Air Quality NEPM standards. For each pollutant, data availability, both quarterly and annual, the number of days when standards were exceeded, annual averages (where an annual standard exists), and an assessment of compliance, are given for each monitoring station within each region.

A station is assessed as complying with the Ambient Air Quality NEPM standard if less than the allowed number of exceedences are recorded at the station, and data availability is greater than seventy-five percent both for the year, and for each quarter of the year. A station can demonstrate non-compliance if a greater number of days than allowed exceed the relevant standard, even if that station does not comply with data availability rates. If a station records no exceedences, or exceedences on a number of days less than that allowed, but has not complied with data availability rates, then the station is assessed as compliance not demonstrated.

A region demonstrates compliance when either all stations in the region demonstrate compliance, or when the region meets approved pollutant screening criteria.

The Ambient Air Quality NEPM states that short-term standards should not be exceeded on more than one day per year for carbon monoxide, nitrogen dioxide, ozone and sulfur dioxide, and on no more than five days per year for particles (PM_{10}). With this form of standard, the non-overlapping second highest daily value (or the sixth for PM_{10}) becomes the value against which compliance is assessed. If this value is greater than the standard then non-compliance is reported.

All days where a particular standard for a pollutant has been exceeded are listed. Also listed are the stations that recorded an exceedence of the standard on that day, and for averaging periods less than twenty-four hours, the number of averaging periods in the day that the standard was exceeded.

Where possible a brief comment is given for particular pollution events. Events that have been clearly influenced by extraordinary natural events, such as bushfires and dust storms, are highlighted. It should be noted that the absence of a comment does not necessarily indicate the absence of such influences, rather that there is no clear information available. In some cases it is likely that there has been some influence, but the extent of this influence cannot be absolutely determined.

Data loss

Not including station establishment and closures listed above, no significant amounts of data were lost during 2005. In line with the air quality monitoring plan SO_2 monitors were installed at Chullora, Macarthur and Newcastle and a CO monitor installed at Macarthur during the year, thus data availability rates from these stations do not meet the Ambient Air Quality NEPM goal.

Instrument failures led to data availability rates lower than the Ambient Air Quality NEPM goal for the PM_{10} monitors at Newcastle and Tamworth.

Carbon monoxide

During 2005 no exceedences of the carbon monoxide standard were recorded in NSW. Compliance with the Ambient Air Quality NEPM goal was demonstrated in all regions. A carbon monoxide monitor was installed at the Macarthur stations during June 2005 consequently the data availability criteria were not met at this station.

Carbon monoxide levels are well below the Ambient Air Quality NEPM standard. The highest recorded value in the state was 2.8ppm (Chullora and Liverpool). This is only 31 per cent of the standard. Levels in all regions are significantly lower than the NEPM standard.

Table 2: 2005 compliance summary for CO in New South Wales

AAQ NEPM Standard 9.0 ppm (8-hour average)

Region/ Performance monitoring Station	Data availability rates (% of hours)					Number of exceedences (days)	Performance against the standards and goal
	Q1	Q2	Q3	Q4	Annual		
Sydney							
Blacktown [1]							
Chullora	97.9	95.7	99.1	95.1	97.0	0	Met
Liverpool	94.5	93.3	83.3	96.4	91.9	0	Met
Macarthur [2]	00.0	21.8	98.2	99.0	55.2	0	ND
Rozelle	97.8	96.8	94.9	99.8	97.3	0	Met
Illawarra							
Wollongong	99.0	93.6	98.3	96.3	96.8	0	Met
Lower Hunter							
Newcastle	97.6	95.6	93.9	95.9	95.8	0	Met

ND Not demonstrated.

(1) Station closed pending relocation.

(2) Instrument installed during 2005.

Table 3: Summary for CO - Daily maximum rolling 8-hour average concentrations (2005)

Region/ Performance monitoring Station	Data availability rates (%)	Number of valid days	Maximum values (ppm)			
			Highest Value	Highest Date	2nd Highest Value	2nd Highest Date
Sydney						
Chullora	97.0	347	2.8	08-Jun 03:00	1.9	24-May 03:00
Liverpool	91.9	331	2.8	09-Jun 02:00	2.5	30-Jul 03:00
Macarthur	55.2	199	1.0	11-Jun 01:00	0.9	20-Aug 01:00
Rozelle	97.3	349	2.1	02-Jun 03:00	1.9	08-Jun 03:00
Illawarra						
Wollongong	96.8	347	2.6	26-Aug 12:00	2.5	25-Aug 10:00
Lower Hunter						
Newcastle	95.8	339	1.9	25-May 01:00	1.7	31-May 02:00

AAQ NEPM Standard - 9.0 ppm (rolling 8-hour average)

Nitrogen dioxide

No exceedences of the nitrogen dioxide 1-hour and annual standards were recorded in NSW during 2005. Compliance with the Ambient Air Quality NEPM goal was demonstrated in Sydney and the lower Hunter region. Compliance was not demonstrated in the Illawarra region because the data availability criteria were not met at Albion Park (due to the relocation of this station).

Table 4: 2005 compliance summary for NO_2 in New South Wales

AAQ NEPM standard
0.12 ppm (1-hour average)
0.03 ppm (1-year average)

Region/ Performance monitoring Station	Data availability rates (% of hours)					Number of Exceed-ences (days)	Annual mean (ppm)	Performance against the standards and goal	
	Q1	Q2	Q3	Q4	Annual			1-hour	1-year
Sydney									
Blacktown [1]									
Bringelly	92.6	94.7	83.7	95.0	91.5	0	0.006	Met	Met
Chullora	91.0	91.2	94.3	93.4	92.5	0	0.014	Met	Met
Liverpool	93.0	93.7	88.9	92.4	92.0	0	0.013	Met	Met
Macarthur	89.4	88.4	94.2	95.4	91.9	0	0.012	Met	Met
Richmond	87.4	93.8	87.1	91.8	90.1	0	0.006	Met	Met
Rozelle	92.6	93.1	85.8	93.4	91.2	0	0.013	Met	Met
Central Coast [2]									
Illawarra									
Albion Park	19.4	00.0	00.0	00.0	4.8	0	0.004	ND	ND
Wollongong	94.8	78.2	89.4	91.9	88.6	0	0.009	Met	Met
Lower Hunter									
Newcastle	86.2	94.5	92.6	85.4	89.7	0	0.009	Met	Met
Maitland [3]									
Wallsend	88.1	95.3	95.0	95.0	93.4	0	0.008	Met	Met

ND Not demonstrated.

(1) Station closed pending relocation.

(2) Station to be established.

(3) Station to be established. Data reported from Wallsend in the interim.

Within NSW levels of nitrogen dioxide are well below the NEPM standard. The highest recorded 1-hour average value in the state was 0.081ppm (68 per cent of the standard) at the Macarthur station. The highest annual average of 0.014ppm (47 percent of the standard) was recorded at Chullora.

Table 5: Summary for NO_2 - Daily maximum 1-hour average concentrations (2005)

Region/ Performance monitoring Station	Data availability rates (%)	Number of valid days	Maximum values (ppm)			
			Highest Value	Highest Date	2nd Highest Value	2nd Highest Date
Sydney						
Bringelly	91.5	349	0.045	05-Oct 19:00	0.035	26-Apr 20:00
Chullora	92.5	353	0.064	21-Dec 23:00	0.052	05-Oct 21:00
Liverpool	92.0	352	0.063	22-Dec 00:00	0.060	21-Dec 23:00
Macarthur	91.9	342	0.081	21-Dec 21:00	0.069	05-Oct 21:00
Richmond	90.1	339	0.036	26-Apr 19:00	0.035	09-Sep 22:00
Rozelle	91.2	344	0.052	09-Jun 14:00	0.049	11-Oct 21:00
Illawarra						
Albion Park	4.8	18	0.035	14-Jan 11:00	0.034	01-Jan 18:00
Wollongong	88.6	338	0.058	23-Sep 19:00	0.054	21-Dec 23:00
Lower Hunter						
Newcastle	89.7	340	0.041	05-Oct 20:00	0.036	14-Sep 20:00
Wallsend	93.4	356	0.038	11-May 18:00	0.037	14-Sep 19:00

AAQ NEPM Standard - 0.12 ppm (1-hour average)

Ozone

Both the 1-hour and 4-hour standards for ozone were exceeded in NSW during 2005. The Sydney region did not comply with the Ambient Air Quality NEPM goal. Compliance was demonstrated in the lower Hunter and Bathurst regions. Compliance was not demonstrated in the Illawarra region because the data availability criteria were not met at Albion Park (due to vandalism and the subsequent relocation of this station).

Table 6: 2005 compliance summary for O_3 in New South Wales

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

Region/ Performance monitoring Station	Data availability rates (% of hours)					Number of exceedences (days)		Performance against the standards and goal	
	Q1	Q2	Q3	Q4	Annual	1-hour	4-hour	1-hour	4-hour
Sydney									
Blacktown [1]									
Bringelly	88.7	94.7	79.7	90.6	88.4	**3**	**3**	Not met	Not met
Chullora	88.9	91.2	94.6	93.0	92.0	0	1	Met	Met
Liverpool	80.4	90.8	88.2	92.6	88.0	1	**2**	Met	Not met
Macarthur	94.5	94.4	94.2	95.6	94.7	**6**	**7**	Not met	Not met
Oakdale	95.1	83.9	92.3	93.4	91.2	**4**	**4**	Not met	Not met
Richmond	87.5	91.3	93.8	94.6	91.8	**2**	**4**	Not met	Not met
Rozelle	89.5	87.2	83.9	94.8	88.9	0	0	Met	Met
St Marys	95.5	95.3	85.8	91.8	92.1	**2**	**3**	Not met	Not met
Central Coast [2]									
Illawarra									
Albion Park	19.4	00.0	00.0	00.0	4.8	0	0	ND	ND
Kembla Grange	90.7	92.9	91.8	94.7	92.6	0	1	Met	Met
Wollongong	94.9	88.7	94.2	91.8	92.4	1	1	Met	Met
Lower Hunter									
Maitland [3]									
Newcastle	93.8	89.7	93.6	92.6	92.4	0	0	Met	Met
Wallsend	88.2	95.3	92.3	89.4	91.3	0	0	Met	Met
Regional									
Bathurst	85.5	90.0	94.1	93.0	90.7	0	0	Met	Met

ND Not demonstrated.

Bold font indicates values that exceed the AAQ NEPM standard

(1) Station closed pending relocation.

(2) Station to be established

(3) Station to be established. Data reported from Wallsend in the interim.

Ozone events in the Sydney and Illawarra regions are highly variable in terms of both frequency and severity. This is largely the result of the annual variability of meteorological conditions, which has the greatest effect on measures of frequency but can also have some influence on measures of peak concentrations. In the Sydney region emissions of ozone precursors (NOx and VOCs) are sufficient to generate concentrations of ozone well above the Ambient Air Quality NEPM standards (EPA 2003).

Both the 1-hour and 4-hour NEPM standards were exceeded in the Sydney and the Illawarra regions. There were no exceedences of either standard in Bathurst or the lower Hunter.

The 1-hour standard was exceeded at six Sydney monitoring stations: Bringelly, Liverpool, Macarthur, Oakdale, Richmond and St Marys. Of these, Macarthur recorded the highest number of exceedences with six days where hourly averages were greater than the standard. Chullora and Rozelle did not exceed the 1-hour standard. The maximum 1-hour average during the year was 0.149 ppm recorded at Liverpool on the 14th January.

In the Illawarra the only exceedence of the 1-hour standard was 0.102ppm recorded at Wollongong on the 8th February. There were no exceedences of the 1-hour standard recorded in the lower Hunter and Bathurst.

Table 7: Summary for O_3 - Daily maximum 1-hour average concentrations (2005)

Region/ Performance monitoring Station	Data availability rates (%)	Number of valid days	Maximum values (ppm)			
			Highest Value	Highest Date	2nd Highest Value	2nd Highest Date
Sydney						
Bringelly	88.4	338	**0.112**	13-Jan 14:00	**0.110**	14-Jan 15:00
Chullora	92.0	350	0.086	14-Jan 13:00	0.086	21-Dec 16:00
Liverpool	88.0	333	**0.149**	14-Jan 13:00	0.091	31-Dec 14:00
Macarthur	94.7	359	**0.142**	14-Jan 14:00	**0.140**	13-Jan 15:00
Oakdale	91.2	346	**0.130**	13-Jan 16:00	**0.109**	12-Jan 18:00
Richmond	91.8	348	**0.125**	25-Feb 14:00	**0.102**	13-Jan 17:00
Rozelle	88.9	339	0.081	08-Feb 16:00	0.072	08-Dec 14:00
St Marys	92.1	350	**0.113**	13-Jan 16:00	**0.103**	25-Feb 13:00
Illawarra						
Albion Park	4.8	18	0.067	14-Jan 13:00	0.064	01-Jan 14:00
Kembla Grange	92.6	355	0.091	08-Feb 16:00	0.079	21-Dec 15:00
Wollongong	92.4	354	**0.102**	08-Feb 16:00	0.083	21-Dec 15:00
Lower Hunter						
Newcastle	92.4	351	0.078	21-Dec 13:00	0.070	06-Feb 18:00
Wallsend	91.3	347	0.094	14-Jan 12:00	0.077	25-Feb 14:00
Regional						
Bathurst	90.7	343	0.056	24-Feb 16:00	0.055	15-Jan 11:00

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

Bold font indicates values that exceed the AAQ NEPM standard

Table 8: Summary for O_3 - Daily maximum rolling 4-hour average concentrations (2005)

Region/ Performance monitoring Station	Data availability rates (%)	Number of valid days	Maximum values (ppm)			
			Highest Value	Highest Date	2nd Highest Value	2nd Highest Date
Sydney						
Bringelly	92.4	338	**0.102**	13-Jan 16:00	**0.101**	14-Jan 15:00
Chullora	96.2	350	**0.080**	21-Dec 18:00	0.079	14-Jan 15:00
Liverpool	92.0	332	**0.121**	14-Jan 15:00	**0.083**	31-Dec 15:00
Macarthur	98.9	359	**0.126**	14-Jan 15:00	**0.109**	13-Jan 16:00
Oakdale	95.1	345	**0.106**	13-Jan 17:00	**0.095**	25-Feb 16:00
Richmond	96.3	347	**0.101**	25-Feb 16:00	**0.081**	13-Jan 18:00
Rozelle	92.9	339	0.065	21-Dec 17:00	0.064	01-Jan 15:00
St Marys	96.2	350	**0.091**	25-Feb 16:00	**0.089**	13-Jan 16:00
Illawarra						
Albion Park	5.0	18	0.063	01-Jan 15:00	0.056	14-Jan 15:00
Kembla Grange	96.7	354	**0.084**	08-Feb 17:00	0.073	21-Dec 17:00
Wollongong	96.2	355	**0.099**	08-Feb 17:00	0.078	21-Dec 17:00
Lower Hunter						
Newcastle	96.5	350	0.070	21-Dec 14:00	0.062	06-Feb 19:00
Wallsend	95.4	346	0.074	14-Jan 13:00	0.072	21-Dec 14:00
Regional						
Bathurst	94.5	343	0.055	24-Feb 18:00	0.054	15-Jan 13:00

AAQ NEPM Standard - 0.08 ppm (rolling 4-hour average)

Bold font indicates values that exceed the AAQ NEPM standard

Table 9: Days when O_3 1-hour Ambient Air Quality NEPM standard exceeded

Date	Stations where standard exceeded (and number of hours)	Comments(#)
12-Jan-2005	Bringelly (1), Macarthur (1), Oakdale (2)	Very high temperatures across Sydney (max. 44.3° at Penrith on the 14th)
13-Jan-2005	Bringelly (2), Macarthur (2), Oakdale (2), Richmond (1), St Marys (1)	
14-Jan-2005	Bringelly (3), Liverpool (3), Macarthur (4)	
8-Feb-2005	Wollongong (2)	
25-Feb-2005	Oakdale (1), Richmond (2), St Marys (1)	
6-Dec-2005	Macarthur (1)	
28-Dec-2005	Macarthur (2), Oakdale (2)	
31-Dec-2005	Macarthur (1)	

(#) Events that can be clearly identified as influencing pollution levels

The 4-hour standard was exceeded at most stations in the Sydney and Illawarra regions. Six stations in Sydney (Bringelly, Liverpool, Macarthur, Oakdale, Richmond and St Marys) exceeded the standard on two or more days. The maximum value recorded in Sydney was 0.126ppm at Macarthur on the 14th January.

In the Illawarra the 4-hour standard was exceeded on the 8th February at Kembla Grange and Wollongong. The maximum 4-hour ozone in the Illawarra was 0.099ppm recorded at Wollongong on this day.

There were no exceedences of the 4-hour standard at Bathurst or in the lower Hunter region.

Table 10: Days when O_3 4-hour Ambient Air Quality NEPM standard exceeded

Date	Stations where standard exceeded (and number of 4-hour periods)	Comments(#)
12-Jan-2005	Bringelly (4), Macarthur (3), Oakdale (4)	Very high temperatures across Sydney (max. 44.3° at Penrith on the 14th)
13-Jan-2005	Bringelly (4), Macarthur (4), Oakdale (5), Richmond (1), St Marys (2)	
14-Jan-2005	Bringelly (5), Liverpool (5), Macarthur (5), Richmond (1), St Marys (2)	
8-Feb-2005	Kembla Grange (2), Wollongong (4)	
24-Feb-2005	Macarthur (2)	
25-Feb-2005	Oakdale (4), Richmond (4), St Marys (2)	
6-Dec-2005	Macarthur (1)	
21-Dec-2005	Chullora (1)	
28-Dec-2005	Macarthur (4), Oakdale (3)	
29-Dec-2005	Richmond (1)	
31-Dec-2005	Liverpool (1), Macarthur (4)	

(#) Events that can be clearly identified as influencing pollution levels

Action for Air, the NSW Government's Air Quality Management Plan for Sydney, the Lower Hunter and the Illawarra, sets out a program of measures that target ground level ozone in summer. The Plan covers strategies designed to reduce emissions from industry, motor vehicles and domestic/commercial sources. These include the Cleaner Vehicles Action Plan; emission limits and load based licensing for industrial facilities; the Cleaner Industries Program; and the Clean Air Program. A number of other measures are also being pursued as part of the ozone management strategy, including reducing the volatility of petrol in summer and vapour recovery at service stations and bulk terminals.

Sulfur dioxide

The 1-hour, 24-hour and annual standards for sulfur dioxide were not exceeded in NSW during 2005. Compliance with the Ambient Air Quality NEPM goal was demonstrated in all regions.

New sulfur dioxide monitors were installed at the Chullora, Macarthur and Newcastle stations during 2005. The data availability criteria were not met at these stations or at Albion Park (due to vandalism and the subsequent relocation of this station).

Table 11: 2005 compliance summary for SO_2 in New South Wales

								AAQ NEPM standards 0.20 ppm (1-hour average) 0.08 ppm (24-hour average) 0.02 ppm (1-year average)			
Region/ Performance monitoring Station	**Data availability rates (% of hours)**					**Number of exceedences (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**
Sydney											
Blacktown [1]											
Bringelly	91.8	94.7	83.7	94.9	91.3	0	0	0.000	Met	Met	Met
Chullora [2]	00.0	85.2	94.5	94.1	68.8	0	0	0.001	ND	ND	ND
Macarthur [2]	00.0	21.2	94.2	95.5	53.1	0	0	0.001	ND	ND	ND
Richmond	88.2	94.6	93.8	94.5	92.8	0	0	0.000	Met	Met	Met
Central Coast [3]											
Illawarra											
Albion Park	19.4	00.0	00.0	00.0	4.8	0	0	0.002	ND	ND	ND
Warrawong	89.1	93.6	94.4	90.1	91.8	0	0	0.001	Met	Met	Met
Wollongong	94.8	91.9	93.8	91.5	93.0	0	0	0.001	Met	Met	Met
Lower Hunter											
Maitland [4]											
Newcastle	08.6	94.6	93.8	92.3	72.6	0	0	0.002	ND	ND	ND
Wallsend	88.1	95.3	95.0	95.0	93.4	0	0	0.001	Met	Met	Met

ND Not demonstrated.

(1) Station closed pending relocation.

(2) Instrument installed during 2005.

(3) Station to be established.

(4) Station to be established. Data reported from Wallsend in the interim.

SO_2 levels are significantly below the 1-hour, 24-hour and annual NEPM standards. Warrawong recorded the highest 1-hour value with 0.070 ppm (35 percent of the standard). The highest 24-hour average was recorded at Albion Park, 0.011 ppm (14 percent of the standard). Newcastle recorded the highest annual average of 0.002 ppm, which is just 10 percent of the standard.

Table 12: Summary for SO_2 - Daily maximum 1-hour average concentrations (2005)

Region/ Performance monitoring Station	Data availability rates (%)	Number of valid days	Maximum values (ppm)			
			Highest Value	Highest Date	2nd Highest Value	2nd Highest Date
Sydney						
Bringelly	91.3	348	0.009	08-Sep 17:00	0.009	11-Jun 19:00
Chullora	68.8	262	0.015	09-Sep 09:00	0.015	10-Sep 10:00
Macarthur	53.1	202	0.015	10-Jun 16:00	0.013	29-Dec 04:00
Richmond	92.8	353	0.015	12-Sep 00:00	0.013	11-Jun 19:00
Illawarra						
Albion Park	4.8	18	0.032	14-Jan 09:00	0.031	01-Jan 17:00
Warrawong	91.8	353	0.070	01-Feb 05:00	0.033	05-Dec 00:00
Wollongong	93.0	356	0.038	25-Sep 17:00	0.033	24-Sep 17:00
Lower Hunter						
Newcastle	72.6	275	0.037	09-May 16:00	0.036	05-Oct 14:00
Wallsend	93.4	356	0.048	07-Apr 08:00	0.037	04-Jun 14:00

AAQ NEPM Standard - 0.20 ppm (1-hour average)

Table 13: Summary for SO_2 - Maximum 24-hour average concentrations (2005)

Region/ Performance monitoring Station	Data availability rates (%)	Number of valid days	Maximum values (ppm)			
			Highest Value	Highest Date	2nd Highest Value	2nd Highest Date
Sydney						
Bringelly	95.3	348	0.002	09-Sep	0.002	10-Jun
Chullora	71.8	262	0.005	09-Sep	0.004	10-Jun
Macarthur	55.3	202	0.003	09-Sep	0.003	29-Dec
Richmond	96.7	353	0.003	22-Jun	0.002	12-Jan
Illawarra						
Albion Park	4.9	18	0.011	12-Jan	0.008	14-Jan
Warrawong	96.7	353	0.009	01-Feb	0.008	11-Jun
Wollongong	97.5	356	0.006	24-Sep	0.006	09-Feb
Lower Hunter						
Newcastle	75.3	275	0.007	04-Jun	0.007	07-Jun
Wallsend	97.5	356	0.007	09-Mar	0.007	04-Jun

AAQ NEPM Standard - 0.08 ppm (24-hour average)

Particles as PM_{10}

Although the PM_{10} standard was exceeded in many regions of NSW during 2005, the only region that did not comply with the Ambient Air Quality NEPM was Wagga Wagga which recorded 28 days above the standard.

Compliance was demonstrated in Sydney, the Illawarra, Albury and Bathurst. Compliance was not demonstrated at Tamworth and in the lower Hunter as the data availability criteria were not met. The data availability criterion was not met at Albion Park due to vandalism and the subsequent relocation of this station.

Table 14: 2005 compliance summary for PM_{10} in New South Wales

AAQ NEPM Standard 50 µg/m^3 (24-hour average)

Region/ Performance monitoring Station	Data availability rates (% of days)					Number of exceedences (days)	Performance against the standards and goal
	Q1	Q2	Q3	Q4	Annual		
Sydney							
Blacktown (1)							
Bringelly	97.8	97.8	76.1	95.7	91.8	2	Met
Chullora	95.6	83.5	90.2	87.0	89.0	0	Met
Liverpool	98.9	96.7	93.5	96.7	96.4	2	Met
Macarthur	76.7	89.0	85.9	83.7	83.8	1	Met
Oakdale	97.8	75.8	100.0	97.8	92.9	0	Met
Richmond	92.2	97.8	100.0	97.8	97.0	0	Met
Rozelle	95.6	98.9	92.4	95.7	95.6	0	Met
Central Coast (2)							
Illawarra							
Albion Park	12.2	00.0	00.0	00.0	3.0	0	ND
Kembla Grange	94.4	100.0	96.7	100.0	97.8	4	Met
Wollongong	100.0	98.9	96.7	93.5	97.3	1	Met
Lower Hunter							
Beresfield	100.0	86.8	98.9	97.8	95.9	1	Met
Maitland (3)							
Newcastle	98.9	67.0	98.9	62.0	81.6	0	ND
Regional							
Albury	90.0	89.0	88.0	94.6	90.4	3	Met
Bathurst	95.6	83.5	97.8	95.7	93.2	0	Met
Dubbo (2)							
Lismore (2)							
Orange (2)							
Tamworth	50.0	96.7	81.5	44.6	68.2	2	ND
Wagga Wagga	82.2	84.6	97.8	97.8	90.7	**28**	Not met

ND Not demonstrated. **Bold** font indicates values that exceed the AAQ NEPM standard

(1) Station closed pending relocation.

(2) Station to be established

(3) Station to be established. Data reported from Beresfield in the interim.

The continuing drought conditions experienced across NSW during the first half of 2005 were a major influence on particle levels across the state. Many regions recorded exceedences of the NEPM standard, however with the exception of Wagga Wagga, no region recorded exceedences on more than the five days permitted.

In Sydney, exceedences of the standard were observed on the 13th January, 3rd May and 9th June. The highest PM_{10} level recorded in Sydney during 2005 was 55.1µg/m^3 recorded at Liverpool on the 9th June.

In the Illawarra region the Ambient Air Quality NEPM standard was exceeded on four days, the 14th January, 8th February, 7th June and 16th December. The maximum value recorded for the year was 59.0 µg/m^3 at Kembla Grange on the 14th January. On this day the PM_{10} standard was also exceeded at Wollongong where 54.8µg/m^3 was recorded.

In the lower Hunter region the standard was exceeded at Beresfield on the 9th February when 53.2µg/m^3 was recorded.

PM_{10} levels in regional centres are influenced by agricultural activities and the use of solid fuel heaters. The highest PM_{10} level recorded in NSW during 2005 was 163.1µg/m^3 at Wagga Wagga on the 3rd April. Elevated PM_{10} levels occur more frequently at Wagga Wagga than elsewhere in NSW. During 2005 at Wagga Wagga the standard was exceeded on 28 days. On 26 of these days Wagga Wagga was the only station in NSW to report PM_{10} levels higher than the standard. The majority of these days were in the months February to June. This period is when agricultural activities such as broad acre cultivation and preparation of land for cropping take place.

Table 15: Summary for PM_{10} – Maximum 24-hour average concentrations (2005)

Region/ Performance monitoring Station	Data availability rates (%)	Number of valid days	Maximum values (µg/m^3)			
			Highest Value	Highest Date	6th Highest Value	6th Highest Date
Sydney						
Bringelly	91.8	335	**53.9**	09-Jun	43.8	12-Jan
Chullora	89.0	325	49.7	07-Jun	45.3	06-Dec
Liverpool	96.4	352	**55.1**	09-Jun	44.5	06-Dec
Macarthur	83.8	306	**54.9**	13-Jan	43.1	24-Dec
Oakdale	92.9	339	42.6	13-Jan	33.8	04-Apr
Richmond	97.0	354	49.1	13-Jan	39.4	06-Dec
Rozelle	95.6	349	47.1	24-Dec	40.0	25-Dec
Illawarra						
Albion Park	3.0	11	41.8	12-Jan	23.0	03-Jan
Kembla Grange	97.8	357	**59.0**	14-Jan	48.8	09-Jun
Wollongong	97.3	355	**54.8**	14-Jan	43.5	04-Nov
Lower Hunter						
Beresfield	95.9	350	**53.2**	09-Feb	43.0	04-Feb
Newcastle	81.6	298	49.9	04-Oct	39.3	08-Jun
Regional						
Albury	90.4	330	**55.1**	12-Mar	43.4	13-Mar
Bathurst	93.2	340	45.0	09-Jun	37.2	03-Apr
Tamworth	68.2	249	**88.8**	02-Feb	33.4	02-Jun
Wagga Wagga	90.7	331	**163.1**	03-Apr	**75.6**	14-May

AAQ NEPM Standard – 50 µg/m^3 (24-hour average)

Bold font indicates values that exceed the AAQ NEPM standard

The Bureau of Meteorology reported that the first five months of 2005 were very dry across much of the state. The severe drought conditions experienced across much of NSW were relieved by widespread rainfall in the second half of 2005, although the Illawarra and Sydney metropolitan regions still recorded lower than average rainfall throughout the year.

Drought conditions are a major influence on particle levels in NSW and the very dry conditions experienced until mid-June contributed heavily to exceedences of the PM_{10} standard. Of the 37 days that exceeded the PM_{10} standard 35 of these were prior to the first significant falls of widespread heavy rain that occurred on the 11th June.

Table 16: Days when PM_{10} 24-hour Ambient Air Quality NEPM standard exceeded

Date	Stations where standard exceeded	Comments(#)
12-Jan-2005	Albury, Wagga Wagga	Very high temperatures and winds (gale force on the Southern Tablelands)
13-Jan-2005	Albury, Bringelly, Macarthur	
14-Jan-2005	Kembla Grange, Wollongong	
2-Feb-2005	Tamworth	Dust storms
8-Feb-2005	Kembla Grange	
9-Feb-2005	Beresfield, Tamworth	Bushfires, Total Fire Ban (Hunter)
12-Mar-2005	Albury	
3-May-2005	Liverpool	
7-Jun-2005	Kembla Grange, Wagga Wagga	
9-Jun-2005	Bringelly, Liverpool	
16-Dec-2005	Kembla Grange	

(#) Events that can be clearly identified as influencing pollution levels

Wagga Wagga recorded exceedences on 28 days. On 26 of these days Wagga Wagga was the only station in NSW to record an exceedences (4-Jan, 25-Feb, 4-Mar, 1-Apr, 2-Apr, 3-Apr, 10-Apr, 26-Apr, 28-Apr, 12-May, 13-May, 14-May, 15-May, 19-May, 20-May, 21-May, 22-May, 23-May, 2-Jun, 3-Jun, 4-Jun, 5-Jun, 6-Jun, 8-Jun, 10-Jun, 24-Dec)

With the exception of Wagga Wagga, and even considering climatological effects, PM_{10} levels are generally below the goal set by the Ambient Air Quality NEPM. Nevertheless the Department of Environment and Conservation continues to work towards reducing emissions of anthropogenically-produced particles. The Government's key strategies in the management of particle emissions are outlined in Action for Air.

Lead

Changes to fuel formulation have brought marked reductions in the levels of lead in the atmosphere. Annual averages throughout New South Wales are now typically less than 0.03µg/m^3 with many 24-hour average samples below the minimum detection limit for lead of 0.007µg/m^3 using ICP-AES (Inductively Coupled Plasma-Atomic Emission Spectroscopy) analysis. Since 2002 the highest annual average recorded in New South Wales was 0.09µg/m^3 at Wallsend during 2003, only 18% of the standard.

With a complete ban on lead in petrol now in force, the primary source of lead in air at the regional scale has been eliminated.

The Department of Environment and Conservation began phasing out ambient lead monitoring for the AAQ NEPM during 2004. All lead monitoring ceased from 1st January 2005.

A report summarising the case for a cessation of lead monitoring was presented to NEPC and can be found on the EPHC website.

Statistical summary and trends

The following section provides a basic statistical summary, using percentiles, for each station and for each standard. Percentiles for daily maximum values are presented. As discussed earlier in Data availability, only valid days are used in calculating these statistics.

For stations that have data sets of two years or longer, trend data, in the form of annual maximums, are provided for each standard for each pollutant. Trend data are presented if any monitoring of a particular pollutant occurred at a station in a given year and the annual data availability rate for the pollutant at that station is fifteen percent or greater.

Carbon Monoxide

Statistical summary

Table 17: Statistical summary for CO - Daily maximum rolling 8-hour average concentrations (2005)

Region/ Performance monitoring Station	Data availability rates (%)	Maximum conc. (ppm)	Percentiles (ppm)						
			99th	98th	95th	90th	75th	50th	25th
Sydney									
Chullora	97.0	2.8	1.9	1.7	1.5	1.2	0.7	0.4	0.3
Liverpool	91.9	2.8	2.4	2.0	1.7	1.4	0.9	0.5	0.3
Macarthur	55.2	1.0	0.8	0.7	0.6	0.5	0.4	0.3	0.2
Rozelle	97.3	2.1	1.7	1.5	1.2	1.0	0.6	0.4	0.2
Illawarra									
Wollongong	96.8	2.6	1.8	1.4	1.2	1.1	0.7	0.5	0.3
Lower Hunter									
Newcastle	95.8	1.9	1.6	1.4	1.1	0.9	0.4	0.3	0.2

AAQ NEPM Standard - 9.0 ppm (rolling 8-hour average)

Trend analysis

Table 18: Daily maximum rolling 8-hour average concentrations for CO (ppm)

Region/ Performance monitoring Station	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Sydney										
Blacktown	4.2	4.5	4.7	3.5	3.1	2.6	3.0	2.5	1.7	
Chullora									3.4	2.8
Liverpool	4.3	5.9	5.4	4.0	4.8	3.5	3.6	5.5	3.0	2.8
Macarthur										1.0
Rozelle	5.7	6.5	5.9	4.0	4.5	3.2	2.8	2.2	2.2	2.1
Illawarra										
Wollongong	3.2	3.5	2.2	2.4	2.4	4.2	2.3	2.1	2.1	2.6
Lower Hunter										
Newcastle	4.8	2.9	4.3	3.3	3.1	4.0	3.2	2.8	2.4	1.9

AAQ NEPM Standard - 9.0 ppm (rolling 8-hour average)

Table 19: Statistical summary for CO - Daily maximum rolling 8-hour average concentrations

Station: Blacktown

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
1996	83.6	0	4.2	3.0	2.8	2.1	1.6	1.1	0.7	0.5
1997	91.9	0	4.5	3.2	2.5	2.1	1.8	1.4	0.9	0.6
1998	89.6	0	4.7	4.0	3.8	2.5	2.1	1.2	0.7	0.4
1999	98.2	0	3.5	3.0	2.7	2.1	1.8	1.2	0.6	0.2
2000	92.3	0	3.1	2.4	2.3	2.0	1.6	1.0	0.4	0.2
2001	95.5	0	2.6	1.9	1.8	1.6	1.3	0.8	0.3	0.2
2002	94.5	0	3.0	2.4	2.0	1.8	1.3	0.6	0.3	0.1
2003	93.6	0	2.5	1.9	1.6	1.2	0.8	0.4	0.1	0.0
2004	40.9	0	1.7	1.5	1.3	1.1	0.8	0.4	0.1	0.0
2005	0.0 #									

Station closed pending relocation.

Table 12: Statistical summary for CO - Daily maximum rolling 8-hour average concentrations

Station: Chullora

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
2004	84.8	0	3.4	2.1	1.9	1.6	1.3	0.8	0.5	0.3
2005	97.0	0	2.8	1.9	1.7	1.5	1.2	0.7	0.4	0.3

Table 21: Statistical summary for CO - Daily maximum rolling 8-hour average concentrations

Station: Liverpool

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
1996	73.7	0	4.3	3.7	3.5	2.7	2.0	1.4	0.9	0.6
1997	75.7	0	5.9	5.0	4.6	3.6	2.9	1.8	0.9	0.5
1998	74.6	0	5.4	4.5	4.1	3.1	2.5	1.5	0.9	0.6
1999	81.6	0	4.0	3.9	3.6	3.1	2.5	1.6	0.8	0.5
2000	98.0	0	4.8	3.6	3.3	2.8	2.1	1.3	0.9	0.5
2001	98.1	0	3.5	2.9	2.8	2.6	1.8	1.1	0.7	0.5
2002	85.6	0	3.6	3.0	2.9	2.4	1.9	1.2	0.7	0.5
2003	93.4	0	5.5	3.1	2.8	2.2	1.6	1.0	0.6	0.4
2004	97.3	0	3.0	2.7	2.4	2.1	1.4	0.9	0.5	0.3
2005	91.9	0	2.8	2.4	2.0	1.7	1.4	0.9	0.5	0.3

AAQ NEPM Standard - 9.0 ppm (rolling 8-hour average)

Table 22: Statistical summary for CO - Daily maximum rolling 8-hour average concentrations

Station: Rozelle

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
1996	82.1	0	5.7	3.5	3.4	3.0	2.1	1.2	0.8	0.6
1997	84.7	0	6.5	5.7	3.8	2.5	2.0	1.2	0.8	0.6
1998	92.9	0	5.9	5.0	4.0	2.8	2.2	1.3	0.9	0.6
1999	83.3	0	4.0	2.5	2.5	2.0	1.6	1.0	0.6	0.4
2000	90.0	0	4.5	2.4	2.3	1.7	1.3	0.8	0.5	0.4
2001	95.0	0	3.2	2.4	2.1	1.7	1.3	0.7	0.5	0.3
2002	87.5	0	2.8	1.7	1.6	1.3	1.1	0.7	0.5	0.3
2003	93.1	0	2.2	1.5	1.4	1.1	0.9	0.6	0.4	0.3
2004	94.0	0	2.2	1.8	1.7	1.3	1.0	0.7	0.4	0.3
2005	97.3	0	2.1	1.7	1.5	1.2	1.0	0.6	0.4	0.2

Table 23: Statistical summary for CO - Daily maximum rolling 8-hour average concentrations

Station: Wollongong

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
1996	93.2	0	3.2	2.7	2.5	2.0	1.7	1.2	0.7	0.5
1997	36.3	0	3.5	3.1	2.9	2.6	2.1	1.3	0.7	0.5
1998	97.1	0	2.2	2.1	2.0	1.8	1.4	1.0	0.6	0.4
1999	98.2	0	2.4	2.2	2.1	1.6	1.3	0.9	0.6	0.4
2000	98.7	0	2.4	1.9	1.7	1.4	1.2	0.8	0.5	0.3
2001	97.6	0	4.2	1.7	1.5	1.1	1.0	0.7	0.5	0.3
2002	91.2	0	2.3	1.9	1.7	1.5	1.2	0.9	0.5	0.3
2003	96.4	0	2.1	1.7	1.5	1.3	1.0	0.7	0.5	0.3
2004	97.3	0	2.1	1.5	1.4	1.2	1.0	0.7	0.5	0.3
2005	96.8	0	2.6	1.8	1.4	1.2	1.1	0.7	0.5	0.3

Table 24: Statistical summary for CO - Daily maximum rolling 8-hour average concentrations

Station: Newcastle

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
1996	48.8	0	4.8	4.0	3.6	1.9	1.5	0.9	0.5	0.3
1997	15.8	0	2.9	2.4	2.2	2.1	1.6	1.0	0.5	0.3
1998	75.5	0	4.3	3.0	2.7	2.1	1.4	0.7	0.3	0.1
1999	67.6	0	3.3	2.8	2.5	1.7	1.0	0.3	0.1	0.0
2000	83.1	0	3.1	2.8	2.6	2.0	1.3	0.7	0.4	0.2
2001	96.7	0	4.0	2.6	2.4	1.7	1.4	0.7	0.4	0.3
2002	94.6	0	3.2	2.1	1.9	1.4	1.0	0.6	0.4	0.3
2003	93.0	0	2.8	2.0	1.8	1.5	1.0	0.6	0.3	0.2
2004	97.0	0	2.4	1.7	1.6	1.3	1.1	0.6	0.3	0.2
2005	95.8	0	1.9	1.6	1.4	1.1	0.9	0.4	0.3	0.2

AAQ NEPM Standard - 9.0 ppm (rolling 8-hour average)

Nitrogen Dioxide

Statistical summary

Table 25: Statistical summary for NO_2 - Daily maximum 1-hour average concentrations (2005)

Region/ Performance monitoring Station	Data availability rates (%)	Maximum conc. (ppm)	Percentiles (ppm)						
			99th	98th	95th	90th	75th	50th	25th
Sydney									
Bringelly	91.5	0.045	0.033	0.030	0.026	0.022	0.018	0.014	0.009
Chullora	92.5	0.064	0.047	0.043	0.040	0.037	0.030	0.026	0.021
Liverpool	92.0	0.063	0.050	0.044	0.039	0.034	0.029	0.025	0.020
Macarthur	91.9	0.081	0.051	0.048	0.042	0.035	0.030	0.025	0.019
Richmond	90.1	0.036	0.031	0.030	0.027	0.025	0.020	0.015	0.011
Rozelle	91.2	0.052	0.046	0.044	0.040	0.036	0.031	0.024	0.017
Illawarra									
Albion Park	4.8	0.035	0.034	0.034	0.032	0.024	0.010	0.005	0.004
Wollongong	88.6	0.058	0.042	0.037	0.032	0.029	0.025	0.020	0.015
Lower Hunter									
Newcastle	89.7	0.041	0.034	0.033	0.031	0.029	0.026	0.019	0.012
Wallsend	93.4	0.038	0.033	0.032	0.029	0.028	0.023	0.018	0.012

AAQ NEPM Standard - 0.12 ppm (1-hour average)

Trend analysis

Table 26: Maximum 1-hour average concentrations for NO_2 (ppm)

Region/ Performance monitoring Station	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Sydney										
Blacktown	0.059	0.096	0.060	0.058	0.070	0.058	0.057	0.055	0.048	
Bringelly	**0.133**	0.060	0.050	0.045	0.045	0.048	0.052	0.044	0.041	0.045
Chullora								0.066	0.056	0.064
Liverpool	0.054	0.060	0.063	0.054	0.079	0.067	0.068	0.064	0.060	0.063
Macarthur									0.052	0.081
Richmond	0.040	0.064	0.053	0.044	0.037	0.038	0.048	0.036	0.037	0.036
Rozelle	0.075	0.082	0.081	0.062	0.070	0.066	0.086	0.052	0.064	0.052
Illawarra										
Albion Park	0.067	0.044	0.081	0.049	0.055	0.051	0.048	0.048	0.044	0.035
Wollongong	0.081	0.064	0.058	0.062	0.065	0.056	0.056	0.049	0.044	0.058
Lower Hunter										
Newcastle	0.044	0.048	0.039	0.049	0.044	0.040	0.047	0.039	0.044	0.041
Wallsend	0.044	0.058	0.035	0.034	0.054	0.044	0.043	0.050	0.041	0.038

AAQ NEPM Standard - 0.12 ppm (1-hour average)

Bold font indicates values that exceed the AAQ NEPM standard

Table 27: Annual average concentrations for NO_2 (ppm)

Region/ Performance monitoring Station	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Sydney										
Blacktown	0.014	0.015	0.015	0.014	0.013	0.013	0.014	0.013	0.013	
Bringelly	0.007	0.007	0.006	0.007	0.007	0.006	0.009	0.007	0.006	0.006
Chullora								0.016	0.016	0.014
Liverpool	0.012	0.014	0.014	0.014	0.014	0.014	0.015	0.013	0.013	0.013
Macarthur									0.009	0.012
Richmond	0.008	0.008	0.007	0.007	0.006	0.007	0.007	0.007	0.007	0.006
Rozelle	0.019	0.020	0.016	0.015	0.014	0.014	0.015	0.014	0.014	0.013
Illawarra										
Albion Park	0.005	0.004	0.004	0.004	0.005	0.004	0.004	0.005	0.004	0.004
Wollongong	0.011	0.011	0.010	0.011	0.010	0.010	0.011	0.010	0.009	0.009
Lower Hunter										
Newcastle	0.010	0.009	0.008	0.009	0.009	0.009	0.009	0.008	0.009	0.009
Wallsend	0.009	0.006	0.008	0.009	0.008	0.009	0.009	0.008	0.008	0.008

AAQ NEPM Standard - 0.03 ppm (Annual average)

Table 28: Statistical summary for NO_2 - Annual daily maximum 1-hour average concentrations

Station: Blacktown

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
1996	77.8	0	0.059	0.049	0.047	0.042	0.039	0.032	0.026	0.021
1997	73.0	0	0.096	0.055	0.051	0.045	0.039	0.033	0.028	0.022
1998	84.6	0	0.060	0.050	0.048	0.043	0.039	0.031	0.026	0.021
1999	90.8	0	0.058	0.048	0.047	0.040	0.035	0.030	0.026	0.021
2000	90.3	0	0.070	0.054	0.043	0.039	0.034	0.029	0.024	0.019
2001	93.3	0	0.058	0.047	0.045	0.037	0.034	0.030	0.025	0.020
2002	92.4	0	0.057	0.050	0.046	0.043	0.037	0.032	0.026	0.020
2003	89.8	0	0.055	0.049	0.047	0.038	0.035	0.030	0.025	0.020
2004	39.3	0	0.048	0.043	0.043	0.039	0.036	0.030	0.024	0.019
2005	0.0#									

Station closed pending relocation.

AAQ NEPM Standard - 0.12 ppm (1-hour average)

Table 29: Statistical summary for NO_2 - Annual daily maximum 1-hour average concentrations

Station: Bringelly

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
1996	73.5	1	**0.133**	0.038	0.035	0.028	0.025	0.018	0.014	0.011
1997	78.6	0	0.060	0.040	0.034	0.029	0.026	0.020	0.015	0.011
1998	85.1	0	0.050	0.032	0.031	0.028	0.024	0.018	0.014	0.010
1999	90.4	0	0.045	0.037	0.034	0.027	0.025	0.020	0.015	0.011
2000	93.4	0	0.045	0.033	0.029	0.026	0.022	0.019	0.015	0.011
2001	94.4	0	0.048	0.033	0.031	0.026	0.023	0.019	0.015	0.011
2002	93.1	0	0.052	0.041	0.038	0.033	0.029	0.022	0.017	0.012
2003	87.1	0	0.044	0.031	0.028	0.023	0.021	0.017	0.013	0.010
2004	91.1	0	0.041	0.031	0.029	0.026	0.022	0.017	0.013	0.010
2005	91.5	0	0.045	0.033	0.030	0.026	0.022	0.018	0.014	0.009

Table 30: Statistical summary for NO_2 - Annual daily maximum 1-hour average concentrations

Station: Lidcombe(1) / Chullora(2)

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
1996 (1)	64.1	0	0.070	0.049	0.047	0.042	0.038	0.031	0.026	0.022
1997 (1)	83.1	0	0.080	0.060	0.055	0.048	0.042	0.034	0.027	0.021
1998 (1)	69.4	1	**0.126**	0.052	0.050	0.046	0.040	0.031	0.026	0.021
1999 (1)	88.9	0	0.073	0.051	0.047	0.043	0.039	0.035	0.028	0.021
2000 (1)	91.7	0	0.070	0.055	0.051	0.042	0.036	0.030	0.025	0.021
2001 (1)	93.8	0	0.071	0.055	0.050	0.042	0.038	0.033	0.028	0.022
2002 (1)	30.8	0	0.052	0.044	0.040	0.036	0.032	0.027	0.022	0.018
2003 (2)	76.0	0	0.066	0.054	0.048	0.043	0.038	0.033	0.028	0.022
2004 (2)	84.3	0	0.056	0.051	0.050	0.044	0.041	0.034	0.028	0.023
2005 (2)	92.5	0	0.064	0.047	0.043	0.040	0.037	0.030	0.026	0.021

Table 31: Statistical summary for NO_2 - Annual daily maximum 1-hour average concentrations

Station: Liverpool

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
1996	88.0	0	0.054	0.049	0.042	0.038	0.035	0.028	0.022	0.018
1997	86.2	0	0.060	0.055	0.051	0.043	0.039	0.031	0.026	0.019
1998	85.1	0	0.063	0.050	0.046	0.040	0.035	0.028	0.022	0.018
1999	87.9	0	0.054	0.046	0.044	0.041	0.038	0.032	0.027	0.021
2000	89.2	0	0.079	0.057	0.049	0.042	0.036	0.030	0.025	0.021
2001	94.3	0	0.067	0.051	0.045	0.043	0.037	0.031	0.027	0.021
2002	93.0	0	0.068	0.051	0.047	0.045	0.040	0.033	0.028	0.022
2003	89.2	0	0.064	0.047	0.042	0.038	0.034	0.028	0.024	0.020
2004	93.7	0	0.060	0.050	0.048	0.042	0.036	0.031	0.025	0.021
2005	92.0	0	0.063	0.050	0.044	0.039	0.034	0.029	0.025	0.020

AAQ NEPM Standard - 0.12 ppm (1-hour average)

Table 32: Statistical summary for NO_2 - Annual daily maximum 1-hour average concentrations

Station: Richmond

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
1996	81.3	0	0.040	0.031	0.031	0.027	0.025	0.022	0.017	0.013
1997	85.9	0	0.064	0.038	0.035	0.031	0.028	0.023	0.020	0.014
1998	84.2	0	0.053	0.037	0.033	0.028	0.025	0.021	0.017	0.013
1999	89.2	0	0.044	0.032	0.029	0.026	0.024	0.021	0.016	0.011
2000	93.3	0	0.037	0.027	0.027	0.025	0.023	0.019	0.015	0.011
2001	92.3	0	0.038	0.031	0.030	0.027	0.025	0.020	0.016	0.011
2002	92.9	0	0.048	0.037	0.032	0.029	0.027	0.023	0.018	0.012
2003	93.0	0	0.036	0.031	0.029	0.026	0.024	0.021	0.016	0.012
2004	88.4	0	0.037	0.034	0.033	0.029	0.027	0.021	0.015	0.012
2005	90.1	0	0.036	0.031	0.030	0.027	0.025	0.020	0.015	0.011

Table 33: Statistical summary for NO_2 - Annual daily maximum 1-hour average concentrations

Station: Rozelle

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
1996	74.2	0	0.075	0.062	0.058	0.048	0.044	0.036	0.030	0.025
1997	70.6	0	0.082	0.076	0.066	0.059	0.051	0.039	0.030	0.026
1998	72.0	0	0.081	0.057	0.053	0.046	0.042	0.033	0.027	0.020
1999	87.4	0	0.062	0.047	0.044	0.041	0.037	0.030	0.025	0.019
2000	94.3	0	0.070	0.057	0.051	0.044	0.038	0.031	0.025	0.020
2001	93.2	0	0.066	0.051	0.049	0.040	0.037	0.032	0.026	0.019
2002	87.1	0	0.086	0.058	0.053	0.045	0.041	0.035	0.027	0.019
2003	88.6	0	0.052	0.047	0.046	0.041	0.038	0.032	0.026	0.020
2004	89.2	0	0.064	0.051	0.047	0.042	0.037	0.031	0.025	0.019
2005	91.2	0	0.052	0.046	0.044	0.040	0.036	0.031	0.024	0.017

Table 34: Statistical summary for NO_2 - Annual daily maximum 1-hour average concentrations

Station: Albion Park

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
1996	76.8	0	0.067	0.041	0.038	0.031	0.024	0.020	0.014	0.009
1997	29.5	0	0.044	0.033	0.030	0.027	0.024	0.017	0.009	0.003
1998	87.4	0	0.081	0.042	0.038	0.033	0.024	0.017	0.010	0.004
1999	90.4	0	0.049	0.042	0.037	0.031	0.025	0.015	0.009	0.005
2000	90.3	0	0.055	0.044	0.041	0.031	0.024	0.017	0.010	0.005
2001	93.0	0	0.051	0.040	0.035	0.028	0.024	0.017	0.010	0.004
2002	57.5	0	0.048	0.035	0.034	0.029	0.024	0.015	0.008	0.005
2003	90.0	0	0.048	0.039	0.036	0.030	0.023	0.017	0.011	0.006
2004	91.4	0	0.044	0.036	0.034	0.027	0.021	0.016	0.011	0.006
2005	4.8	0	0.035	0.034	0.034	0.032	0.024	0.010	0.005	0.004

AAQ NEPM Standard - 0.12 ppm (1-hour average)

Table 35: Statistical summary for NO_2 - Annual daily maximum 1-hour average concentrations

Station: Wollongong

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
1996	88.9	0	0.081	0.043	0.040	0.034	0.030	0.025	0.021	0.017
1997	82.8	0	0.064	0.054	0.047	0.040	0.036	0.028	0.023	0.017
1998	86.9	0	0.058	0.044	0.042	0.036	0.031	0.025	0.021	0.016
1999	90.8	0	0.062	0.046	0.042	0.037	0.032	0.027	0.022	0.016
2000	93.0	0	0.065	0.049	0.043	0.034	0.030	0.025	0.021	0.017
2001	93.6	0	0.056	0.043	0.040	0.037	0.031	0.027	0.022	0.016
2002	94.2	0	0.056	0.048	0.044	0.039	0.036	0.029	0.023	0.016
2003	93.3	0	0.049	0.039	0.036	0.035	0.032	0.027	0.022	0.017
2004	92.2	0	0.044	0.039	0.038	0.033	0.029	0.026	0.021	0.015
2005	88.6	0	0.058	0.042	0.037	0.032	0.029	0.025	0.020	0.015

Table 36: Statistical summary for NO_2 - Annual daily maximum 1-hour average concentrations

Station: Newcastle

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
1996	54.6	0	0.044	0.043	0.037	0.032	0.028	0.024	0.020	0.014
1997	69.3	0	0.048	0.040	0.039	0.035	0.031	0.027	0.020	0.014
1998	83.4	0	0.039	0.035	0.034	0.031	0.029	0.024	0.019	0.011
1999	90.2	0	0.049	0.040	0.038	0.034	0.030	0.025	0.020	0.012
2000	90.1	0	0.044	0.038	0.034	0.031	0.028	0.024	0.018	0.011
2001	91.5	0	0.040	0.034	0.032	0.030	0.029	0.026	0.020	0.012
2002	85.9	0	0.047	0.040	0.037	0.034	0.031	0.025	0.019	0.012
2003	95.0	0	0.039	0.035	0.034	0.032	0.029	0.025	0.019	0.011
2004	91.0	0	0.044	0.037	0.035	0.032	0.029	0.025	0.020	0.012
2005	89.7	0	0.041	0.034	0.033	0.031	0.029	0.026	0.019	0.012

Table 37: Statistical summary for NO_2 - Annual daily maximum 1-hour average concentrations

Station: Wallsend

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
1996	74.9	0	0.044	0.036	0.033	0.030	0.028	0.023	0.018	0.014
1997	11.1	0	0.058	0.028	0.025	0.021	0.019	0.014	0.013	0.011
1998	78.6	0	0.035	0.034	0.030	0.028	0.025	0.022	0.017	0.013
1999	85.6	0	0.034	0.033	0.030	0.027	0.025	0.021	0.017	0.012
2000	91.8	0	0.054	0.037	0.033	0.029	0.026	0.022	0.017	0.012
2001	87.5	0	0.044	0.039	0.036	0.032	0.030	0.024	0.018	0.014
2002	63.2	0	0.043	0.038	0.034	0.029	0.027	0.024	0.018	0.014
2003	85.9	0	0.050	0.037	0.034	0.029	0.027	0.022	0.016	0.013
2004	92.2	0	0.041	0.035	0.033	0.029	0.027	0.023	0.017	0.013
2005	93.4	0	0.038	0.033	0.032	0.029	0.028	0.023	0.018	0.012

AAQ NEPM Standard - 0.12 ppm (1-hour average)

Ozone

Statistical summary

Table 38: Statistical summary for O_3 - Daily maximum 1-hour average concentrations (2005)

Region/ Performance monitoring Station	Data availability rates (%)	Maximum conc. (ppm)	Percentiles (ppm)						
			99th	98th	95th	90th	75th	50th	25th
Sydney									
Bringelly	88.4	**0.112**	0.084	0.078	0.065	0.056	0.043	0.034	0.029
Chullora	92.0	0.086	0.069	0.066	0.057	0.048	0.037	0.031	0.025
Liverpool	88.0	**0.149**	0.082	0.077	0.059	0.052	0.040	0.032	0.027
Macarthur	94.7	**0.142**	**0.104**	0.090	0.073	0.061	0.044	0.033	0.029
Oakdale	91.2	**0.130**	0.097	0.085	0.071	0.058	0.043	0.034	0.030
Richmond	91.8	**0.125**	0.090	0.081	0.065	0.058	0.046	0.035	0.030
Rozelle	88.9	0.081	0.067	0.059	0.051	0.044	0.034	0.029	0.024
St Marys	92.1	**0.113**	0.086	0.076	0.066	0.058	0.042	0.034	0.029
Illawarra									
Albion Park	4.8	0.067	0.066	0.065	0.062	0.049	0.039	0.030	0.025
Kembla Grange	92.6	0.091	0.071	0.065	0.051	0.044	0.036	0.032	0.027
Wollongong	92.4	**0.102**	0.071	0.065	0.054	0.046	0.035	0.030	0.026
Lower Hunter									
Newcastle	92.4	0.078	0.061	0.057	0.049	0.042	0.035	0.030	0.026
Wallsend	91.3	0.094	0.068	0.063	0.052	0.046	0.037	0.031	0.026
Regional									
Bathurst	90.7	0.056	0.054	0.052	0.048	0.044	0.038	0.033	0.030

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

Bold font indicates values that exceed the AAQ NEPM standard

Table 39: Statistical summary for O_3 - Daily maximum rolling 4-hour average concentrations (2005)

Region/ Performance monitoring Station	Data availability rates (%)	Maximum conc. (ppm)	Percentiles (ppm)						
			99th	98th	95th	90th	75th	50th	25th
Sydney									
Bringelly	92.4	**0.102**	0.074	0.066	0.059	0.050	0.039	0.033	0.028
Chullora	96.2	**0.080**	0.064	0.059	0.052	0.042	0.034	0.028	0.023
Liverpool	92.0	**0.121**	0.073	0.067	0.053	0.046	0.036	0.030	0.025
Macarthur	98.9	**0.126**	**0.091**	0.077	0.061	0.054	0.040	0.032	0.028
Oakdale	95.1	**0.106**	0.079	0.072	0.062	0.052	0.040	0.032	0.029
Richmond	96.3	**0.101**	0.080	0.066	0.059	0.052	0.042	0.033	0.028
Rozelle	92.9	0.065	0.058	0.054	0.045	0.039	0.032	0.027	0.023
St Marys	96.2	**0.091**	0.077	0.067	0.058	0.050	0.040	0.032	0.028
Illawarra									
Albion Park	5.0	0.063	0.059	0.058	0.054	0.047	0.039	0.029	0.023
Kembla Grange	96.7	**0.084**	0.060	0.059	0.047	0.040	0.035	0.031	0.026
Wollongong	96.2	**0.099**	0.063	0.058	0.048	0.041	0.033	0.029	0.024
Lower Hunter									
Newcastle	96.5	0.070	0.052	0.049	0.044	0.039	0.033	0.028	0.024
Wallsend	95.4	0.074	0.061	0.056	0.048	0.041	0.034	0.029	0.025
Regional									
Bathurst	94.5	0.055	0.052	0.049	0.046	0.041	0.036	0.032	0.029

AAQ NEPM Standard - 0.08 ppm (rolling 4-hour average)

Bold font indicates values that exceed the AAQ NEPM standard

Trend analysis

Table 40: Maximum 1-hour average concentrations for O_3 (ppm)

Region/ Performance monitoring Station	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Sydney										
Blacktown	0.082	**0.149**	**0.109**	0.091	**0.113**	**0.153**	**0.130**	**0.181**	**0.123**	
Bringelly	0.098	**0.135**	**0.113**	**0.114**	**0.130**	**0.175**	**0.118**	**0.155**	**0.122**	**0.112**
Chullora								0.084	**0.105**	0.086
Liverpool	0.092	**0.151**	**0.130**	**0.102**	**0.133**	**0.141**	**0.100**	**0.151**	**0.113**	**0.149**
Macarthur									0.099	**0.142**
Oakdale	**0.111**	**0.152**	**0.109**	**0.107**	**0.126**	**0.135**	0.094	**0.102**	**0.124**	**0.130**
Richmond	0.093	**0.120**	**0.113**	**0.127**	0.088	**0.117**	**0.125**	**0.148**	0.096	**0.125**
Rozelle			0.088	0.059	0.080	**0.115**	0.100	0.083	0.094	0.081
St Marys	0.087	**0.124**	**0.122**	**0.113**	**0.158**	**0.146**	**0.119**	0.093	**0.142**	**0.113**
Illawarra										
Albion Park	0.062	**0.144**	**0.140**	0.090	**0.106**	0.088	0.094	**0.130**	**0.112**	0.067
Kembla Grange	0.083	**0.124**	**0.137**	**0.101**	**0.117**	**0.119**	0.099	**0.113**	**0.120**	0.091
Wollongong	0.066	**0.120**	**0.105**	0.087	**0.108**	**0.116**	**0.121**	0.097	**0.103**	**0.102**
Lower Hunter										
Newcastle	0.056	**0.141**	0.080	0.066	0.071	0.072	0.083	0.079	**0.112**	0.078
Wallsend	0.056	**0.129**	0.095	0.069	0.073	0.078	0.081	0.077	**0.103**	0.094
Regional										
Bathurst						0.063	0.064	0.056	0.092	0.056

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

Bold font indicates values that exceed the AAQ NEPM standard

Table 41: Maximum rolling 4-hour average concentrations for O_3 (ppm)

Region/ Performance monitoring Station	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Sydney										
Blacktown	0.071	**0.100**	**0.097**	0.077	**0.101**	**0.120**	**0.107**	**0.157**	**0.107**	
Bringelly	0.076	**0.102**	**0.089**	**0.092**	**0.115**	**0.128**	**0.099**	**0.133**	**0.110**	**0.102**
Chullora								0.077	**0.086**	**0.080**
Liverpool	0.078	**0.116**	**0.108**	**0.084**	**0.107**	**0.120**	**0.089**	**0.132**	**0.092**	**0.121**
Macarthur									**0.084**	**0.126**
Oakdale	**0.088**	**0.133**	**0.092**	**0.090**	**0.098**	**0.105**	**0.080**	**0.089**	**0.099**	**0.106**
Richmond	0.075	**0.103**	**0.097**	**0.098**	0.078	**0.111**	**0.112**	**0.138**	**0.088**	**0.101**
Rozelle			0.079	0.053	0.073	**0.083**	**0.087**	0.070	**0.087**	0.065
St Marys	0.080	**0.104**	**0.091**	**0.091**	**0.136**	**0.125**	**0.093**	**0.091**	**0.128**	**0.091**
Illawarra										
Albion Park	0.053	**0.124**	**0.116**	**0.081**	**0.083**	**0.082**	**0.083**	**0.111**	**0.092**	0.063
Kembla Grange	0.062	**0.099**	**0.117**	**0.081**	**0.089**	**0.092**	**0.083**	**0.107**	**0.100**	**0.084**
Wollongong	0.055	**0.113**	**0.082**	0.073	**0.086**	**0.091**	**0.099**	**0.080**	**0.090**	**0.099**
Lower Hunter										
Newcastle	0.054	**0.125**	0.068	0.065	0.065	0.069	0.077	0.061	0.073	0.070
Wallsend	0.053	**0.105**	**0.084**	0.059	0.070	0.073	0.074	0.059	0.078	0.074
Regional										
Bathurst						0.060	0.062	0.053	0.067	0.055

AAQ NEPM Standard - 0.08 ppm (rolling 4-hour average)

Bold font indicates values that exceed the AAQ NEPM standard

Table 42: Statistical summary for O_3 - Annual daily maximum 1-hour average concentrations

Station: Blacktown

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
1996	85.7	0	0.082	0.065	0.060	0.052	0.046	0.033	0.024	0.018
1997	93.7	**4**	**0.149**	0.088	0.075	0.064	0.053	0.036	0.026	0.021
1998	83.8	**3**	**0.109**	0.093	0.083	0.063	0.052	0.038	0.024	0.018
1999	95.1	0	0.091	0.079	0.075	0.063	0.050	0.035	0.026	0.020
2000	91.5	**2**	**0.113**	0.088	0.075	0.061	0.051	0.037	0.028	0.024
2001	93.6	**5**	**0.153**	**0.107**	0.088	0.075	0.054	0.040	0.030	0.024
2002	91.7	**2**	**0.130**	0.093	0.083	0.068	0.059	0.043	0.033	0.026
2003	90.3	**3**	**0.181**	0.085	0.073	0.061	0.050	0.037	0.029	0.025
2004	39.5	**2**	**0.123**	0.093	0.089	0.080	0.066	0.050	0.036	0.028
2005	0.0#									

Station closed pending relocation.

Table 43: Statistical summary for O_3 - Annual daily maximum 1-hour average concentrations

Station: Bringelly

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
1996	94.2	0	0.098	0.077	0.071	0.057	0.049	0.036	0.027	0.022
1997	93.7	**5**	**0.135**	**0.102**	0.087	0.069	0.058	0.044	0.029	0.024
1998	74.5	**4**	**0.113**	**0.101**	0.098	0.078	0.066	0.044	0.029	0.024
1999	92.1	**3**	**0.114**	0.100	0.094	0.073	0.055	0.037	0.029	0.024
2000	94.9	**3**	**0.130**	0.096	0.092	0.070	0.059	0.039	0.032	0.027
2001	91.5	**9**	**0.175**	**0.115**	**0.102**	0.074	0.059	0.042	0.033	0.027
2002	93.0	**2**	**0.118**	0.098	0.090	0.074	0.064	0.045	0.034	0.028
2003	91.3	**3**	**0.155**	0.095	0.076	0.065	0.056	0.041	0.032	0.028
2004	91.1	**6**	**0.122**	**0.104**	0.091	0.074	0.060	0.044	0.033	0.029
2005	88.4	**3**	**0.112**	0.084	0.078	0.065	0.056	0.043	0.034	0.029

Table 44: Statistical summary for O_3 - Annual daily maximum 1-hour average concentrations

Station: Lidcombe(1) / Chullora(2)

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
1996 (1)	82.1	0	0.075	0.062	0.057	0.047	0.042	0.031	0.022	0.015
1997 (1)	95.1	**2**	**0.168**	0.087	0.083	0.064	0.050	0.034	0.023	0.019
1998 (1)	89.5	**5**	**0.142**	**0.106**	0.080	0.070	0.051	0.034	0.025	0.020
1999 (1)	89.4	0	0.092	0.076	0.065	0.055	0.043	0.031	0.025	0.020
2000 (1)	94.7	1	**0.118**	0.080	0.071	0.058	0.048	0.033	0.026	0.021
2001 (1)	94.5	**4**	**0.156**	0.094	0.085	0.066	0.050	0.035	0.025	0.020
2002 (1)	31.0	0	0.100	0.078	0.074	0.061	0.046	0.037	0.029	0.021
2003 (2)	80.6	0	0.084	0.066	0.063	0.046	0.040	0.034	0.028	0.023
2004 (2)	87.2	1	**0.105**	0.087	0.074	0.061	0.050	0.038	0.030	0.026
2005 (2)	92.0	0	0.086	0.069	0.066	0.057	0.048	0.037	0.031	0.025

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

Bold font indicates values that exceed the AAQ NEPM standard

Table 45: Statistical summary for O_3 - Annual daily maximum 1-hour average concentrations

Station: Liverpool

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
1996	95.1	0	0.092	0.069	0.065	0.048	0.039	0.027	0.021	0.015
1997	88.5	**2**	**0.151**	0.090	0.083	0.055	0.044	0.033	0.022	0.016
1998	93.1	**4**	**0.130**	0.098	0.091	0.069	0.055	0.035	0.023	0.018
1999	83.6	1	**0.102**	0.086	0.077	0.064	0.045	0.032	0.025	0.020
2000	93.3	**2**	**0.133**	0.088	0.079	0.069	0.058	0.035	0.028	0.024
2001	94.7	**5**	**0.141**	**0.103**	0.089	0.071	0.053	0.039	0.030	0.025
2002	93.6	1	**0.100**	0.087	0.084	0.064	0.054	0.039	0.030	0.025
2003	93.3	**4**	**0.151**	0.087	0.065	0.054	0.045	0.035	0.029	0.024
2004	92.3	**3**	**0.113**	0.096	0.084	0.068	0.054	0.040	0.030	0.026
2005	88.0	1	**0.149**	0.082	0.077	0.059	0.052	0.040	0.032	0.027

Table 46: Statistical summary for O_3 - Annual daily maximum 1-hour average concentrations

Station: Oakdale

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
1996	60.7	1	**0.111**	0.068	0.057	0.049	0.041	0.032	0.026	0.023
1997	89.6	**8**	**0.152**	**0.111**	**0.105**	0.079	0.063	0.045	0.031	0.027
1998	54.5	**2**	**0.109**	0.086	0.084	0.071	0.058	0.042	0.034	0.028
1999	89.6	**5**	**0.107**	**0.104**	0.090	0.068	0.055	0.041	0.031	0.027
2000	90.1	**4**	**0.126**	0.100	0.086	0.065	0.055	0.039	0.030	0.027
2001	34.8	**7**	**0.135**	**0.118**	**0.115**	0.089	0.072	0.045	0.032	0.025
2002	18.6	0	0.094	0.088	0.088	0.082	0.077	0.062	0.047	0.037
2003	91.1	1	**0.102**	0.079	0.073	0.063	0.054	0.041	0.033	0.029
2004	85.6	**7**	**0.124**	**0.105**	0.089	0.072	0.063	0.047	0.035	0.031
2005	91.2	**4**	**0.130**	0.097	0.085	0.071	0.058	0.043	0.034	0.030

Table 47: Statistical summary for O_3 - Annual daily maximum 1-hour average concentrations

Station: Richmond

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
1996	91.6	0	0.093	0.065	0.059	0.052	0.046	0.036	0.029	0.023
1997	79.4	**3**	**0.120**	0.094	0.077	0.066	0.056	0.041	0.030	0.026
1998	91.1	1	**0.113**	0.090	0.078	0.067	0.056	0.041	0.031	0.025
1999	92.0	1	**0.127**	0.076	0.074	0.064	0.054	0.040	0.032	0.027
2000	89.7	0	0.088	0.080	0.071	0.062	0.051	0.039	0.030	0.025
2001	90.8	**5**	**0.117**	**0.106**	0.095	0.074	0.057	0.042	0.034	0.028
2002	92.5	**2**	**0.125**	0.094	0.084	0.070	0.063	0.045	0.034	0.029
2003	86.1	**2**	**0.148**	0.083	0.078	0.061	0.053	0.039	0.030	0.026
2004	89.5	0	0.096	0.080	0.075	0.065	0.058	0.045	0.034	0.029
2005	91.8	**2**	**0.125**	0.090	0.081	0.065	0.058	0.046	0.035	0.030

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

Bold font indicates values that exceed the AAQ NEPM standard

Table 48: Statistical summary for O_3 - Annual daily maximum 1-hour average concentrations

Station: Rozelle

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
1996	0.0									
1997	0.0									
1998	72.5	0	0.088	0.056	0.050	0.045	0.040	0.027	0.020	0.015
1999	89.9	0	0.059	0.050	0.047	0.038	0.032	0.025	0.020	0.015
2000	87.8	0	0.080	0.068	0.058	0.048	0.036	0.030	0.026	0.021
2001	93.4	1	**0.115**	0.066	0.057	0.047	0.040	0.032	0.026	0.021
2002	88.1	0	0.100	0.073	0.066	0.053	0.043	0.035	0.028	0.023
2003	91.2	0	0.083	0.064	0.058	0.045	0.037	0.031	0.027	0.023
2004	88.9	0	0.094	0.077	0.072	0.056	0.045	0.034	0.027	0.024
2005	88.9	0	0.081	0.067	0.059	0.051	0.044	0.034	0.029	0.024

Table 49: Statistical summary for O_3 - Annual daily maximum 1-hour average concentrations

Station: St Marys

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
1996	94.7	0	0.087	0.067	0.063	0.055	0.048	0.034	0.027	0.021
1997	81.8	**3**	**0.124**	0.095	0.087	0.070	0.059	0.044	0.029	0.023
1998	84.9	**3**	**0.122**	0.097	0.081	0.065	0.056	0.039	0.027	0.023
1999	88.3	**2**	**0.113**	0.091	0.083	0.062	0.052	0.034	0.026	0.021
2000	91.5	**3**	**0.158**	0.096	0.086	0.069	0.058	0.041	0.032	0.027
2001	90.3	**6**	**0.146**	**0.111**	0.099	0.076	0.059	0.042	0.033	0.028
2002	95.3	1	**0.119**	0.091	0.082	0.067	0.059	0.046	0.034	0.028
2003	92.7	0	0.093	0.071	0.066	0.058	0.052	0.037	0.030	0.026
2004	93.6	**3**	**0.142**	0.091	0.082	0.067	0.058	0.044	0.033	0.029
2005	92.1	**2**	**0.113**	0.086	0.076	0.066	0.058	0.042	0.034	0.029

Table 50: Statistical summary for O_3 - Annual daily maximum 1-hour average concentration

Station: Albion Park

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
1996	83.3	0	0.062	0.053	0.052	0.046	0.040	0.030	0.025	0.021
1997	41.0	**5**	**0.144**	**0.115**	**0.111**	0.068	0.056	0.037	0.028	0.025
1998	89.9	**2**	**0.140**	0.099	0.086	0.062	0.050	0.036	0.029	0.026
1999	90.4	0	0.090	0.084	0.067	0.051	0.043	0.034	0.029	0.025
2000	90.0	1	**0.106**	0.086	0.079	0.059	0.045	0.035	0.030	0.026
2001	93.6	0	0.088	0.074	0.065	0.054	0.044	0.037	0.032	0.027
2002	57.6	0	0.094	0.077	0.068	0.048	0.043	0.033	0.027	0.024
2003	92.8	**4**	**0.130**	0.081	0.063	0.044	0.040	0.034	0.030	0.027
2004	93.5	1	**0.112**	0.080	0.062	0.051	0.044	0.035	0.030	0.027
2005	4.8	0	0.067	0.066	0.065	0.062	0.049	0.039	0.030	0.025

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

Bold font indicates values that exceed the AAQ NEPM standard

Table 51: Statistical summary for O_3 - Annual daily maximum 1-hour average concentrations

Station: Kembla Grange

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
1996	95.0	0	0.083	0.056	0.054	0.047	0.039	0.029	0.024	0.020
1997	89.7	**4**	**0.124**	0.095	0.070	0.056	0.047	0.032	0.028	0.023
1998	87.1	**2**	**0.137**	0.098	0.092	0.063	0.050	0.036	0.029	0.025
1999	91.1	1	**0.101**	0.079	0.065	0.051	0.042	0.033	0.028	0.024
2000	93.9	**3**	**0.117**	0.087	0.077	0.056	0.045	0.034	0.029	0.025
2001	82.3	**2**	**0.119**	0.085	0.078	0.056	0.046	0.036	0.030	0.025
2002	91.7	0	0.099	0.084	0.079	0.053	0.044	0.036	0.031	0.026
2003	93.3	**2**	**0.113**	0.092	0.066	0.044	0.038	0.033	0.030	0.026
2004	91.3	**3**	**0.120**	0.077	0.060	0.051	0.043	0.036	0.031	0.027
2005	92.6	0	0.091	0.071	0.065	0.051	0.044	0.036	0.032	0.027

Table 52: Statistical summary for O_3 - Annual daily maximum 1-hour average concentrations

Station: Wollongong

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
1996	94.4	0	0.066	0.060	0.054	0.046	0.037	0.026	0.018	0.013
1997	90.6	**4**	**0.120**	0.094	0.064	0.055	0.047	0.032	0.026	0.023
1998	87.0	1	**0.105**	0.082	0.071	0.060	0.048	0.034	0.027	0.023
1999	87.7	0	0.087	0.067	0.062	0.046	0.041	0.032	0.027	0.021
2000	94.1	1	**0.108**	0.083	0.074	0.061	0.046	0.034	0.028	0.024
2001	94.0	1	**0.116**	0.074	0.071	0.061	0.050	0.037	0.030	0.025
2002	90.7	**2**	**0.121**	0.084	0.081	0.062	0.048	0.036	0.030	0.024
2003	92.8	0	0.097	0.080	0.070	0.046	0.040	0.033	0.029	0.025
2004	92.5	1	**0.103**	0.082	0.069	0.055	0.043	0.034	0.029	0.026
2005	92.4	1	**0.102**	0.071	0.065	0.054	0.046	0.035	0.030	0.026

Table 53: Statistical summary for O_3 - Annual daily maximum 1-hour average concentration

Station: Newcastle

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
1996	88.3	0	0.056	0.041	0.039	0.034	0.031	0.025	0.021	0.018
1997	92.0	1	**0.141**	0.062	0.055	0.048	0.041	0.030	0.025	0.020
1998	94.6	0	0.080	0.065	0.054	0.044	0.040	0.031	0.026	0.021
1999	92.0	0	0.066	0.055	0.051	0.046	0.040	0.033	0.027	0.022
2000	88.4	0	0.071	0.065	0.058	0.048	0.042	0.032	0.027	0.023
2001	93.3	0	0.072	0.063	0.057	0.047	0.040	0.034	0.029	0.025
2002	94.0	0	0.083	0.077	0.061	0.054	0.046	0.037	0.030	0.025
2003	92.4	0	0.079	0.061	0.054	0.045	0.039	0.035	0.030	0.025
2004	92.3	1	**0.112**	0.068	0.065	0.052	0.044	0.036	0.030	0.025
2005	92.4	0	0.078	0.061	0.057	0.049	0.042	0.035	0.030	0.026

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

Bold font indicates values that exceed the AAQ NEPM standard

Table 54: Statistical summary for O_3 - Annual daily maximum 1-hour average concentration

Station: Wallsend

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
1996	91.9	0	0.056	0.045	0.043	0.037	0.033	0.025	0.020	0.015
1997	76.8	1	**0.129**	0.065	0.054	0.048	0.042	0.034	0.027	0.020
1998	86.6	0	0.095	0.072	0.063	0.050	0.041	0.033	0.027	0.022
1999	83.2	0	0.069	0.057	0.054	0.047	0.042	0.033	0.027	0.021
2000	90.4	0	0.073	0.066	0.060	0.048	0.042	0.032	0.027	0.023
2001	87.9	0	0.078	0.070	0.063	0.053	0.046	0.036	0.028	0.023
2002	81.9	0	0.081	0.074	0.069	0.056	0.049	0.038	0.031	0.025
2003	91.6	0	0.077	0.064	0.060	0.049	0.042	0.034	0.029	0.025
2004	88.2	1	**0.103**	0.071	0.065	0.054	0.047	0.037	0.031	0.026
2005	91.3	0	0.094	0.068	0.063	0.052	0.046	0.037	0.031	0.026

Table 55: Statistical summary for O_3 - Annual daily maximum 1-hour average concentrations

Station: Bathurst

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
2001	50.4	0	0.063	0.052	0.050	0.048	0.045	0.036	0.032	0.027
2002	34.7	0	0.064	0.063	0.062	0.057	0.052	0.044	0.038	0.032
2003	76.4	0	0.056	0.051	0.049	0.046	0.042	0.036	0.032	0.029
2004	89.9	0	0.092	0.067	0.059	0.054	0.050	0.043	0.034	0.029
2005	90.7	0	0.056	0.054	0.052	0.048	0.044	0.038	0.033	0.030

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

Bold font indicates values that exceed the AAQ NEPM standard

Table 56: Statistical summary for O_3 - Daily maximum rolling 4-hour average concentration

Station: Blacktown

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
1996	86.4	0	0.071	0.053	0.050	0.046	0.040	0.030	0.022	0.016
1997	94.8	**2**	**0.100**	0.076	0.064	0.057	0.046	0.033	0.024	0.019
1998	84.9	**3**	**0.097**	0.079	0.069	0.055	0.047	0.035	0.023	0.017
1999	99.3	0	0.077	0.064	0.061	0.054	0.045	0.031	0.024	0.018
2000	95.3	**3**	**0.101**	0.078	0.065	0.054	0.045	0.034	0.026	0.021
2001	97.7	**8**	**0.120**	**0.091**	**0.080**	0.065	0.048	0.036	0.029	0.022
2002	95.7	**6**	**0.107**	**0.083**	0.077	0.061	0.054	0.040	0.031	0.024
2003	94.3	**3**	**0.157**	0.078	0.066	0.056	0.045	0.035	0.028	0.023
2004	41.3	**4**	**0.107**	**0.082**	0.080	0.070	0.061	0.044	0.033	0.026
2005	0.0#									

Station closed pending relocation.

Table 57: Statistical summary for O_3 - Daily maximum rolling 4-hour average concentration

Station: Bringelly

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
1996	82.9	0	0.076	0.060	0.058	0.050	0.045	0.034	0.026	0.021
1997	87.3	**5**	**0.102**	**0.081**	0.074	0.060	0.050	0.040	0.028	0.024
1998	77.6	**9**	**0.089**	**0.085**	**0.083**	0.064	0.056	0.038	0.027	0.023
1999	96.0	**4**	**0.092**	0.078	0.074	0.061	0.049	0.034	0.028	0.023
2000	99.3	**6**	**0.115**	**0.086**	0.076	0.063	0.052	0.037	0.030	0.026
2001	95.4	**12**	**0.128**	**0.098**	**0.086**	0.069	0.054	0.039	0.032	0.026
2002	96.8	**7**	**0.099**	**0.088**	0.078	0.066	0.055	0.041	0.033	0.026
2003	95.3	**5**	**0.133**	**0.082**	0.068	0.057	0.050	0.038	0.031	0.027
2004	95.1	**7**	**0.110**	**0.085**	0.078	0.064	0.053	0.041	0.032	0.028
2005	92.4	**3**	**0.102**	0.074	0.066	0.059	0.050	0.039	0.033	0.028

Table 58: Statistical summary for O_3 - Daily maximum rolling 4-hour average concentration

Station: Lidcombe(1) / Chullora(2)

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
1996 (1)	81.6	0	0.065	0.056	0.050	0.043	0.037	0.028	0.021	0.014
1997 (1)	90.2	**4**	**0.121**	0.078	0.070	0.058	0.045	0.032	0.022	0.017
1998 (1)	87.8	**5**	**0.119**	**0.082**	0.073	0.056	0.045	0.031	0.023	0.017
1999 (1)	91.0	0	0.077	0.065	0.056	0.050	0.039	0.029	0.023	0.018
2000 (1)	98.7	**2**	**0.095**	0.074	0.066	0.053	0.043	0.031	0.025	0.019
2001 (1)	98.5	**4**	**0.137**	**0.080**	0.076	0.057	0.044	0.032	0.024	0.019
2002 (1)	32.4	1	**0.084**	0.072	0.063	0.052	0.043	0.035	0.027	0.020
2003 (2)	84.2	0	0.077	0.057	0.053	0.041	0.037	0.032	0.026	0.021
2004 (2)	91.2	**4**	**0.086**	0.077	0.065	0.054	0.045	0.035	0.029	0.024
2005 (2)	96.2	1	**0.080**	0.064	0.059	0.052	0.042	0.034	0.028	0.023

AAQ NEPM Standard - 0.08 ppm (rolling 4-hour average)

Bold font indicates values that exceed the AAQ NEPM standard

Table 59: Statistical summary for O_3 - Daily maximum rolling 4-hour average concentration

Station: Liverpool

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
1996	78.3	0	0.078	0.062	0.056	0.046	0.035	0.025	0.019	0.014
1997	73.3	**2**	**0.116**	0.076	0.067	0.048	0.039	0.025	0.020	0.015
1998	97.2	**5**	**0.108**	**0.084**	0.077	0.058	0.046	0.031	0.022	0.016
1999	87.3	1	**0.084**	0.068	0.065	0.054	0.041	0.030	0.023	0.018
2000	97.5	**3**	**0.107**	0.076	0.070	0.059	0.047	0.033	0.027	0.022
2001	99.0	**7**	**0.120**	**0.093**	0.078	0.064	0.048	0.036	0.029	0.023
2002	97.7	**5**	**0.089**	0.078	0.068	0.058	0.048	0.035	0.028	0.023
2003	97.1	**3**	**0.132**	0.073	0.054	0.048	0.040	0.033	0.028	0.022
2004	96.4	**5**	**0.092**	**0.080**	0.071	0.059	0.048	0.037	0.029	0.024
2005	92.0	**2**	**0.121**	0.073	0.067	0.053	0.046	0.036	0.030	0.025

Table 60: Statistical summary for O_3 - Daily maximum rolling 4-hour average concentration

Station: Oakdale

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
1996	63.1	1	**0.088**	0.062	0.053	0.044	0.038	0.030	0.025	0.022
1997	93.2	**12**	**0.133**	**0.090**	**0.081**	0.068	0.055	0.041	0.030	0.026
1998	56.8	**2**	**0.092**	0.079	0.075	0.061	0.051	0.039	0.032	0.027
1999	93.3	**6**	**0.090**	**0.083**	0.075	0.059	0.050	0.038	0.030	0.027
2000	94.0	**4**	**0.098**	**0.082**	0.072	0.055	0.047	0.037	0.029	0.026
2001	36.2	**8**	**0.105**	**0.096**	**0.093**	**0.084**	0.057	0.042	0.030	0.025
2002	19.3	1	**0.080**	0.079	0.076	0.073	0.068	0.055	0.043	0.035
2003	95.0	**3**	**0.089**	0.072	0.064	0.056	0.048	0.039	0.032	0.028
2004	89.2	**7**	**0.099**	**0.088**	0.077	0.064	0.056	0.044	0.034	0.030
2005	95.1	**4**	**0.106**	0.079	0.072	0.062	0.052	0.040	0.032	0.029

Table 61: Statistical summary for O_3 - Daily maximum rolling 4-hour average concentration

Station: Richmond

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
1996	92.9	0	0.075	0.055	0.052	0.047	0.041	0.034	0.027	0.022
1997	76.6	**4**	**0.103**	**0.082**	0.067	0.058	0.051	0.039	0.029	0.025
1998	94.8	**2**	**0.097**	0.074	0.068	0.058	0.050	0.037	0.029	0.024
1999	95.9	1	**0.098**	0.071	0.064	0.053	0.048	0.038	0.031	0.025
2000	93.2	0	0.078	0.065	0.061	0.054	0.046	0.036	0.028	0.024
2001	94.5	**6**	**0.111**	**0.084**	0.074	0.065	0.051	0.039	0.032	0.026
2002	96.3	**4**	**0.112**	**0.080**	0.073	0.062	0.056	0.042	0.032	0.027
2003	89.5	**3**	**0.138**	0.076	0.067	0.055	0.048	0.037	0.029	0.025
2004	93.8	1	**0.088**	0.073	0.067	0.057	0.052	0.042	0.033	0.028
2005	96.3	**4**	**0.101**	0.080	0.066	0.059	0.052	0.042	0.033	0.028

AAQ NEPM Standard - 0.08 ppm (rolling 4-hour average)

Bold font indicates values that exceed the AAQ NEPM standard

Table 62: Statistical summary for O_3 - Daily maximum rolling 4-hour average concentration

Station: Rozelle

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
1996	0.0									
1997	0.0									
1998	75.1	0	0.079	0.046	0.044	0.039	0.034	0.025	0.019	0.014
1999	92.6	0	0.053	0.043	0.039	0.035	0.029	0.023	0.019	0.014
2000	91.5	0	0.073	0.058	0.050	0.042	0.034	0.028	0.024	0.019
2001	97.4	1	**0.083**	0.055	0.050	0.040	0.036	0.030	0.024	0.020
2002	92.1	1	**0.087**	0.061	0.054	0.047	0.040	0.032	0.026	0.021
2003	95.3	0	0.070	0.057	0.052	0.039	0.034	0.030	0.025	0.021
2004	92.9	1	**0.087**	0.071	0.065	0.050	0.041	0.032	0.026	0.022
2005	92.9	0	0.065	0.058	0.054	0.045	0.039	0.032	0.027	0.023

Table 63: Statistical summary for O_3 - Daily maximum rolling 4-hour average concentration

Station: St Marys

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
1996	89.9	0	0.080	0.056	0.052	0.049	0.043	0.033	0.026	0.020
1997	78.9	**4**	**0.104**	**0.084**	0.071	0.062	0.053	0.040	0.028	0.022
1998	88.6	**4**	**0.091**	0.080	0.071	0.057	0.049	0.034	0.026	0.021
1999	92.2	**3**	**0.091**	0.073	0.065	0.057	0.046	0.031	0.025	0.019
2000	95.6	**5**	**0.136**	**0.083**	0.076	0.063	0.053	0.038	0.030	0.025
2001	94.2	**11**	**0.125**	**0.092**	**0.085**	0.067	0.051	0.040	0.031	0.027
2002	99.7	**7**	**0.093**	**0.084**	0.070	0.060	0.053	0.042	0.032	0.026
2003	96.8	**2**	**0.091**	0.062	0.059	0.051	0.046	0.035	0.029	0.025
2004	97.8	**4**	**0.128**	0.078	0.067	0.060	0.053	0.041	0.032	0.028
2005	96.2	**3**	**0.091**	0.077	0.067	0.058	0.050	0.040	0.032	0.028

Table 64: Statistical summary for O_3 - Daily maximum rolling 4-hour average concentration

Station: Albion Park

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
1996	85.9	0	0.053	0.045	0.042	0.038	0.033	0.028	0.024	0.020
1997	43.3	**5**	**0.124**	**0.099**	**0.087**	0.063	0.049	0.033	0.027	0.024
1998	91.2	**5**	**0.116**	**0.084**	0.065	0.052	0.044	0.033	0.028	0.025
1999	89.4	1	**0.081**	0.070	0.056	0.045	0.038	0.032	0.028	0.024
2000	93.7	**4**	**0.083**	0.080	0.065	0.051	0.041	0.034	0.028	0.025
2001	97.7	1	**0.082**	0.064	0.059	0.049	0.041	0.036	0.031	0.026
2002	60.0	1	**0.083**	0.069	0.065	0.043	0.039	0.031	0.026	0.023
2003	96.8	**4**	**0.111**	0.070	0.058	0.040	0.037	0.033	0.029	0.025
2004	97.5	1	**0.092**	0.073	0.055	0.046	0.040	0.033	0.029	0.026
2005	5.0	0	0.063	0.059	0.058	0.054	0.047	0.039	0.029	0.023

AAQ NEPM Standard - 0.08 ppm (rolling 4-hour average)

Bold font indicates values that exceed the AAQ NEPM standard

Table 65: Statistical summary for O_3 - Daily maximum rolling 4-hour average concentration

Station: Kembla Grange

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
1996	96.0	0	0.062	0.048	0.047	0.039	0.034	0.027	0.023	0.019
1997	92.3	**5**	**0.099**	**0.084**	0.060	0.048	0.042	0.030	0.026	0.022
1998	87.7	**6**	**0.117**	**0.081**	0.074	0.053	0.044	0.033	0.027	0.023
1999	88.9	1	**0.081**	0.067	0.056	0.044	0.037	0.031	0.027	0.023
2000	97.9	**4**	**0.089**	0.077	0.067	0.050	0.039	0.032	0.028	0.024
2001	85.7	**2**	**0.092**	0.071	0.061	0.051	0.042	0.034	0.029	0.024
2002	95.8	1	**0.083**	0.071	0.070	0.046	0.040	0.034	0.029	0.024
2003	97.4	**3**	**0.107**	0.073	0.056	0.041	0.036	0.032	0.028	0.025
2004	95.4	**3**	**0.100**	0.067	0.053	0.047	0.040	0.034	0.030	0.026
2005	96.7	1	**0.084**	0.060	0.059	0.047	0.040	0.035	0.031	0.026

Table 66: Statistical summary for O_3 - Daily maximum rolling 4-hour average concentration

Station: Wollongong

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
1996	92.4	0	0.055	0.046	0.043	0.038	0.032	0.023	0.016	0.011
1997	91.6	**4**	**0.113**	**0.081**	0.062	0.050	0.042	0.030	0.025	0.021
1998	87.3	1	**0.082**	0.076	0.067	0.050	0.042	0.031	0.026	0.022
1999	85.4	0	0.073	0.058	0.054	0.043	0.037	0.030	0.025	0.019
2000	98.2	**3**	**0.086**	0.076	0.067	0.056	0.040	0.031	0.027	0.023
2001	98.0	1	**0.091**	0.068	0.064	0.052	0.044	0.034	0.029	0.024
2002	94.6	**2**	**0.099**	0.076	0.068	0.056	0.043	0.034	0.028	0.023
2003	96.4	1	**0.080**	0.072	0.059	0.042	0.037	0.032	0.028	0.024
2004	96.3	**2**	**0.090**	0.067	0.058	0.050	0.040	0.032	0.028	0.025
2005	96.2	1	**0.099**	0.063	0.058	0.048	0.041	0.033	0.029	0.024

Table 67: Statistical summary for O_3 - Daily maximum rolling 4-hour average concentrations

Station: Newcastle

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
1996	91.9	0	0.054	0.037	0.035	0.031	0.027	0.023	0.019	0.016
1997	95.4	1	**0.125**	0.056	0.050	0.043	0.037	0.029	0.023	0.018
1998	98.6	0	0.068	0.058	0.049	0.040	0.034	0.029	0.024	0.019
1999	96.0	0	0.065	0.050	0.047	0.042	0.037	0.032	0.026	0.021
2000	92.1	0	0.065	0.059	0.051	0.043	0.038	0.030	0.025	0.021
2001	97.4	0	0.069	0.057	0.051	0.042	0.037	0.032	0.027	0.023
2002	98.2	0	0.077	0.063	0.054	0.050	0.041	0.034	0.028	0.023
2003	96.3	0	0.061	0.052	0.049	0.041	0.038	0.033	0.028	0.024
2004	96.4	0	0.073	0.061	0.059	0.048	0.041	0.034	0.028	0.024
2005	96.5	0	0.070	0.052	0.049	0.044	0.039	0.033	0.028	0.024

AAQ NEPM Standard - 0.08 ppm (rolling 4-hour average)

Bold font indicates values that exceed the AAQ NEPM standard

Table 68: Statistical summary for O_3 - Daily maximum rolling 4-hour average concentration

Station: Wallsend

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
1996	83.1	0	0.053	0.041	0.039	0.033	0.028	0.023	0.019	0.014
1997	76.0	**2**	**0.105**	0.054	0.049	0.044	0.039	0.032	0.026	0.019
1998	90.2	1	**0.084**	0.061	0.052	0.043	0.037	0.030	0.026	0.020
1999	86.7	0	0.059	0.050	0.047	0.042	0.038	0.031	0.024	0.020
2000	94.2	0	0.070	0.059	0.056	0.045	0.038	0.030	0.026	0.022
2001	91.7	0	0.073	0.062	0.056	0.048	0.041	0.033	0.027	0.022
2002	85.6	0	0.074	0.067	0.065	0.052	0.043	0.035	0.029	0.023
2003	95.7	0	0.059	0.057	0.054	0.044	0.039	0.032	0.028	0.024
2004	92.0	0	0.078	0.064	0.057	0.049	0.044	0.035	0.029	0.025
2005	95.4	0	0.074	0.061	0.056	0.048	0.041	0.034	0.029	0.025

Table 69: Statistical summary for O_3 - Daily maximum rolling 4-hour average concentration

Station: Bathurst

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
2001	52.3	0	0.060	0.051	0.049	0.046	0.042	0.035	0.030	0.025
2002	36.1	0	0.062	0.058	0.057	0.054	0.049	0.042	0.037	0.030
2003	79.6	0	0.053	0.049	0.047	0.044	0.040	0.036	0.031	0.028
2004	93.7	0	0.067	0.058	0.055	0.050	0.048	0.041	0.033	0.027
2005	94.5	0	0.055	0.052	0.049	0.046	0.041	0.036	0.032	0.029

AAQ NEPM Standard - 0.08 ppm (rolling 4-hour average)

Bold font indicates values that exceed the AAQ NEPM standard

Sulfur Dioxide

Statistical summary

Table 70: Statistical summary for SO_2 - Daily maximum 1-hour average concentrations (2005)

Region/ Performance monitoring Station	Data availability rates (%)	Maximum conc. (ppm)	Percentiles (ppm)						
			99th	98th	95th	90th	75th	50th	25th
Sydney									
Bringelly	91.3	0.009	0.007	0.006	0.004	0.003	0.002	0.001	0.000
Chullora	68.8	0.015	0.013	0.011	0.009	0.007	0.004	0.002	0.001
Macarthur	53.1	0.015	0.008	0.008	0.006	0.004	0.003	0.002	0.001
Richmond	92.8	0.015	0.009	0.007	0.006	0.004	0.003	0.001	0.001
Illawarra									
Albion Park	4.8	0.032	0.031	0.031	0.030	0.028	0.006	0.001	0.000
Warrawong	91.8	0.070	0.032	0.025	0.019	0.014	0.007	0.002	0.000
Wollongong	93.0	0.038	0.022	0.020	0.015	0.011	0.006	0.003	0.001
Lower Hunter									
Newcastle	72.6	0.037	0.035	0.028	0.019	0.015	0.009	0.005	0.002
Wallsend	93.4	0.048	0.032	0.026	0.021	0.016	0.009	0.005	0.002

AAQ NEPM Standard - 0.20 ppm (1-hour average)

Table 71: Statistical summary for SO_2 - Daily 24-hour average concentrations (2005)

Region/ Performance monitoring Station	Data availability rates (%)	Maximum conc. (ppm)	Percentiles (ppm)						
			99th	98th	95th	90th	75th	50th	25th
Sydney									
Bringelly	95.3	0.002	0.002	0.001	0.001	0.001	0.000	0.000	0.000
Chullora	71.8	0.005	0.003	0.003	0.003	0.002	0.001	0.001	0.000
Macarthur	55.3	0.003	0.003	0.002	0.002	0.001	0.001	0.000	0.000
Richmond	96.7	0.003	0.002	0.002	0.001	0.001	0.001	0.000	0.000
Illawarra									
Albion Park	4.9	0.011	0.009	0.009	0.007	0.006	0.001	0.000	0.000
Warrawong	96.7	0.009	0.007	0.005	0.004	0.003	0.002	0.000	0.000
Wollongong	97.5	0.006	0.005	0.004	0.003	0.002	0.001	0.001	0.000
Lower Hunter									
Newcastle	75.3	0.007	0.006	0.005	0.004	0.003	0.002	0.001	0.000
Wallsend	97.5	0.007	0.006	0.005	0.004	0.003	0.002	0.001	0.000

AAQ NEPM Standard - 0.08 ppm (24-hour average)

Trend analysis

Table 72: Maximum 1-hour average concentrations for SO_2 (ppm)

Region/ Performance monitoring Station	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Sydney										
Blacktown	0.020	0.018	0.020	0.020	0.015	0.020	0.021	0.016	0.016	
Bringelly	0.009	0.012	0.013	0.012	0.018	0.012	0.010	0.017	0.015	0.009
Richmond	0.018	0.016	0.012	0.019	0.015	0.012	0.028	0.012	0.021	0.015
Illawarra										
Albion Park	0.036	0.034	0.055	0.033	0.042	0.034	0.029	0.035	0.034	0.032
Warrawong			0.058	0.051	0.110	0.162	0.046	0.063	0.088	0.070
Wollongong	0.019	0.043	0.033	0.041	0.031	0.030	0.039	0.031	0.053	0.038
Lower Hunter										
Wallsend	0.080	0.101	0.063	0.074	0.041	0.049	0.045	0.047	0.067	0.048

AAQ NEPM Standard - 0.20 ppm (1-hour average)

Table 73: Maximum 24-hour average concentrations for SO_2 (ppm)

Region/ Performance monitoring Station	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Sydney										
Blacktown	0.007	0.010	0.008	0.003	0.004	0.005	0.004	0.004	0.004	
Bringelly	0.005	0.003	0.003	0.003	0.004	0.003	0.002	0.002	0.002	0.002
Richmond	0.003	0.003	0.007	0.003	0.004	0.010	0.004	0.003	0.003	0.003
Illawarra										
Albion Park	0.011	0.011	0.014	0.009	0.014	0.013	0.009	0.009	0.009	0.011
Warrawong			0.010	0.009	0.010	0.013	0.009	0.012	0.012	0.009
Wollongong	0.007	0.011	0.009	0.006	0.007	0.007	0.008	0.006	0.015	0.006
Lower Hunter										
Wallsend	0.022	0.022	0.016	0.014	0.010	0.013	0.011	0.010	0.014	0.007

AAQ NEPM Standard - 0.08 ppm (24-hour average)

Table 74: Annual average concentrations for SO_2 (ppm)

Region/ Performance monitoring Station	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Sydney										
Blacktown	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	
Bringelly	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000
Richmond	0.001	0.001	0.001	0.001	0.000	0.000	0.001	0.000	0.000	0.000
Illawarra										
Albion Park	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002
Warrawong			0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.001
Wollongong	0.002	0.001	0.002	0.001	0.002	0.001	0.001	0.001	0.001	0.001
Lower Hunter										
Wallsend	0.003	0.004	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.001

AAQ NEPM Standard - 0.02 ppm (Annual average)

Table 75: Statistical summary for SO_2 - Annual daily maximum 1-hour average concentrations

Station: Blacktown

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
1996	41.3	0	0.020	0.010	0.009	0.008	0.006	0.004	0.003	0.002
1997	82.0	0	0.018	0.015	0.011	0.009	0.007	0.005	0.003	0.002
1998	84.9	0	0.020	0.013	0.011	0.009	0.007	0.004	0.003	0.002
1999	88.8	0	0.020	0.009	0.008	0.007	0.006	0.004	0.003	0.002
2000	85.9	0	0.015	0.011	0.010	0.008	0.006	0.004	0.003	0.002
2001	93.9	0	0.020	0.014	0.012	0.008	0.007	0.005	0.003	0.002
2002	93.2	0	0.021	0.013	0.010	0.008	0.006	0.004	0.003	0.002
2003	91.3	0	0.016	0.012	0.010	0.007	0.005	0.004	0.003	0.002
2004	39.1	0	0.016	0.012	0.012	0.010	0.008	0.005	0.004	0.002
2005	0.0#									

Station closed pending relocation.

AAQ NEPM Standard - 0.20 ppm (1-hour average)

Table 76: Statistical summary for SO_2 - Annual daily maximum 1-hour average concentrations

Station: Bringelly

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
1996	64.2	0	0.009	0.007	0.006	0.005	0.004	0.002	0.001	0.001
1997	92.1	0	0.012	0.008	0.007	0.005	0.004	0.002	0.001	0.001
1998	87.8	0	0.013	0.007	0.006	0.005	0.004	0.002	0.002	0.001
1999	87.8	0	0.012	0.008	0.007	0.005	0.004	0.003	0.002	0.001
2000	90.8	0	0.018	0.007	0.006	0.005	0.004	0.003	0.001	0.001
2001	94.7	0	0.012	0.010	0.008	0.006	0.004	0.003	0.002	0.001
2002	94.6	0	0.010	0.009	0.008	0.006	0.004	0.002	0.001	0.001
2003	93.0	0	0.017	0.006	0.006	0.004	0.003	0.002	0.001	0.001
2004	90.8	0	0.015	0.008	0.007	0.005	0.004	0.002	0.001	0.000
2005	91.3	0	0.009	0.007	0.006	0.004	0.003	0.002	0.001	0.000

Table 77: Statistical summary for SO_2 - Annual daily maximum 1-hour average concentrations

Station: Richmond

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
1996	64.8	0	0.018	0.007	0.006	0.005	0.004	0.002	0.002	0.001
1997	86.1	0	0.016	0.009	0.008	0.006	0.005	0.003	0.002	0.001
1998	73.0	0	0.012	0.008	0.006	0.005	0.004	0.003	0.001	0.001
1999	90.3	0	0.019	0.018	0.018	0.007	0.005	0.003	0.002	0.001
2000	85.6	0	0.015	0.009	0.007	0.006	0.004	0.002	0.001	0.001
2001	84.7	0	0.012	0.010	0.007	0.005	0.004	0.002	0.001	0.001
2002	93.3	0	0.028	0.009	0.008	0.006	0.004	0.003	0.001	0.001
2003	93.0	0	0.012	0.010	0.008	0.006	0.004	0.003	0.001	0.001
2004	89.7	0	0.021	0.011	0.009	0.007	0.005	0.003	0.002	0.001
2005	92.8	0	0.015	0.009	0.007	0.006	0.004	0.003	0.001	0.001

Table 78: Statistical summary for SO_2 - Annual daily maximum 1-hour average concentrations

Station: Albion Park

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
1996	78.6	0	0.036	0.028	0.025	0.019	0.012	0.004	0.001	0.001
1997	41.2	0	0.034	0.028	0.025	0.020	0.016	0.007	0.001	0.000
1998	87.7	0	0.055	0.027	0.025	0.018	0.012	0.005	0.001	0.000
1999	90.5	0	0.033	0.025	0.024	0.017	0.013	0.005	0.001	0.000
2000	94.2	0	0.042	0.032	0.030	0.024	0.017	0.008	0.001	0.000
2001	93.7	0	0.034	0.027	0.024	0.018	0.013	0.008	0.001	0.000
2002	57.4	0	0.029	0.027	0.026	0.022	0.016	0.006	0.001	0.000
2003	93.7	0	0.035	0.025	0.021	0.015	0.012	0.005	0.001	0.000
2004	92.9	0	0.034	0.029	0.026	0.017	0.013	0.006	0.001	0.000
2005	4.8	0	0.032	0.031	0.031	0.030	0.028	0.006	0.001	0.000

AAQ NEPM Standard - 0.20 ppm (1-hour average)

Bold font indicates values that exceed the AAQ NEPM standard

Table 79: Statistical summary for SO_2 - Annual daily maximum 1-hour average concentrations

Station: Warrawong

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
1996	0.0									
1997	0.0									
1998	86.8	0	0.058	0.033	0.030	0.019	0.015	0.006	0.002	0.001
1999	89.2	0	0.051	0.036	0.027	0.019	0.013	0.006	0.002	0.001
2000	90.8	0	0.110	0.068	0.038	0.026	0.020	0.011	0.003	0.000
2001	93.1	0	0.162	0.065	0.055	0.042	0.027	0.012	0.003	0.000
2002	94.0	0	0.046	0.031	0.028	0.023	0.019	0.011	0.004	0.000
2003	93.7	0	0.063	0.048	0.040	0.020	0.016	0.009	0.002	0.000
2004	91.4	0	0.088	0.037	0.029	0.021	0.014	0.006	0.002	0.000
2005	91.8	0	0.070	0.032	0.025	0.019	0.014	0.007	0.002	0.000

Table 80: Statistical summary for SO_2 - Annual daily maximum 1-hour average concentrations

Station: Wollongong

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
1996	35.1	0	0.019	0.019	0.018	0.014	0.011	0.006	0.003	0.002
1997	90.5	0	0.043	0.022	0.018	0.014	0.010	0.007	0.004	0.002
1998	91.3	0	0.033	0.027	0.022	0.017	0.013	0.007	0.004	0.002
1999	91.6	0	0.041	0.018	0.016	0.013	0.011	0.008	0.004	0.002
2000	94.3	0	0.031	0.025	0.021	0.017	0.014	0.009	0.005	0.003
2001	92.6	0	0.030	0.027	0.020	0.016	0.013	0.008	0.004	0.002
2002	91.1	0	0.039	0.030	0.025	0.019	0.015	0.009	0.005	0.002
2003	93.7	0	0.031	0.025	0.022	0.015	0.013	0.008	0.004	0.002
2004	92.8	0	0.053	0.022	0.018	0.014	0.011	0.006	0.003	0.001
2005	93.0	0	0.038	0.022	0.020	0.015	0.011	0.006	0.003	0.001

Table 81: Statistical summary for SO_2 - Annual daily maximum 1-hour average concentrations

Station: Wallsend

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
1996	52.5	0	0.080	0.057	0.046	0.035	0.024	0.014	0.008	0.005
1997	70.5	0	0.101	0.068	0.062	0.046	0.033	0.021	0.011	0.006
1998	86.6	0	0.063	0.053	0.039	0.034	0.027	0.018	0.009	0.005
1999	80.4	0	0.074	0.042	0.041	0.033	0.024	0.014	0.009	0.004
2000	92.0	0	0.041	0.031	0.030	0.024	0.019	0.012	0.007	0.003
2001	86.9	0	0.049	0.035	0.030	0.025	0.021	0.013	0.008	0.003
2002	80.2	0	0.045	0.034	0.028	0.024	0.019	0.012	0.007	0.004
2003	90.3	0	0.047	0.032	0.028	0.021	0.016	0.011	0.006	0.003
2004	90.1	0	0.067	0.039	0.032	0.021	0.016	0.010	0.005	0.002
2005	93.4	0	0.048	0.032	0.026	0.021	0.016	0.009	0.005	0.002

AAQ NEPM Standard - 0.20 ppm (1-hour average)

Bold font indicates values that exceed the AAQ NEPM standard

Table 82: Statistical summary for SO_2 - 24-hour average concentrations

Station: Blacktown

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
1996	42.9	0	0.007	0.005	0.005	0.004	0.002	0.002	0.001	0.001
1997	83.8	0	0.010	0.005	0.004	0.003	0.003	0.002	0.001	0.001
1998	89.9	0	0.008	0.005	0.004	0.003	0.003	0.002	0.001	0.001
1999	95.3	0	0.003	0.003	0.003	0.002	0.002	0.001	0.001	0.000
2000	84.2	0	0.004	0.003	0.003	0.003	0.002	0.001	0.001	0.000
2001	98.1	0	0.005	0.004	0.003	0.003	0.002	0.001	0.001	0.001
2002	96.4	0	0.004	0.003	0.003	0.002	0.002	0.001	0.001	0.001
2003	95.1	0	0.004	0.003	0.003	0.002	0.002	0.001	0.001	0.001
2004	40.4	0	0.004	0.004	0.003	0.003	0.002	0.002	0.001	0.001
2005	0.0									

Station closed pending relocation.

Table 83: Statistical summary for SO_2 - 24-hour average concentrations

Station: Bringelly

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
1996	64.2	0	0.005	0.004	0.004	0.002	0.001	0.001	0.001	0.000
1997	96.2	0	0.003	0.002	0.002	0.002	0.001	0.001	0.001	0.000
1998	92.1	0	0.003	0.002	0.002	0.002	0.001	0.001	0.001	0.000
1999	94.0	0	0.003	0.002	0.002	0.002	0.002	0.001	0.001	0.000
2000	94.8	0	0.004	0.002	0.001	0.001	0.001	0.001	0.000	0.000
2001	98.6	0	0.003	0.002	0.002	0.001	0.001	0.001	0.000	0.000
2002	99.2	0	0.002	0.002	0.002	0.001	0.001	0.001	0.000	0.000
2003	97.3	0	0.002	0.002	0.002	0.001	0.001	0.000	0.000	0.000
2004	94.8	0	0.002	0.002	0.001	0.001	0.001	0.000	0.000	0.000
2005	95.3	0	0.002	0.002	0.001	0.001	0.001	0.000	0.000	0.000

Table 84: Statistical summary for SO_2 - 24-hour average concentrations

Station: Richmond

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
1996	67.5	0	0.003	0.002	0.002	0.002	0.001	0.001	0.001	0.000
1997	89.0	0	0.003	0.003	0.003	0.002	0.002	0.001	0.001	0.001
1998	75.1	0	0.007	0.004	0.003	0.002	0.001	0.001	0.001	0.000
1999	95.6	0	0.003	0.002	0.002	0.002	0.001	0.001	0.001	0.000
2000	89.3	0	0.004	0.002	0.002	0.001	0.001	0.001	0.000	0.000
2001	88.8	0	0.010	0.002	0.002	0.002	0.001	0.001	0.000	0.000
2002	97.5	0	0.004	0.002	0.002	0.002	0.001	0.001	0.000	0.000
2003	97.0	0	0.003	0.002	0.002	0.001	0.001	0.001	0.000	0.000
2004	92.9	0	0.003	0.002	0.002	0.002	0.001	0.001	0.000	0.000
2005	96.7	0	0.003	0.002	0.002	0.001	0.001	0.001	0.000	0.000

AAQ NEPM Standard - 0.08 ppm (24-hour average)

Table 85: Statistical summary for SO_2 - 24-hour average concentrations

Station: Albion Park

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
1996	0.0	0	0.011	0.009	0.007	0.004	0.002	0.001	0.001	0.000
1997	33.2	0	0.011	0.008	0.007	0.006	0.003	0.001	0.000	0.000
1998	94.0	0	0.014	0.010	0.008	0.004	0.003	0.001	0.000	0.000
1999	98.6	0	0.009	0.008	0.006	0.004	0.003	0.001	0.000	0.000
2000	98.1	0	0.014	0.009	0.008	0.006	0.004	0.002	0.000	0.000
2001	98.1	0	0.013	0.008	0.007	0.005	0.003	0.002	0.000	0.000
2002	60.0	0	0.009	0.008	0.007	0.006	0.004	0.001	0.000	0.000
2003	98.9	0	0.009	0.007	0.005	0.004	0.003	0.001	0.000	0.000
2004	97.0	0	0.009	0.007	0.006	0.004	0.003	0.001	0.000	0.000
2005	4.9	0	0.011	0.009	0.009	0.007	0.006	0.001	0.000	0.000

Table 86: Statistical summary for SO_2 - 24-hour average concentrations

Station: Warrawong

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
1998	92.6	0	0.011	0.007	0.005	0.004	0.003	0.001	0.000	0.000
1999	95.3	0	0.009	0.007	0.005	0.004	0.003	0.001	0.001	0.000
2000	93.7	0	0.010	0.007	0.006	0.004	0.003	0.002	0.000	0.000
2001	97.3	0	0.013	0.010	0.009	0.006	0.005	0.002	0.000	0.000
2002	98.6	0	0.009	0.006	0.006	0.005	0.003	0.002	0.001	0.000
2003	98.4	0	0.012	0.009	0.007	0.004	0.003	0.002	0.000	0.000
2004	95.4	0	0.012	0.006	0.006	0.004	0.003	0.001	0.000	0.000
2005	96.7	0	0.009	0.007	0.005	0.004	0.003	0.002	0.000	0.000

Table 87: Statistical summary for SO_2 - 24-hour average concentrations

Station: Wollongong

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
1996	35.5	0	0.007	0.007	0.005	0.004	0.003	0.002	0.001	0.001
1997	92.6	0	0.011	0.006	0.005	0.003	0.003	0.002	0.001	0.000
1998	97.3	0	0.009	0.005	0.005	0.004	0.003	0.002	0.001	0.001
1999	98.1	0	0.006	0.005	0.004	0.004	0.003	0.002	0.001	0.001
2000	99.2	0	0.008	0.006	0.005	0.004	0.003	0.002	0.001	0.001
2001	95.9	0	0.008	0.006	0.005	0.004	0.003	0.002	0.001	0.000
2002	95.3	0	0.008	0.006	0.006	0.004	0.003	0.002	0.001	0.000
2003	98.4	0	0.006	0.005	0.004	0.003	0.003	0.001	0.001	0.000
2004	97.3	0	0.015	0.006	0.005	0.003	0.002	0.001	0.001	0.000
2005	97.5	0	0.006	0.005	0.004	0.003	0.002	0.001	0.001	0.000

AAQ NEPM Standard - 0.08 ppm (24-hour average)

Table 88: Statistical summary for SO_2 - 24-hour average concentrations

Station: Wallsend

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)						
				99th	98th	95th	90th	75th	50th	25th
1996	54.1	0	0.022	0.012	0.011	0.008	0.006	0.004	0.003	0.002
1997	72.6	0	0.022	0.018	0.015	0.012	0.008	0.004	0.003	0.002
1998	91.0	0	0.016	0.014	0.010	0.008	0.006	0.004	0.002	0.002
1999	86.0	0	0.014	0.011	0.009	0.007	0.005	0.003	0.002	0.001
2000	94.5	0	0.010	0.009	0.007	0.006	0.004	0.003	0.002	0.001
2001	89.6	0	0.013	0.009	0.008	0.006	0.005	0.003	0.002	0.001
2002	82.2	0	0.012	0.007	0.007	0.005	0.004	0.003	0.002	0.001
2003	93.7	0	0.011	0.006	0.005	0.004	0.003	0.002	0.001	0.001
2004	92.9	0	0.014	0.007	0.006	0.004	0.003	0.002	0.001	0.001
2005	97.5	0	0.007	0.006	0.005	0.004	0.003	0.002	0.001	0.000

AAQ NEPM Standard - 0.08 ppm (24-hour average)

Particles as PM_{10}

Statistical summary

Table 89: Statistical summary for PM_{10} - 24-hour average concentrations (2005)

Region/ Performance monitoring Station	Data availability rates (%)	Maximum conc. (ppm)	Percentiles (µg/m^3)						
			99th	98th	95th	90th	75th	50th	25th
Sydney									
Bringelly	91.8	**53.9**	44.3	42.5	35.6	30.3	23.8	18.2	13.8
Chullora	89.0	49.7	46.1	42.0	38.0	33.4	27.0	20.3	16.3
Liverpool	96.4	**55.1**	45.9	43.7	36.2	32.4	26.3	20.0	15.1
Macarthur	83.8	**54.9**	45.3	42.4	36.0	30.5	24.6	18.2	13.6
Oakdale	92.9	42.6	36.9	32.1	27.3	22.2	16.8	12.3	8.4
Richmond	97.0	49.1	41.7	35.0	30.1	25.7	20.2	15.4	11.4
Rozelle	95.6	47.1	40.5	38.9	34.8	31.0	24.2	18.9	14.8
Illawarra									
Albion Park	3.0	41.9	39.8	39.3	37.9	36.9	29.7	22.1	15.6
Kembla Grange	97.8	**59.0**	49.4	45.7	38.6	33.1	23.2	17.2	12.2
Wollongong	97.3	**54.8**	44.0	41.3	35.4	30.0	23.5	16.7	12.7
Lower Hunter									
Beresfield	95.9	**53.2**	44.4	39.4	35.9	31.7	24.9	18.4	14.6
Newcastle	81.6	49.9	40.9	38.9	35.1	31.7	26.2	21.1	16.6
Regional									
Albury	90.4	**55.1**	46.6	39.6	35.9	30.9	20.1	14.4	10.8
Bathurst	93.2	45.0	38.3	36.6	30.5	25.2	18.3	12.8	8.8
Tamworth	68.2	**88.8**	34.7	33.1	30.1	26.6	20.3	14.7	10.6
Wagga Wagga	90.7	**163.1**	**77.8**	**67.8**	**57.0**	46.3	30.5	19.8	14.2

AAQ NEPM Standard – 50 µg/m^3 (24-hour average)

Bold font indicates values that exceed the AAQ NEPM standard

Trend analysis

Table 90: Maximum 24-hour average concentrations for PM_{10} (µg/m^3)

Region/ Performance monitoring Station	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Sydney										
Blacktown	39.2	**57.3**	**66.9**	37.4	36.2	**127.1**	**122.0**	**186.8**	42.6	
Bringelly	**92.0**	**68.2**	45.9	33.9	36.5	**99.4**	**120.2**	**274.7**	**60.3**	**53.9**
Chullora								**212.8**	**57.5**	49.7
Liverpool	37.3	**58.7**	45.7	46.0	**64.1**	**61.4**	**127.6**	**282.6**	**60.5**	**55.1**
Macarthur									**59.1**	**54.9**
Oakdale									41.3	42.6
Richmond	**85.8**	**71.5**	**55.6**	44.4	43.2	**119.9**	**126.4**	**194.3**	46.2	49.1
Rozelle								36.8	**51.4**	47.1
Illawarra										
Albion Park		**61.6**	**63.6**	48.7	**62.5**	**58.7**	**88.3**	**281.0**	**51.5**	41.8
Kembla Grange									**57.6**	**59.0**
Wollongong	**69.6**	**64.8**	**56.9**	40.2	**58.1**	**68.2**	**76.7**	**280.5**	48.1	**54.8**
Lower Hunter										
Beresfield	**100.6**	**71.8**	46.1	48.0	**53.6**	**81.0**	**166.4**	**88.0**	**55.7**	**53.2**
Newcastle									46.9	49.9
Regional										
Albury						28.8	**81.3**	**921.4**	**55.6**	**55.1**
Bathurst					35.2	35.6	**258.2**	**621.7**	**72.9**	44.9
Tamworth					21.1	34.6	**189.8**	**243.3**	**55.7**	**88.8**
Wagga Wagga						**69.8**	**178.2**	**837.0**	**105.9**	**163.1**

AAQ NEPM Standard – 50 µg/m^3 (24-hour average)

Bold font indicates values that exceed the AAQ NEPM standard

Table 91: Statistical summary for PM_{10} - 24-hour average concentrations

Station: Blacktown

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ug/m3)	Percentiles (µg/m^3)						
				99th	98th	95th	90th	75th	50th	25th
1996	97.3	0	39.2	30.6	30.0	27.2	25.3	19.3	14.7	10.7
1997	74.2	2	**57.3**	44.0	41.7	35.8	31.3	23.6	17.8	13.5
1998	98.1	1	**66.9**	36.3	33.4	30.8	28.3	21.0	16.0	11.4
1999	92.3	0	37.5	29.3	26.4	24.1	22.1	18.3	14.6	11.3
2000	94.8	0	36.2	29.1	27.9	24.2	21.2	18.1	14.4	11.8
2001	92.9	3	**127.1**	43.2	41.7	35.7	32.5	24.8	18.9	13.9
2002	93.4	**11**	**122.0**	**82.4**	**64.5**	42.9	33.6	25.2	18.4	14.6
2003	94.8	4	**186.8**	**52.7**	41.0	34.3	28.9	21.7	17.0	12.7
2004	35.8	0	42.6	41.9	41.5	36.3	33.7	27.6	22.3	17.9
2005	0.0									

Station closed pending relocation.

Table 92: Statistical summary for PM_{10} - 24-hour average concentrations

Station: Bringelly

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ug/m3)	Percentiles (µg/m^3)						
				99th	98th	95th	90th	75th	50th	25th
1996	89.1	1	**92.0**	33.5	30.8	26.0	24.0	18.8	14.0	9.7
1997	98.4	1	**68.2**	40.2	34.3	31.8	27.6	21.1	15.0	10.9
1998	95.9	0	45.9	37.9	36.3	30.6	28.2	20.2	15.1	10.4
1999	85.5	0	33.9	29.3	27.0	24.3	22.2	18.0	14.2	11.0
2000	88.5	0	36.5	33.0	30.6	26.7	23.1	18.4	14.7	12.1
2001	96.7	5	**99.4**	**54.7**	33.6	27.3	24.4	20.2	16.2	12.6
2002	97.0	**12**	**120.2**	**73.6**	**64.4**	40.1	34.5	25.4	18.4	13.6
2003	97.0	5	**274.7**	**52.1**	40.1	33.9	28.8	21.4	16.6	12.1
2004	93.4	2	**60.3**	44.3	40.6	34.4	30.4	24.7	19.1	13.2
2005	91.8	2	**53.9**	44.3	42.5	35.6	30.3	23.8	18.2	13.8

Table 93: Statistical summary for PM_{10} - 24-hour average concentrations

Station: Lidcombe[(1)] / Chullora[(2)]

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ug/m3)	Percentiles (µg/m^3)						
				99th	98th	95th	90th	75th	50th	25th
1996 [(1)]	87.4	0	46.2	35.1	31.4	28.7	26.0	20.0	14.9	11.5
1997 [(1)]	81.1	0	49.8	39.8	36.8	31.8	27.5	21.2	15.9	11.9
1998 [(1)]	100.0	0	38.7	32.5	30.8	28.1	23.2	17.8	13.1	10.0
1999 [(1)]	87.7	0	37.0	31.4	29.6	26.0	23.7	20.0	15.6	11.6
2000 [(1)]	94.3	1	**52.5**	38.5	34.1	29.5	25.4	20.2	16.2	12.4
2001 [(1)]	86.0	1	**65.3**	39.5	34.5	30.1	27.8	23.1	17.9	14.0
2002 [(1)]	30.7	3	**86.4**	**62.3**	47.2	35.5	29.7	20.8	16.0	13.9
2003 [(2)]	85.2	**10**	**212.8**	**59.6**	**55.3**	45.1	35.7	28.5	21.0	16.3
2004 [(2)]	90.4	2	**57.5**	48.4	45.6	38.5	33.7	27.4	21.1	16.2
2005 [(2)]	89.0	0	49.7	46.1	42.0	38.0	33.4	27.0	20.3	16.3

AAQ NEPM Standard – 50 µg/m^3 (24-hour average)

Bold font indicates values that exceed the AAQ NEPM standard

Table 94: Statistical summary for PM_{10} - 24-hour average concentrations

Station: Liverpool

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ug/m3)	Percentiles (µg/m^3)						
				99th	98th	95th	90th	75th	50th	25th
1996	61.2	0	37.3	34.0	32.9	30.0	26.7	20.7	15.7	11.2
1997	92.6	1	**58.7**	41.4	38.3	35.1	29.8	22.9	16.9	12.3
1998	98.6	0	45.7	40.3	39.2	33.2	29.4	22.5	16.7	11.3
1999	97.3	0	46.0	34.8	32.1	27.9	24.3	20.4	15.9	11.4
2000	94.3	2	**64.1**	41.8	36.9	31.1	26.2	20.6	16.4	12.6
2001	95.3	2	**61.4**	37.0	34.9	30.2	28.1	22.6	18.3	13.3
2002	91.0	**13**	**127.6**	**76.0**	**68.5**	46.1	37.3	27.2	20.2	15.1
2003	90.1	**6**	**282.6**	**57.5**	43.9	37.0	32.5	25.5	19.6	14.8
2004	91.8	1	**60.5**	46.1	44.1	36.2	32.3	27.1	20.6	14.8
2005	96.4	2	**55.1**	45.9	43.7	36.2	32.4	26.3	20.0	15.1

Table 95: Statistical summary for PM_{10} - 24-hour average concentrations

Station: Macarthur

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ug/m3)	Percentiles (µg/m^3)						
				99th	98th	95th	90th	75th	50th	25th
2004	14.8	1	**59.1**	46.8	44.1	39.8	36.9	30.6	21.6	15.7
2005	83.8	1	**54.9**	45.3	42.4	36.0	30.5	24.6	18.2	13.6

Table 96: Statistical summary for PM_{10} - 24-hour average concentrations

Station: Oakdale

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ug/m3)	Percentiles (µg/m^3)						
				99th	98th	95th	90th	75th	50th	25th
2004	56.6	0	41.3	30.0	26.4	23.8	19.2	15.7	10.4	6.6
2005	92.9	0	42.6	36.9	32.1	27.3	22.2	16.8	12.3	8.4

Table 97: Statistical summary for PM_{10} - 24-hour average concentrations

Station: Richmond

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ug/m3)	Percentiles (µg/m^3)						
				99th	98th	95th	90th	75th	50th	25th
1996	95.9	1	**85.8**	32.3	31.3	26.3	22.9	18.2	13.4	9.8
1997	94.8	4	**71.5**	49.5	42.8	35.2	28.6	21.4	16.3	11.2
1998	74.8	1	**55.6**	40.0	35.2	31.4	26.4	18.5	13.6	9.4
1999	92.1	0	44.4	27.5	25.0	22.4	19.4	17.0	13.2	9.8
2000	95.4	0	43.2	33.1	30.8	25.1	22.9	17.7	13.9	10.9
2001	87.4	4	**119.9**	**58.1**	32.6	27.9	25.3	20.1	16.0	11.8
2002	94.2	**17**	**126.4**	**102.8**	**84.2**	49.1	34.9	24.5	17.1	12.2
2003	96.7	**7**	**194.3**	**66.3**	46.4	34.8	28.6	21.1	15.7	11.3
2004	96.2	0	46.2	39.9	37.6	33.5	29.7	22.6	17.5	12.2
2005	97.0	0	49.1	41.7	35.0	30.1	25.7	20.2	15.4	11.4

AAQ NEPM Standard – 50 µg/m^3 (24-hour average)

Bold font indicates values that exceed the AAQ NEPM standard

Table 98: Statistical summary for PM_{10} - 24-hour average concentrations

Station: Rozelle

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ug/m3)	Percentiles (µg/m^3)						
				99th	98th	95th	90th	75th	50th	25th
2003	10.7	0	36.8	36.6	36.4	33.7	30.7	21.1	18.9	16.0
2004	92.6	1	**51.4**	42.1	39.4	33.1	30.2	24.9	19.3	13.9
2005	95.6	0	47.1	40.4	38.9	34.8	31.0	24.2	18.9	14.8

Table 99: Statistical summary for PM_{10} - 24-hour average concentrations

Station: Albion Park

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ug/m3)	Percentiles (µg/m^3)						
				99th	98th	95th	90th	75th	50th	25th
1997	43.8	2	**61.6**	48.5	45.6	39.3	32.6	24.6	15.1	9.8
1998	93.2	5	**63.6**	**56.6**	41.9	33.6	28.9	19.3	12.6	8.0
1999	98.9	0	48.7	36.8	32.6	25.4	22.1	16.3	11.0	7.8
2000	96.4	2	**62.5**	41.3	35.8	29.4	25.1	18.2	12.9	9.6
2001	97.3	1	**58.7**	41.9	38.0	34.5	28.5	20.6	14.9	9.9
2002	59.5	**6**	**88.3**	**65.1**	**53.1**	40.2	34.6	26.1	16.4	10.9
2003	96.2	4	**281.0**	**50.2**	38.8	29.9	25.7	19.0	13.7	9.9
2004	95.9	1	**51.5**	42.6	39.6	33.3	29.4	22.2	15.4	10.5
2005	3.0	0	41.8	39.8	39.3	37.9	36.9	29.7	22.1	15.6

Table 100: Statistical summary for PM_{10} - 24-hour average concentrations

Station: Kembla Grange

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ug/m3)	Percentiles (µg/m^3)						
				99th	98th	95th	90th	75th	50th	25th
2004	57.4	1	**57.6**	44.2	42.4	36.1	30.1	21.2	14.8	10.4
2005	97.8	4	**59.0**	49.4	45.7	38.6	33.1	23.2	17.2	12.2

AAQ NEPM Standard – 50 µg/m^3 (24-hour average)

Bold font indicates values that exceed the AAQ NEPM standard

Table 101: Statistical summary for PM_{10} - 24-hour average concentrations

Station: Wollongong

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ug/m3)	Percentiles (µg/m^3)						
				99th	98th	95th	90th	75th	50th	25th
1996	91.3	3	**69.6**	39.7	36.9	32.5	28.7	22.0	16.8	12.8
1997	95.3	2	**64.8**	46.7	42.7	38.4	33.0	24.4	18.1	12.9
1998	96.4	1	**56.9**	45.4	42.1	34.9	28.7	22.1	16.8	12.7
1999	96.4	0	40.2	35.4	32.5	28.4	25.4	20.2	15.8	12.4
2000	93.4	3	**58.1**	46.1	42.3	34.2	26.9	20.7	15.5	11.6
2001	97.5	4	**68.2**	48.0	42.6	36.7	31.2	22.6	16.5	12.1
2002	94.5	**9**	**76.7**	**61.9**	**53.1**	43.8	34.1	25.6	18.5	13.7
2003	97.8	**7**	**280.5**	**60.4**	46.7	34.3	28.6	21.5	16.7	12.4
2004	97.3	0	48.1	45.4	39.9	36.3	30.4	23.4	17.3	12.2
2005	97.3	1	**54.8**	44.0	41.3	35.4	30.0	23.5	16.7	12.7

Table 102: Statistical summary for PM_{10} - 24-hour average concentrations

Station: Beresfield

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ug/m3)	Percentiles (µg/m^3)						
				99th	98th	95th	90th	75th	50th	25th
1996	91.8	**6**	**100.6**	**54.2**	46.7	39.5	35.5	26.6	18.8	13.4
1997	97.8	**6**	**71.8**	**51.1**	48.0	40.8	33.8	24.4	17.3	11.2
1998	99.7	0	46.1	37.5	36.1	33.1	28.8	23.3	17.1	11.9
1999	98.4	0	48.0	37.8	33.8	28.7	26.3	21.0	16.0	11.5
2000	90.4	1	**53.6**	43.1	38.3	33.8	27.1	20.5	16.2	12.8
2001	90.1	3	**81.0**	47.5	45.6	37.4	31.8	25.8	20.0	15.0
2002	82.5	**25**	**166.4**	**84.6**	**70.8**	**56.8**	46.3	33.1	21.2	15.9
2003	91.2	5	**88.0**	**53.5**	44.0	34.3	29.1	22.3	17.4	13.2
2004	87.2	1	**55.7**	47.5	43.1	38.3	33.2	24.7	19.3	13.9
2005	95.9	1	**53.2**	44.4	39.5	35.9	31.7	24.9	18.4	14.6

Table 103: Statistical summary for PM_{10} - 24-hour average concentrations

Station: Newcastle

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ug/m3)	Percentiles (µg/m^3)						
				99th	98th	95th	90th	75th	50th	25th
2004	19.4	0	46.9	46.0	44.6	37.3	33.3	26.6	21.9	17.1
2005	81.6	0	49.9	40.9	38.9	35.1	31.7	26.2	21.1	16.6

AAQ NEPM Standard – 50 µg/m^3 (24-hour average)

Bold font indicates values that exceed the AAQ NEPM standard

Table 104: Statistical summary for PM_{10} - 24-hour average concentrations

Station: Albury

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ug/m3)	Percentiles (µg/m^3)						
				99th	98th	95th	90th	75th	50th	25th
2001	31.8	0	28.8	26.1	25.3	21.8	20.2	16.8	12.2	9.4
2002	86.6	5	**81.3**	**56.8**	44.4	38.0	31.2	22.9	16.1	12.9
2003	80.8	**28**	**921.4**	**215.0**	**190.8**	**91.3**	48.4	22.7	13.9	9.7
2004	76.8	2	**55.6**	41.9	41.1	36.9	32.5	18.5	13.1	9.9
2005	90.4	3	**55.1**	46.6	39.6	35.9	30.9	20.1	14.4	10.8

Table 105: Statistical summary for PM_{10} - 24-hour average concentrations

Station: Bathurst

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ug/m3)	Percentiles (µg/m^3)						
				99th	98th	95th	90th	75th	50th	25th
2000	32.5	0	35.2	33.6	32.4	27.6	22.4	17.7	12.2	8.9
2001	30.1	0	35.6	35.3	35.0	31.3	27.5	22.7	16.5	12.3
2002	91.8	**15**	**258.2**	**83.6**	**68.8**	45.7	35.2	25.0	16.6	12.5
2003	90.4	**12**	**621.7**	**103.4**	**75.0**	34.4	26.8	17.0	12.8	8.8
2004	88.5	4	**72.9**	49.9	46.1	37.9	33.3	24.2	15.3	9.7
2005	93.2	0	44.9	38.3	36.6	30.5	25.2	18.3	12.8	8.8

Table 106: Statistical summary for PM_{10} - 24-hour average concentrations

Station: Tamworth

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ug/m3)	Percentiles (µg/m^3)						
				99th	98th	95th	90th	75th	50th	25th
2000	21.0	0	21.1	20.6	20.4	19.0	18.1	15.0	11.5	8.5
2001	97.3	0	34.6	25.7	24.1	22.6	20.0	16.5	13.0	9.9
2002	99.2	**9**	**189.8**	**66.2**	**51.2**	40.9	33.6	23.4	17.4	13.1
2003	92.9	**7**	**243.3**	**54.5**	48.0	34.3	25.8	19.7	15.0	11.4
2004	79.5	2	**55.7**	42.3	40.1	34.6	31.0	24.6	19.5	15.3
2005	68.2	2	**88.8**	34.7	33.1	30.1	26.6	20.3	14.7	10.6

Table 107: Statistical summary for PM_{10} - 24-hour average concentrations

Station: Wagga Wagga

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ug/m3)	Percentiles (µg/m^3)						
				99th	98th	95th	90th	75th	50th	25th
2001	31.2	2	**69.8**	45.4	37.5	31.9	28.7	22.5	16.7	12.4
2002	99.2	**35**	**178.2**	**121.6**	**94.9**	**60.6**	49.3	33.3	24.6	16.9
2003	87.4	**22**	**837.0**	**129.7**	**91.4**	**55.5**	43.0	29.1	19.0	12.5
2004	91.0	**28**	**105.9**	**69.7**	**68.4**	**60.0**	47.5	32.8	21.3	13.9
2005	90.7	**28**	**163.1**	**77.8**	**67.8**	**57.0**	46.3	30.5	19.8	14.2

AAQ NEPM Standard – 50 µg/m^3 (24-hour average)

Bold font indicates values that exceed the AAQ NEPM standard

Assessment of progress towards achieving the goal

The air quality management programs and strategies put in place by the NSW Government are directed at protecting ambient air quality. The Ambient Air Quality NEPM goal provides additional impetus for the implementation of these strategies and a useful benchmark against which programs to manage the air environment can be assessed.

Framework for Air Quality Management in the Sydney Greater Metropolitan Region

Action for Air, the NSW Government's Air Quality Management Plan for Sydney, the Lower Hunter and the Illawarra, sets out a program of measures which target the pollutants of most concern in the region - ground level ozone in summer and particles. The Plan covers strategies designed to reduce emissions from industry, motor vehicles and domestic/commercial sources.

The following outlines the key mechanisms for managing ozone and particles.

Motor Vehicle and Motor Vehicle Fuels

Motor vehicle emissions are the major source of ozone precursors in the Sydney region, making up 71% of Oxides of Nitrogen (NOx) emissions and 38% of Volatile Organic Compound (VOC) emissions in 2005. In the Greater Metropolitan Region (GMR), motor vehicles are the source of 30% of NOx and 38% of VOC emissions, with industry making a more significant contribution to NOx emissions in the GMR.

a) Low Volatility Petrol

While the Commonwealth Government has introduced the Fuel Quality Standards Act 2000, which provides for national fuel standards to be established as determinations under the Act, the management of petrol volatility has been left to the States because of the need to take account of regional climatic and seasonal factors when setting volatility limits. NSW amended the Protection of the Environment Operations Clean Air (Motor Vehicle and Motor Vehicle Fuels) Regulation 2002 to limit petrol volatility from the start of the 2004/05 summer. The regulation is estimated to reduce motor vehicle VOC emissions in the GMR by around 17% over the summer period. This equates to a reduction in VOC emissions of over 2500 tonnes each summer.

b) NSW Cleaner Vehicles Action Plan

The traditionally slow turnover of the Australian vehicle fleet has been a limiting factor to the realisation of the air quality benefits from cleaner vehicle technology. To address this, the NSW Government has taken steps to improve the environmental performance of the NSW fleet by introducing the Cleaner Vehicles Action Plan. The Plan is designed to hasten the uptake of vehicles complying with the most advanced emission standards. It includes Clean Car Benchmarks which rate the environmental performance of new motor vehicles, a Clean Fleet Program for private fleets and a web based consumer guide on the environmental performance of passenger vehicles. The Government has also banned the purchase of V8 vehicles on Government contracts and set targets for the environmental performance of its fleet of 25,000 vehicles.

c) Diesel Retrofit Program

NSW is undertaking a Diesel Retrofit Demonstration Project to improve the emissions performance of in-service diesel vehicles by fitting emission reduction devices to their exhausts to reduce particle emissions. The trial is designed to assess the feasibility, costs and benefits of implementing a broader diesel retrofit program.

d) Emissions Standards for Light and Heavy Duty Vehicles

In 1999, the Commonwealth Government announced a timetable for the introduction of progressively more stringent emission standards for light and heavy-duty vehicles as Australian Design Rules under the Motor Vehicles Standards Act 1989.

To recognise better environmental performance and new leading edge technologies used in trucks and buses, NSW is considering options for the development of an environmental rating system for heavy vehicles similar to the scheme for light vehicles.

e) National Fuel Standards

The effective operation of the more advanced emission control technology required to meet the more stringent emissions standards depends upon the availability of fuel of an appropriate quality. The Commonwealth Government has enacted the Fuel Quality Standards Act 2000 and under this legislation has established environmental standards for petrol and diesel covering a comprehensive range of parameters which effect vehicle emissions performance.

In combination, it is expected that the new vehicle emissions and fuel standards will achieve significant emission reductions. For example in Sydney from 2002 to 2020 emissions of VOCs from the motor vehicles fleet are forecast to fall by 46%, NOx by 67%, CO by 75% and PM_{10} by 40%.

f) Smoky vehicle program

The DEC operates the Smoky Vehicle Program that identifies vehicles that emit visible smoke continuously for more than 10 seconds. In the 2004/05 year 1,175 penalty infringement notices and 2,017 warning letters were issued. The community can also report smoky vehicles, including on the DEC's website. The DEC receives around 360 reports each month from the public.

g) RTA-Clean Fleet Program

The NSW RTA has worked in conjunction with public and private bus and truck fleets to develop maintenance guidelines to reduce excessive emissions from diesel vehicles. The guidelines will form part of a Clean Fleet program for private fleet operators that focuses on maintenance practices for heavy-duty fleets and vehicle purchasing policies for light-duty fleets. These guidelines have been tested with a number of NSW fleets. To support this program, the RTA has developed a diesel emissions training course available through TAFE for diesel mechanics and fleet/workshop managers.

h) Greener bus and taxi fleets

Alternative fuels can help cut pollution and State Transit now owns and operates over 400 compressed natural gas buses. CNG buses currently emit significantly lower levels of particles than their diesel counterparts. However, relative to diesel vehicles meeting Euro 4 emission standards (which will apply to all new diesel vehicles from 2006/07), the emission difference between CNG buses and diesel buses will be reduced. The Government has a 7-year procurement plan to replace older diesel buses with over 500 new buses that comply with the more stringent Euro 4 emission standards. The average age of buses will be reduced to 12 years.

The NSW Government is working with the NSW Taxi Council on a trial of an environmentally friendly taxi for Sydney's metropolitan area. The trial will consider the environmental and economic effects of using a hybrid vehicle compared with LPG and unleaded petrol.

Licensed Industry

Industrial emissions are a relatively small proportion of total emissions of NOx and VOCs in the Sydney region, at 15% and 11% respectively. The situation changes somewhat when considering the Greater Metropolitan Region (GMR), with industry responsible for 60% of NOx and 10% VOC emissions. Industry emissions make up a greater proportion of particle emissions, namely 37% for the Sydney region and 60% for the GMR.

Controls on emissions to air from industrial sources are in place under NSW EPA licensing arrangements for scheduled facilities under the Protection of the Environment Operations Act. The Protection of the Environment (Clean Air) Regulation provides the regulatory framework for this licensing and it specifies never-to-be exceeded concentration limits for air pollutants. In 2005 DEC finalised significant amendments to the Regulation which introduce a framework to review the adequacy of older emissions standards that apply to existing industry. They also introduce new emission standards for future industry and for equipment that undergoes major modification or is replaced within the Sydney GMR. The amendments took effect from 1 September 2005. In 1999 load based licensing was introduced, which retains licence specific limits but links licence fees to the

amount of pollution discharged thus providing a financial incentive for licensees to achieve discharges below the required minimum performance. In the GMR, the load fee for emissions of NOx and VOCs is higher because of the sensitivity of this region and to provide greater incentive to reduce pollution.

Small industrial, commercial and domestic sources

Trends in population growth and economic development are expected to increase the significance of small commercial and domestic sources of emissions as a proportion of total emissions, particularly VOCs. These industries are generally service oriented and include the following: surface coating, mobile asphalt plants, service stations, printers and dry cleaners.

The domestic sector is also a contributor to VOC emissions. Household sources include petrol lawnmowers, garden tools, solvents and paints and solid wood heaters.

In combination these “area sources” are responsible for 37% of VOC emissions in the GMR. They are also a significant source (34%) of particle emissions in the Sydney region (2005).

Under the Protection of the Environment Operations Act 1997 local councils have the principal responsibility for managing emissions from commercial and domestic premises. The NSW Government is developing capacity building programs for local government, such as the Air Quality Toolkit completed in 2006.

Emissions from domestic solid fuel heaters are being addressed through national initiatives to improve solid fuel heater design standards. NSW has introduced a new offence under the Protection of the Environment Operations Act relating to excessive smoke emissions from residential chimneys. Local councils have powers to manage the installation of domestic solid fuel heaters.

a) Clean Air Fund

The Clean Air Fund was established with funding of over $5 million from the NSW Environmental Trust. It has been instrumental in developing innovative programs to reduce emissions from light industrial, commercial and domestic activities. These include local air improvement programs involving local councils, reducing emissions from petrol vapour, small engines such as outboard motors and comprehensive work on an air emissions inventory that will allow targets to be developed for reducing emissions.

Conclusions

The data presented in this report demonstrate that NSW achieved compliance with the Ambient Air Quality NEPM goals for carbon monoxide, nitrogen dioxide, sulfur dioxide and lead. Levels of these pollutants continue to be well below Ambient Air Quality NEPM standards.

Compliance with Ambient Air Quality NEPM goals for photochemical smog and fine particles was not demonstrated. The continued severe drought conditions experienced throughout NSW during 2005 have contributed to elevated ozone and particle pollution events. However, for ozone in particular, anthropogenic emissions are sufficient to generate exceedences of the Ambient Air Quality NEPM standards and meeting the Ambient Air Quality NEPM goal for photochemical oxidants will be a challenge for NSW.

The NSW governments long term air quality management plan, Action for Air, outlines a broad range of strategies to manage air quality in NSW. A review of Action for Air that is currently underway will examine ways in which the current air quality management framework can be improved to more effectively address the problem areas of ozone and particles.

References

EPA 2003, NSW State of the Environment 2003, NSW Environment Protection Authority, Sydney.

Appendix A: Ambient Air Quality NEPM Monitoring in NSW

NSW Air Quality Monitoring Plan (AQMP)

Under the Ambient Air Quality NEPM, jurisdictions were required to prepare a Monitoring Plan to meet the monitoring requirements detailed in the Ambient Air Quality NEPM. The approved NSW Ambient Air Quality NEPM monitoring plan outlines the monitoring network for each of the required pollutants and is available on the Department of Environment and Conservation website www.dec.nsw.gov.au/air/nepm/index.htm

The NSW Ambient Air Quality NEPM Monitoring Plan was approved as consistent with the Ambient Air Quality NEPM by NEPC on 29 June 2001.

Since the submission of the AQMP to NEPC operational constraints have necessitated the closure of a number of air quality monitoring stations that were designated for NEPM reporting. A review of the AQMP is currently occurring.

The Sydney region

The population of the Sydney region requires at least seven monitoring stations according to the formula in clause 14(1) of the Ambient Air Quality NEPM. Monitoring stations have been selected for the region to ensure that there is adequate coverage of the population, and that the network will capture the higher concentrations.

In the Sydney region there are currently six trend stations, two performance stations, and one campaign station. Each sub-region contains two trend stations that characterise general air quality and also frequently record individual pollutant events. This approach ensures that there is adequate coverage of the populated areas and of the broad differences in pollutant distribution within the region. The choice of stations in each region was made to optimise both population coverage and representation of the occurrences of higher pollutant concentration.

Trend stations are located in the northwest at Blacktown and Richmond, in the southwest at Bringelly and Macarthur, and in the east at Chullora and Rozelle. These stations provide a good geographic spread throughout the region and capture a range of the high concentration events. However to supplement the trend monitoring network additional stations are needed to capture particular events. High concentrations of ozone are frequently recorded at Oakdale. This station is on the edge of the Sydney basin in a sparsely populated area, however ozone concentrations in this region are an important measure of progress to achieving the goal of the Ambient Air Quality NEPM.

Campaign monitoring will be undertaken in the Central Coast, in the northern part of the Sydney region. The outcome of this monitoring will determine whether there is a need to establish a trend station in this area. Installation of this monitoring station has been delayed and is not expected until late 2006 at the earliest.

The trend station at Lidcombe was closed due to construction activity in May 2002. A new station was established nearby at Chullora in December 2002. Trend data are reported for both stations. The trend station at Woolooware and the performance station in the CBD were closed in August 2004.

The monitoring network for the Sydney region is shown in Figure A1 and summarised in Table A1, which lists all stations noting the parameters measured at each.

Table A1: Sydney region Ambient Air Quality NEPM monitoring network

Station	Station type (1)	Number of parameters	Ozone	Nitrogen dioxide	PM_{10}	Carbon monoxide	Sulfur dioxide	Lead(5)
Blacktown	T	5	X	X	X	X	X	
Bringelly	T	4	X	X	X		X	
Central Coast (2)	C	4	X	X	X		X	
Chullora (3)	T	5	X	X	X	X	X	
Liverpool (4)	C	5	X	X	X	X		
Macarthur	T	5	X	X	X	X	X	
Oakdale	P	2	X		X			
Richmond	T	4	X	X	X		X	
Rozelle	T	4	X	X	X	X		
St Marys	P	1	X					

(1) P denotes performance; T denotes trend; C denotes campaign.

(2) Scheduled to begin operation in 2006.

(3) Replaced the Lidcombe trend station.

(4) Data from the Liverpool station will be reported at least until the Macarthur station is fully established.

(5) Lead monitoring ceased at the end of 2004.

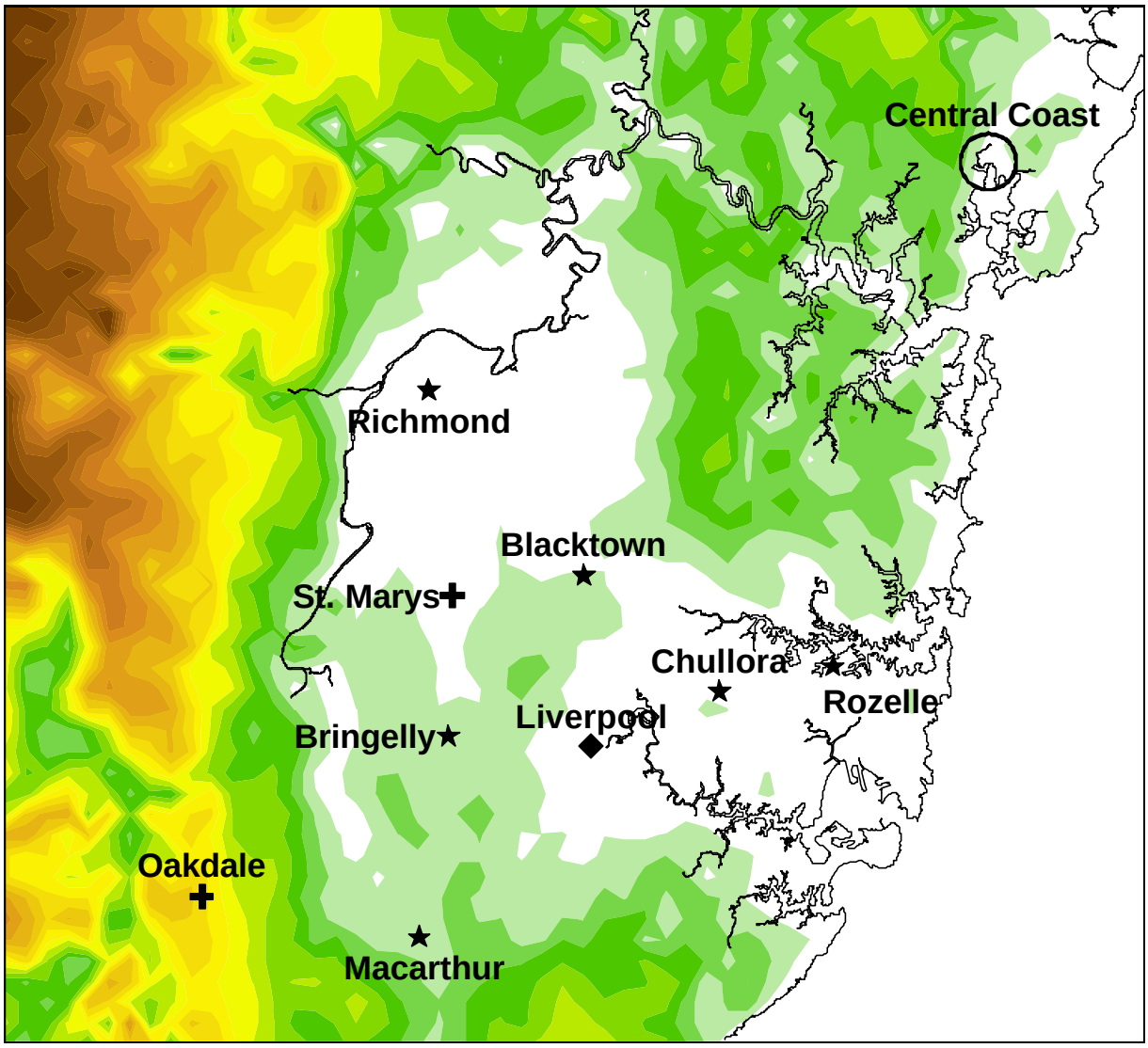


Figure A1: Ambient Air Quality NEPM Monitoring in the Sydney region (AMG co-ordinates)

★ trend station; + performance station; ◆ campaign station; ○ proposed station;

The Lower Hunter region

The population criterion of section 14(2) of the Ambient Air Quality NEPM requires at least two monitoring sites in the Lower Hunter region. The region contains two major population centres, Newcastle and Maitland. Current monitoring has focussed on Newcastle and its environs. The installation of the planned trend station in the Maitland area has been delayed. Until this site is established, data from the existing stations at Wallsend and Beresfield will be reported. Together these stations characterise the general air quality to which the urban population of the Lower Hunter is exposed.

The monitoring network for the Lower Hunter is shown in Figure A2 and summarised in Table A2, which notes the parameters to be reported from each station.

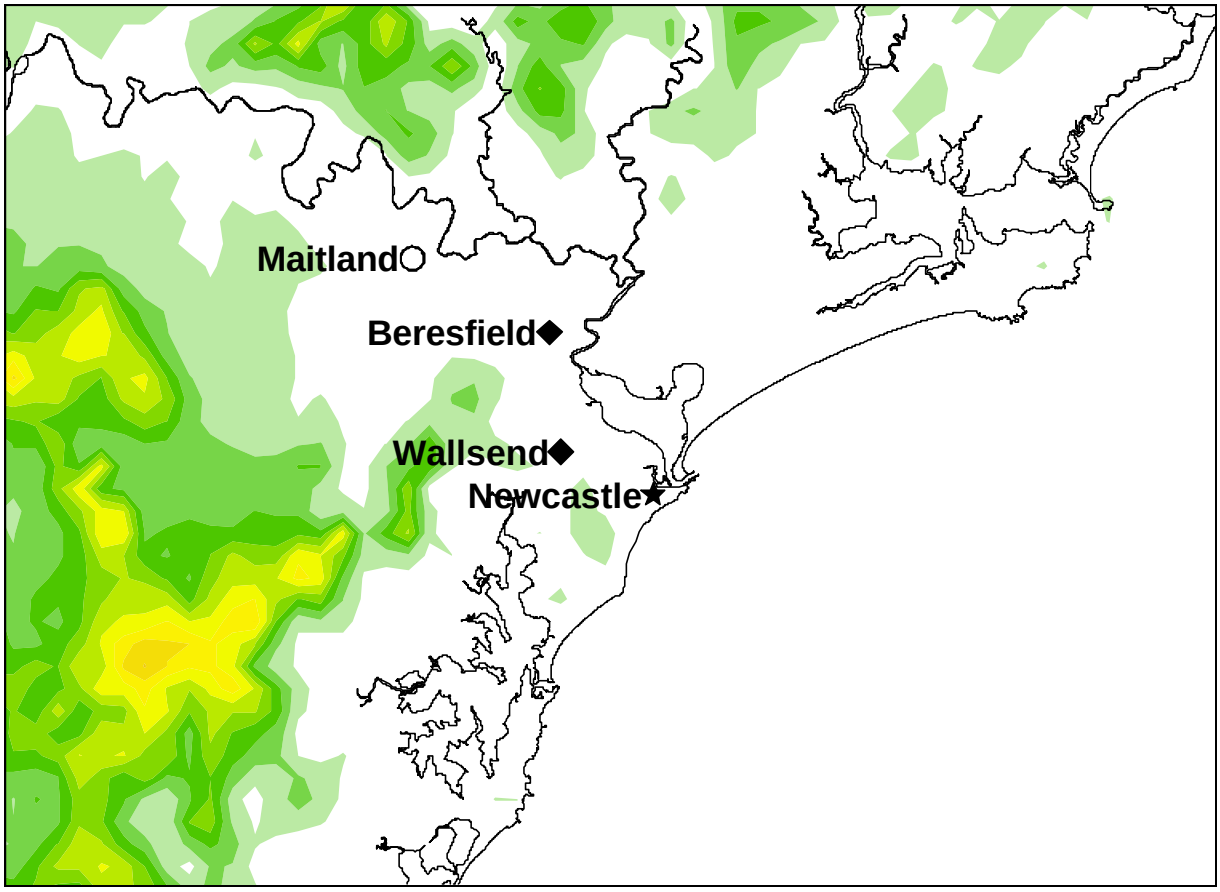


Figure A2: Ambient Air Quality NEPM Monitoring in the Lower Hunter region

★ trend station; ◆ campaign station; ○ proposed station;

Table A2: Lower Hunter region Ambient Air Quality NEPM monitoring network

Station	Station Type (1)	Number of parameters	Ozone	Nitrogen dioxide	PM_{10}	Carbon monoxide	Sulfur dioxide	Lead(4)
Newcastle	T	5	X	X	X	X	X	
Maitland (2)	T	4	X	X	X		X	
Beresfield (3)	C	1			X			
Wallsend (3)	C	3	X	X			X	

(1) P denotes performance; T denotes trend, C denotes campaign.

(2) Scheduled to begin operation in 2004, but delayed.

(3) Data from Beresfield and Wallsend will be reported at least until the Maitland station is established.

(4) Lead monitoring ceased at the end of 2004.

The Illawarra region

In the Illawarra, the presence of industrial sources in the region, the occurrence of emissions transport from Sydney, and the complexity of the region together result in a need for a greater monitoring effort than that indicated purely on the basis of population. Accordingly, the general air quality to which the urban population is exposed will be characterised by monitoring all pollutants of interest at the trend station at Wollongong and the performance station at Albion Park. Two additional stations represent the local conditions at Kembla Grange and Warrawong.

Ambient Air Quality NEPM screening guidelines allow for carbon monoxide to be monitored at fewer stations. Carbon monoxide is monitored only at the Wollongong trend station.

The monitoring network for the Illawarra Region is shown in Figure A3 and summarised in Table A3, which notes the parameters to be reported from each station.

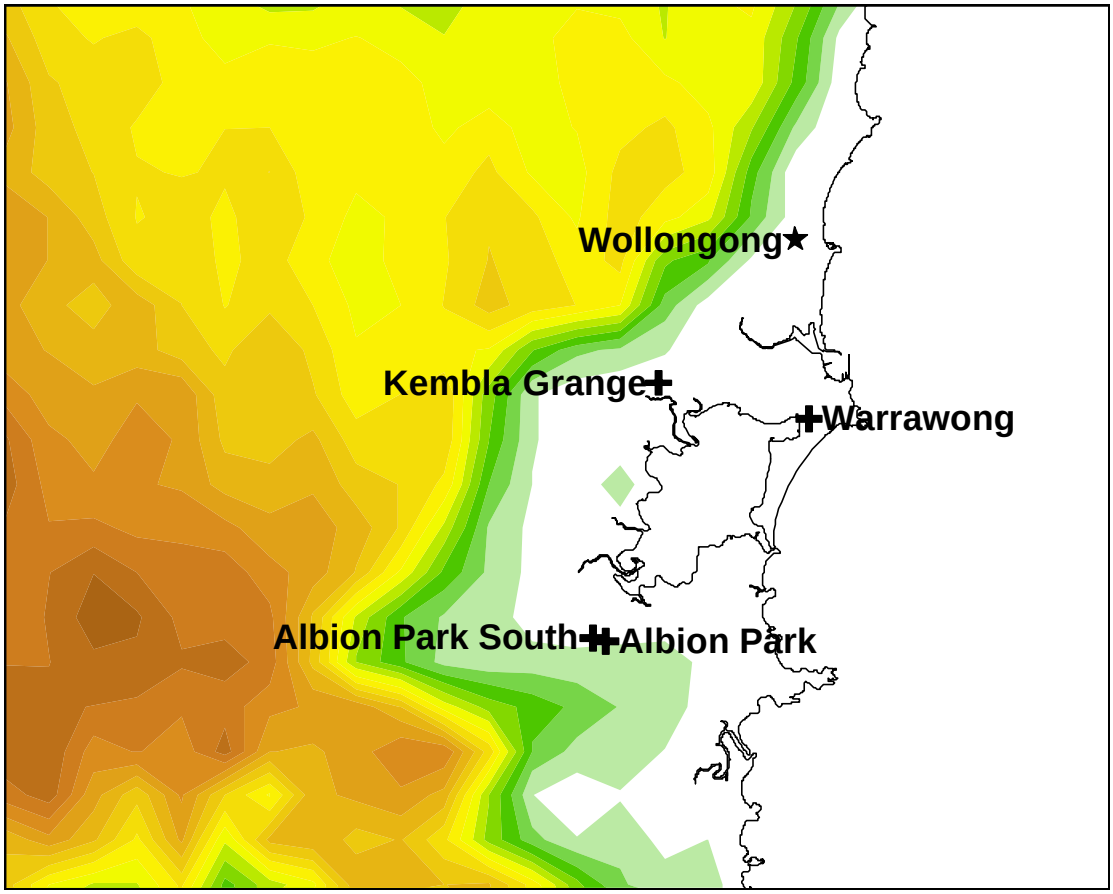


Figure A3: Ambient Air Quality NEPM Monitoring in the Illawarra region

★ trend station; + performance station;

Table A3: Illawarra region Ambient Air Quality NEPM monitoring network

Station	Station type (1)	Number of parameters	Ozone	Nitrogen dioxide	PM_{10}	Carbon monoxide	Sulfur dioxide	Lead(2)
Albion Park	P	4	X	X	X		X	
Kembla Grange	P	2	X		X			
Warrawong	P	1					X	
Wollongong	T	5	X	X	X	X	X	

(1) P denotes performance; T denotes trend; C denotes campaign.

(2) Lead monitoring ceased at the end of 2004.

Other regions

The NSW Ambient Air Quality NEPM Monitoring Plan provides for monitoring at several regional centres of NSW. Ambient Air Quality NEPM screening guidelines allow for carbon monoxide, nitrogen dioxide, ozone, sulfur dioxide and lead not to be monitored at these rural population centres.

Several regional centres are located on the tablelands where smoke from wood fires may be of concern during winter. As there is the potential for exceedences of the Ambient Air Quality NEPM goal for particles, the Department of Environment and Conservation (DEC) has begun campaign monitoring at Albury, Bathurst, Tamworth and Wagga Wagga. On completion of these campaigns the data will be evaluated against the screening procedures. A decision will be made whether it is necessary to establish further campaign stations at Dubbo, Lismore, and Orange as originally proposed.

Table A4: Rural NSW Ambient Air Quality NEPM monitoring network

Station	Station type (1)	Number of parameters	Ozone	Nitrogen dioxide	PM_{10}	Carbon monoxide	Sulfur dioxide	Lead
Albury	C	1			X			
Bathurst	C	2	X		X			
Dubbo (2)	C	1			X			
Lismore (2)	C	1			X			
Orange (2)	C	1			X			
Tamworth	C	1			X			
Wagga Wagga	C	1			X			

(1) C denotes campaign.

(2) Monitoring subject to results from initial campaign monitoring.

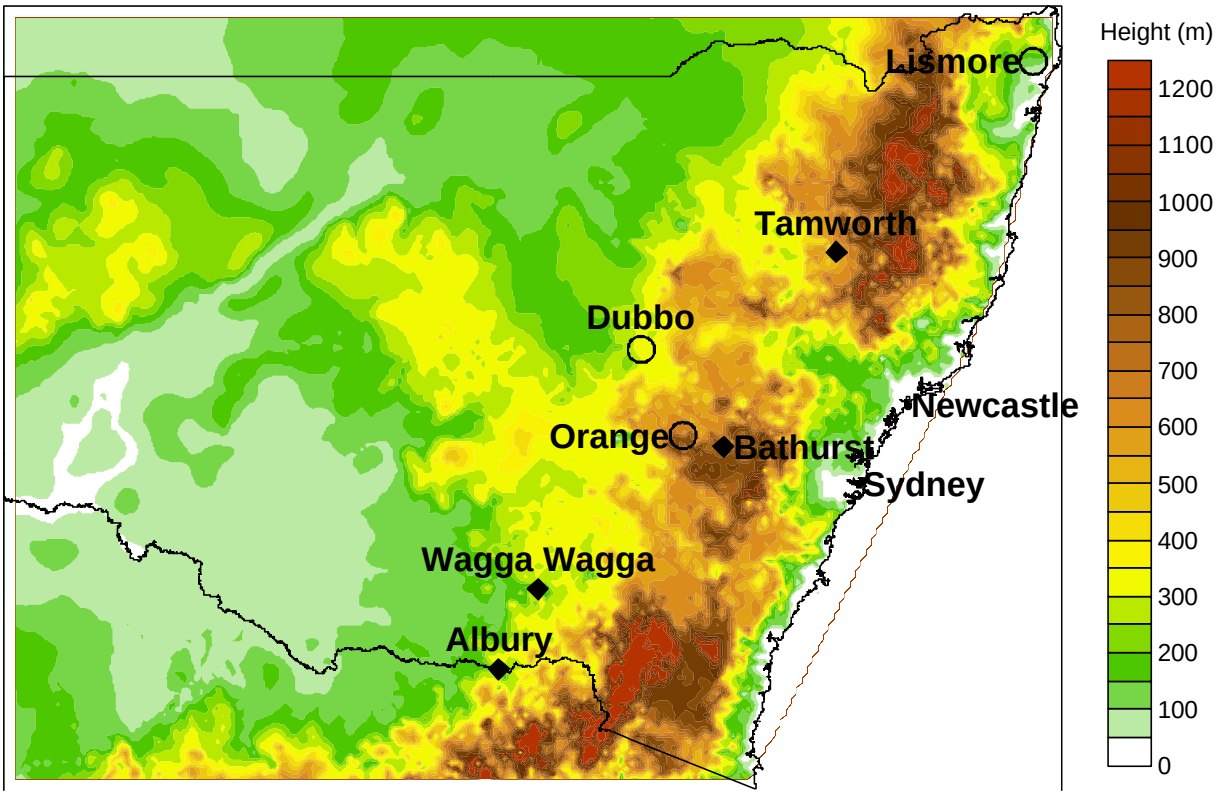


Figure A4: Ambient Air Quality NEPM Monitoring in rural New South Wales

◆ campaign station; ○ proposed station;

Station siting and exposure

All stations within the network meet all of the Ambient Air Quality NEPM siting and exposure criteria with the exceptions of Liverpool, Rozelle, Tamworth, and Wagga Wagga.

Table A5: Stations not complying with all siting and exposure criteria

Station	Siting criteria not met	Comments
Liverpool	Clear sky angle <120°.	Trees have grown since establishment of station.
Rozelle	Clear sky angle <120°. Less than 20m from trees.	Trees have grown since establishment of station.
Tamworth	Less than 20m from trees.	Best location in urban area specifically targeted for monitoring.
Wagga Wagga	Less than 20m from trees.	Street trees within about 15 m of station

Population exposure

Under the NSW Ambient Air Quality NEPM Monitoring Plan, monitoring stations have been distributed to provide a reasonable coverage of the population while capturing the spatial variability of pollution events. The monitoring network covers a population of about 4 million in the greater metropolitan area of the Sydney, lower Hunter and Illawarra regions. The current monitoring in regional NSW covers an additional population of about 140 000. Information about the characteristics of individual monitoring stations and exposed population is given in the NSW Monitoring Plan, available on the DEC website http://www.dec.nsw.gov.au/air/nepm/index.htm

Table A6: Population exposure

Station	Exposed population
Sydney Region	
Blacktown	Trend station in a largely residential area in the northwest sub-region.
Bringelly	Trend station in a rural area in the southwest of the Sydney basin.
Chullora	Trend station in a mixed residential and commercial area. Replaced the Lidcombe trend station, which had operated since 1970.
Macarthur	Trend station representing residential areas in the southwest of the Sydney basin.
Oakdale	Rural area on the SW edge of the Sydney basin - upper bound station for ozone.
Richmond	Trend station representing the residential area in the north of the Hawkesbury basin.
Rozelle	Trend station within the Parramatta River valley. Existing long-term station.
St Marys	Upper bound station for ozone in a residential area.
Central Coast (1)	Trend station representing residential areas of the Central Coast.
Lower Hunter	
Beresfield	Performance station in a semi-rural area used as a proxy for the Maitland station.
Maitland (2)	Trend station representing residential area.
Newcastle	Trend station within the main population centre.
Wallsend	Performance station in a residential area used as a proxy for the yet-to-be-established Maitland station.
Illawarra	
Albion Park	Performance station in a semi-rural area in the south of the region.
Kembla Grange	Upper bound station in a residential area to the west of Lake Illawarra.
Warrawong	Upper bound station in an industrial-residential area.
Wollongong	Trend station in the main population/commercial centre.
Rural Population centres	
Tamworth	Rural township campaign station established 2000.
Bathurst	Rural township campaign station established 2000.
Wagga Wagga	Rural township campaign station established 2001.
Albury	Rural township campaign station established 2000.
Dubbo (3)	Rural township campaign station.
Orange (3)	Rural township campaign station.
Lismore (3)	Rural township campaign station.

(1) Station to be established.

(2) Station to be established. Data reported from Beresfield and Wallsend in the interim.

(3) Future campaign stations are subject to evaluation of initial campaign monitoring.

Pollutant screening criteria

Clause 14(2) of NEPM allows for fewer performance monitoring stations where it can be demonstrated that pollutant levels are reasonably expected to be consistently lower than the NEPM standards. These screening criteria have been used for carbon monoxide, nitrogen dioxide, ozone, sulfur dioxide, and lead, at several regions in NSW. More detailed information regarding screening of pollutants for specific regions is given in the NSW Monitoring Plan, available on the DEC website http://www.dec.nsw.gov.au/air/nepm/index.htm

Monitoring methods

The NSW network is comprised of instruments that are in accordance with the relevant Australian standard. It will be noted that, in the case of PM_{10}, the Tapered Element Oscillating Microbalance (TEOM) method is used for NEPM monitoring and reporting. PM_{10} data from the TEOM are presented as measured and unadjusted.

Table A7: Instruments used in NSW for NEPM monitoring

Pollutant	Standard	Title	Method used
Carbon monoxide	AS3580.7.1-1992	Ambient Air - Determination of Carbon Monoxide - Direct Reading Instrument Method	Gas Filter Correlation /Infra-Red
Nitrogen dioxide	AS3580.5.1-1993	Ambient Air - Determination of Oxides of Nitrogen - Chemiluminescence Method	Gas Phase Chemi-luminescence
Photochemical oxidant (ozone)	AS3580.6.1-1990	Ambient Air - Determination of Ozone - Direct Reading Instrument Method	Non Dispersive Ultra-violet
Sulfur dioxide	AS3580.4.1-1990	Ambient Air - Determination of Sulfur Dioxide - Direct Reading Instrument Method	Pulsed Fluorescence
Lead	AS2800-1985	Ambient Air - Determination of Particulate Lead-High Volume Sampler - Gravimetric Method	Atomic Absorption
Particles as PM_{10}	AS 3580.9.8-2001	Determination of Suspended particulate matter - PM_{10} continuous direct mass method using a tapered element oscillating microbalance analyser.	Tapered Element Oscillating Microbalance (TEOM)

NATA accreditation

As required under Clause 12 of the Ambient Air Quality NEPM, the DEC is accredited by the National Association of Testing Authorities (NATA) for the measurement of all Ambient Air Quality NEPM parameters. The biennial reassessment of the Air Quality Monitoring Laboratory and associated monitoring stations by NATA is due in August 2006.

Appendix B: Fine particles as $PM_{2.5}$

In May 2003 NEPC announced a variation to the Ambient Air Quality NEPM. The purpose of the Variation was to include in the Ambient Air Quality NEPM, Advisory Reporting Standards (ARS) for particles as $PM_{2.5}$ and protocols for monitoring and reporting $PM_{2.5}$. The standards introduced are 25µg/m^3 for a daily (24-hour) average, and 8µg/m^3 for an annual average.

Below are presented data measuring particles as $PM_{2.5}$ from NSW during 2005. Also included are historical trend data from 1996 onwards (where available).

$PM_{2.5}$ monitoring

The advisory reporting standard requires $PM_{2.5}$ monitoring to be conducted at NEPM performance monitoring stations that have been specified for particles as PM_{10}. At present PM_{10} and $PM_{2.5}$ monitoring is performed concurrently at six of the eighteen stations currently specified as NEPM monitoring stations for PM_{10} - Chullora, Liverpool, Richmond, Woolooware, Beresfield and Wollongong. PM_{10} and $PM_{2.5}$ monitoring is also performed at the Earlwood, Wallsend and Warrawong stations which are not designated as NEPM monitoring stations for PM_{10}.

The DEC has operated Tapered Element Oscillating Microbalance (TEOM) continuous fine particle monitors sampling $PM_{2.5}$ since 1996. Currently there is no Australian standard method for monitoring $PM_{2.5}$ using TEOM. The advisory reporting standard allows the use of TEOM monitors for $PM_{2.5}$ measurement, although it is stated that values obtained from this method "cannot be used for comparison with the advisory reporting standards until the outcomes of the $PM_{2.5}$ Equivalence Program have been formally included in the Principal Measure." This report only presents data obtained by TEOM monitors. These data are compared to the advisory reporting standard purely for interest.

$PM_{2.5}$ Equivalence Program

In the absence of an Australian Standard method for $PM_{2.5}$ monitoring the variation to the Ambient Air Quality NEPM identifies the need for consistent data collection. The Technical Paper on monitoring of particles for PM2.5 provides advice on $PM_{2.5}$ monitoring and proposes an equivalence program to assess the accuracy of and precision of $PM_{2.5}$ measurement methods with regard to the USEPA Federal Reference Method.

The DEC is contributing to this program by running co-located $PM_{2.5}$ samplers at the Chullora and Richmond monitoring stations. Alongside the PARTISOL and RAAS FRMs these stations operate instruments using a number of measurement techniques such as BAM, TEOM and TEOM/FDMS. Only data from the TEOM monitors are reported here.

The TEOM $PM_{2.5}$ monitors used by the DEC have been operated along similar lines to the TEOM PM_{10} monitors and in accordance with *AS3580.9.8 (Determination of suspended particulate matter - PM_{10} continuous direct mass method using a tapered element oscillating microbalance analyser)*. The internal software of the TEOM is configured to make linear adjustments of mass measurement. For PM_{10} the adjustment is based on empirical results designed to achieve comparable results to the USEPA PM_{10} reference methods. This adjustment is of the form:

$$Y = A + Bx$$

For PM_{10} : A = 3.0, B = 1.03

Historically all TEOM monitors used by the DEC have used this adjustment, including when the instruments are used for $PM_{2.5}$ measurements. At the commencement of the $PM_{2.5}$ equivalence program the TEOM monitors at Chullora and Richmond were configured such that the coefficients for linear adjustments were A=0 and B=1. TEOM monitors at other stations operate using the PM_{10} coefficients. After the results of the equivalence program are finalised data from all TEOM instruments will be adjusted with the appropriate coefficients.

In this report data is clearly marked as either scaled (A=3, B=1.03) or unscaled (A=0, B=1).

Station siting, exposure and population exposure

Figure B1 shows the location of the $PM_{2.5}$ monitoring stations in NSW. *Table B2* gives a brief description of the stations where $PM_{2.5}$ monitoring is conducted.

The Beresfield, Chullora, Richmond, Wallsend, Warrawong and Wollongong stations meet all of the Ambient Air Quality NEPM siting and exposure criteria. The Earlwood and Liverpool stations do not meet these criteria. Particulars of non-compliance with siting criteria for each of these stations are given below in *Table B1*.

Information about the characteristics of individual monitoring stations and exposed population are given in the NSW Monitoring Plan, available on the DEC website http://www.dec.nsw.gov.au/air/nepm/index.htm.

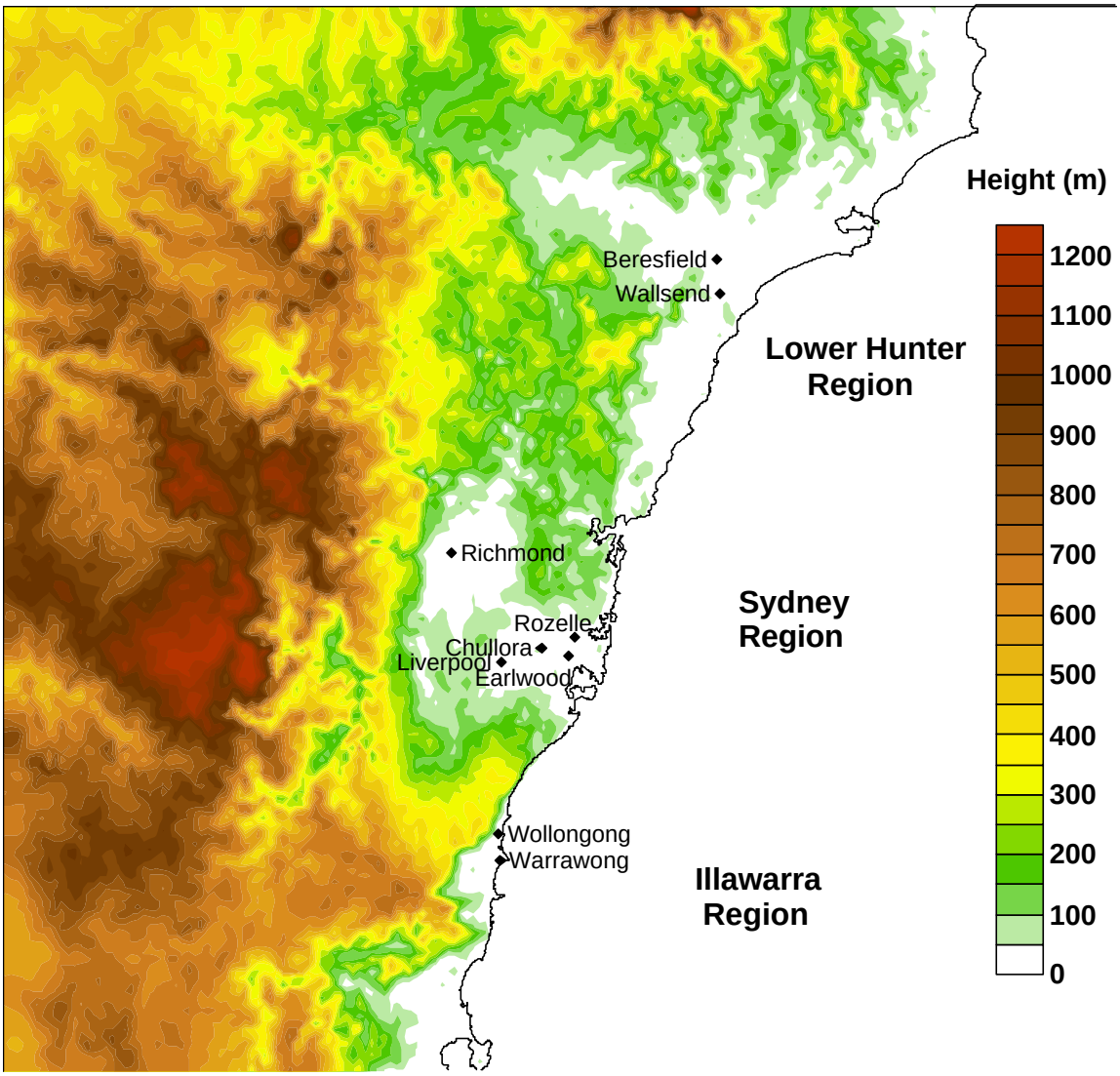
Table B1: Stations not complying with all siting and exposure criteria

Station	Siting criteria not met	Comments
Earlwood	Clear sky angle <120°. Less than 20m from trees.	Trees have grown since establishment of station.
Liverpool	Clear sky angle <120°.	Trees have grown since establishment of station.

Table B2: Population exposure

Station	Exposed population
Sydney Region	
Chullora	Trend station in a mixed residential and commercial area. Replaced the Lidcombe trend station, which had operated since 1970.
Earlwood	Non-NEPM station in a residential area within the Cooks River valley.
Liverpool	Campaign station in an urban area of SW Sydney.
Richmond	Trend station representing the residential area in the north of the Hawkesbury basin.
Rozelle	Trend station within the Parramatta River valley. Existing long-term station.
Lower Hunter	
Beresfield	Performance station in a semi-rural area used as a proxy for the Maitland station.
Wallsend	Non-NEPM (for PM_{10}) station in a residential area.
Illawarra	
Warrawong	Non-NEPM (for PM_{10}) station in an industrial-residential area.
Wollongong	Trend station in the main population/commercial centre.

Figure B1: $PM_{2.5}$ monitoring in NSW



Data analysis

The variation to the Ambient Air Quality NEPM (2003) states that values obtained using the TEOM method for $PM_{2.5}$ "cannot be used for comparison with the advisory reporting standards until the outcomes of the $PM_{2.5}$ Equivalence Program have been formally included in the Principal Measure."

This report only presents data obtained by TEOM monitors. These data are compared to the advisory reporting standard for $PM_{2.5}$ purely for interest.

Table B3: Summary of $PM_{2.5}$ concentrations in NSW (2005)

Advisory Reporting Standard
25 µg/m³ (24-hour average)
8 µg/m³ (Annual average)

Region/ Performance monitoring Station	Data availability rates (% of hours)					Valid days	Days above ARS	Annual mean (µg/m³)	Maximum values (µg/m³)			
	Q1	Q2	Q3	Q4	Annual				High Value	Date	2nd High Value	Date
Sydney												
Chullora (2)	97.8	89.0	91.3	94.6	93.2	340	2	7.6	**25.6**	09-Jun	**25.5**	08-Jun
Earlwood (1)	98.9	98.9	100.0	97.8	98.9	361	2	10.3	**31.2**	08-Jun	**29.2**	09-Jun
Liverpool (1)	93.3	95.6	84.8	90.2	91.0	332	7	11.6	**34.9**	09-Jun	**29.4**	08-Jun
Richmond (2)	90.0	76.9	78.3	89.1	83.6	305	0	7.1	22.7	05-Jun	22.5	13-Jan
Illawarra												
Warrawong (1)	94.4	97.8	96.7	90.2	94.8	346	3	10.6	**27.4**	08-Feb	**26.3**	09-Jun
Wollongong (1)	100.0	100.0	97.8	93.5	97.8	357	1	9.5	**25.2**	09-Jun	22.4	14-Jan
Lower Hunter												
Beresfield (1)	96.7	91.2	89.1	97.8	93.7	342	0	10.0	22.1	30-Dec	22.1	30-May
Wallsend (1)	90.0	96.7	100.0	97.8	96.2	351	0	9.7	23.5	18-Mar	21.3	21-Dec

Bold font indicates values that exceed the AAQ NEPM advisory reporting standard

(1) Scaled data (A=3, B=1.03)

(2) Unscaled data

Exceedences of the Ambient Air Quality NEPM advisory reporting standards were recorded in all regions during 2005. The $PM_{2.5}$ annual average was exceeded in all regions where monitoring occurred with six stations reporting annual averages greater than 8µg/m³. Liverpool recorded the highest annual average of 11.6µg/m³. The 24-hour reporting standard was exceeded at five stations in the Sydney and Illawarra regions, no exceedences where recorded in the lower Hunter. The 24-hour average reporting standard was exceeded on nine days during 2005 with Liverpool exceeding the standard on seven of these days. The highest 24-hour average was 34.9µg/m³ recorded on the 9th June at Liverpool.

The Bureau of Meteorology reported that the first five months of 2005 were very dry across much of the state. The severe drought conditions experienced across much of NSW were relieved by widespread rainfall in the second half of 2005, although the Illawarra and Sydney metropolitan regions still recorded lower than average rainfall. Drought conditions are a major influence on $PM_{2.5}$ levels in NSW and the continued very dry conditions from the start of the year until mid-June contributed to exceedences of the $PM_{2.5}$ reporting standard. Seven of the nine days that exceeded the reporting standard occurred prior to the first significant falls of widespread heavy rain that occurred on the 11th June.

Table B4: Days when $PM_{2.5}$ 24-hour Ambient Air Quality NEPM standard exceeded

Date	Stations where standard exceeded	Comments(#)
8-Feb-2005	Warrawong	
3-Apr-2005	Warrawong	
4-Jun-2005	Liverpool	
7-Jun-2005	Liverpool	
8-Jun-2005	Chullora, Earlwood, Liverpool	
9-Jun-2005	Chullora, Earlwood, Liverpool, Warrawong, Wollongong	
10-Jun-2005	Liverpool	
31-Aug-2005	Liverpool	
24Sep-2005	Liverpool	

Table B5: Statistical summary for $PM_{2.5}$ - Daily 24-hour average concentrations (2005)

Region/ Performance monitoring Station	Data availability rates (%)	Maximum conc. (µg/m^3)	Percentiles (µg/m^3)						
			99th	98th	95th	90th	75th	50th	25th
Sydney									
Chullora (2)	93.2	**25.6**	19.1	17.3	14.5	12.9	9.4	6.6	5.0
Earlwood (1)	98.9	**31.2**	23.6	22.4	17.4	15.6	12.3	9.3	7.5
Liverpool (1)	91.0	**34.9**	**27.5**	23.9	20.7	18.3	14.3	10.6	8.1
Richmond (2)	83.6	22.7	17.3	15.3	13.7	11.9	9.2	6.5	4.5
Illawarra									
Warrawong (1)	94.8	**27.4**	23.3	21.6	19.1	16.5	13.0	9.7	7.5
Wollongong (1)	97.8	**25.2**	21.1	19.3	16.5	15.4	11.2	8.7	6.9
Lower Hunter									
Beresfield (1)	93.7	22.1	20.7	19.5	18.4	15.7	12.0	9.1	7.2
Wallsend (1)	96.2	23.5	19.9	19.0	16.8	14.4	11.6	9.0	7.2

AAQ NEPM advisory reporting standard - 25µg/m^3 (24-hour average)

Bold font indicates values that exceed the AAQ NEPM advisory reporting standard

(1) Scaled data (A=3, B=1.03)

(2) Unscaled data

Trend data

Annual averages and annual maximum 24-hour averages for all stations are given below.

Table B6: Maximum 24-hour average concentrations for $PM_{2.5}$ (µg/m^3)

Region/ Performance monitoring Station	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Sydney										
Chullora								**81.0** (1)	24.5 (3)	**25.6** (2)
Earlwood (1)	22.6	**39.3**	**33.4**	**27.6**	**35.4**	**81.7**	**56.1**	**39.4**	24.4	**31.2**
Liverpool (1)			**26.5**	**25.4**	**45.1**	**118.6**	**89.2**	**50.1**	**41.8**	**34.9**
Richmond	17.2 (1)	**51.3** (1)	**40.3** (1)	**33.1** (1)	17.0 (1)	**101.3** (1)	**98.2** (1)	**61.9** (1)	**26.9** (3)	22.7 (2)
Illawarra										
Warrawong (1)	**31.7**	**37.1**	**27.0**	19.9	**32.6**	23.2	**89.6**	**160.3**	**26.8**	**27.4**
Wollongong (1)			18.8	19.4	**31.1**	**53.4**	**93.8**	**112.5**	**26.7**	**25.2**
Lower Hunter										
Beresfield (1)			18.5	21.4	**34.1**	**66.4**	**50.4**	**40.9**	**31.7**	22.1
Wallsend (1)	14.1	**43.4**	**38.2**	21.9	**61.5**	**56.4**	**59.6**	**34.1**	**26.9**	23.5

AAQ NEPM advisory reporting standard - 25mg/m^3 (24-hour average)

Table B7: Annual average concentrations for $PM_{2.5}$ (µg/m^3)

Region/ Performance monitoring Station	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Sydney										
Chullora								**11.2** (1)	**8.7** (3)	7.6 (2)
Earlwood (1)	**9.2**	**10.2**	**10.3**	**10.2**	**10.3**	**11.6**	**12.8**	**11.0**	**10.8**	**10.3**
Liverpool (1)			**10.1**	**9.6**	**10.4**	**11.8**	**15.2**	**13.6**	**12.5**	**11.6**
Richmond	6.9 (1)	7.9 (1)	6.4 (1)	6.5 (1)	7.0 (1)	**10.7** (1)	**11.5** (1)	**10.0** (1)	**9.6** (3)	7.1 (2)
Illawarra										
Warrawong (1)	7.6	**8.7**	**8.8**	**8.3**	**9.1**	**9.9**	**12.7**	**12.0**	**11.4**	**10.6**
Wollongong (1)			7.7	8.0	**8.3**	**9.4**	**11.5**	**10.5**	**9.8**	**9.5**
Lower Hunter										
Beresfield (1)			**8.2**	**8.8**	**8.8**	**12.4**	**13.6**	**9.4**	**11.0**	**10.0**
Wallsend (1)	7.3	**9.6**	**8.5**	**8.0**	**8.4**	**10.2**	**11.3**	**9.8**	**9.9**	**9.7**

AAQ NEPM advisory reporting standard - 8mg/m^3 (annual average)

Bold font indicates values that exceed the AAQ NEPM advisory reporting standard

(1) Scaled data (A=3, B=1.03)

(2) Unscaled data

(3) Scaled data until Jun 2004, unscaled post Jun 2004

Statistical trends

Table B8: Statistical summary for $PM_{2.5}$ - 24-hour average concentrations

Station: Earlwood

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (µg/m³)	Percentiles (µg/m³)						
				99th	98th	95th	90th	75th	50th	25th
1997 (1)	98.1	**12**	**39.3**	**30.4**	**27.4**	22.1	16.5	12.1	8.8	6.5
1998 (1)	95.6	**7**	**33.4**	**25.8**	24.4	19.0	16.9	12.7	9.0	6.9
1999 (1)	93.4	**4**	**27.6**	**25.2**	21.1	18.4	16.2	12.7	9.1	6.9
2000 (1)	84.7	**3**	**35.4**	21.6	19.9	18.2	16.8	12.1	9.3	7.2
2001 (1)	93.7	**8**	**81.7**	**50.2**	**25.1**	20.6	18.1	13.1	9.7	7.6
2002 (1)	98.9	**15**	**56.1**	**51.1**	**29.3**	23.6	20.7	15.2	10.9	8.1
2003 (1)	98.6	**9**	**39.4**	**30.5**	**26.5**	19.6	17.3	12.9	9.6	7.5
2004 (1)	96.2	0	24.4	22.2	21.3	18.6	16.5	13.3	10.0	7.5
2005 (1)	98.9	**2**	**31.2**	23.6	22.4	17.4	15.6	12.3	9.3	7.5

Table B9: Statistical summary for $PM_{2.5}$ - 24-hour average concentrations

Station: Lidcombe* / Chullora #

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (µg/m³)	Percentiles (µg/m³)						
				99th	98th	95th	90th	75th	50th	25th
1996* (1)	13.7	7	**28.3**	**28.0**	**27.9**	**26.8**	**25.5**	16.5	10.3	8.5
1997* (1)	89.3	7	**39.0**	**28.6**	**25.1**	20.1	16.0	12.3	9.1	7.1
1998* (1)	99.7	1	**28.8**	22.4	20.8	17.0	14.3	11.3	8.4	6.2
1999* (1)	98.1	1	**26.2**	21.5	19.6	16.9	14.5	12.0	9.4	7.0
2000* (1)	92.1	2	**45.1**	18.8	18.5	17.0	14.9	11.3	8.9	7.2
2001* (1)	90.4	4	**82.9**	**28.9**	19.9	18.6	16.1	12.7	9.7	7.8
2002* (1)	32.1	4	**70.6**	**48.6**	**33.0**	19.5	15.7	11.4	8.9	7.4
2003# (1)	70.4	**6**	**81.0**	**32.3**	**25.7**	18.8	16.5	13.0	9.7	7.6
2004# (3)	89.1	0	24.5	19.4	18.2	16.1	14.2	10.9	7.9	5.8
2005# (2)	93.2	**2**	**25.6**	19.1	17.3	14.5	12.9	9.4	6.6	5.0

Table B10: Statistical summary for $PM_{2.5}$ - 24-hour average concentrations

Station: Liverpool

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (µg/m³)	Percentiles (µg/m³)						
				99th	98th	95th	90th	75th	50th	25th
1998 (1)	85.5	1	**26.5**	22.3	21.2	19.2	17.0	12.7	9.6	6.5
1999 (1)	98.6	1	**25.4**	20.1	18.6	17.1	14.8	12.1	9.0	6.8
2000 (1)	97.8	**5**	**45.1**	**25.3**	22.7	17.7	15.3	12.1	9.5	7.4
2001 (1)	97.8	**6**	**118.6**	**53.1**	21.9	19.4	17.1	13.4	10.2	7.6
2002 (1)	96.7	**38**	**89.2**	**44.4**	**39.3**	**29.8**	**25.3**	17.9	12.9	9.4
2003 (1)	65.5	**12**	**50.1**	**37.3**	**30.3**	24.6	20.6	16.6	12.2	9.6
2004 (1)	85.0	**10**	**41.8**	**29.2**	**25.8**	20.8	19.3	15.1	11.7	8.5
2005 (1)	91.0	**7**	**34.9**	**27.5**	23.9	20.7	18.3	14.3	10.6	8.1

AAQ NEPM advisory reporting standard - 25mg/m³ (24-hour average)

Bold font indicates values that exceed the AAQ NEPM advisory reporting standard

(1) Scaled data (A=3, B=1.03)

(2) Unscaled data

(3) Scaled data until Jun 2004, unscaled post Jun 2004

Table B11: Statistical summary for $PM_{2.5}$ - 24-hour average concentrations

Station: Richmond

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (µg/m^3)	Percentiles (µg/m^3)						
				99th	98th	95th	90th	75th	50th	25th
1997 (1)	94.8	**7**	**51.3**	**31.6**	24.9	17.2	12.3	8.9	6.6	4.9
1998 (1)	95.9	**2**	**40.3**	14.6	13.5	11.9	10.3	7.9	5.8	4.2
1999 (1)	95.3	1	**33.1**	13.1	11.8	10.7	10.0	7.9	6.0	4.6
2000 (1)	96.7	0	17.0	14.2	13.4	12.0	10.6	8.2	6.3	5.1
2001 (1)	59.5	**3**	**101.3**	**51.7**	21.2	16.7	13.9	10.9	8.8	6.5
2002 (1)	64.4	**12**	**98.2**	**56.7**	**45.2**	23.9	19.0	13.6	10.0	6.8
2003 (1)	95.9	**10**	**61.9**	**38.5**	**28.0**	18.6	14.9	11.0	8.4	6.4
2004 (3)	96.7	**2**	**26.9**	23.5	20.4	17.5	15.0	11.7	8.9	6.5
2005 (2)	83.6	0	22.7	17.3	15.3	13.7	11.9	9.2	6.5	4.5

Table B12: Statistical summary for $PM_{2.5}$ - 24-hour average concentrations

Station: Warrawong

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (µg/m^3)	Percentiles (µg/m^3)						
				99th	98th	95th	90th	75th	50th	25th
1997 (1)	99.7	**4**	**37.1**	23.5	21.0	16.9	13.8	10.6	7.6	5.8
1998 (1)	97.3	1	**27.0**	20.3	19.2	17.0	13.2	10.5	8.1	6.2
1999 (1)	97.5	0	19.9	16.2	15.6	14.0	12.6	9.6	7.8	6.2
2000 (1)	97.5	**3**	**32.6**	20.7	18.7	15.3	13.3	10.5	8.3	6.7
2001 (1)	94.2	0	23.2	21.5	20.6	17.6	15.1	12.0	8.9	6.7
2002 (1)	96.7	**18**	**89.6**	**40.3**	**31.4**	24.4	21.1	15.2	10.5	8.0
2003 (1)	98.4	**8**	**160.3**	**27.3**	24.9	20.6	17.6	14.1	10.5	8.1
2004 (1)	94.0	**2**	**26.8**	23.6	22.1	20.7	17.9	14.2	10.4	8.0
2005 (1)	94.8	**3**	**27.4**	23.3	21.6	19.1	16.5	13.0	9.7	7.5

Table B13: Statistical summary for $PM_{2.5}$ - 24-hour average concentrations

Station: Wollongong

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (µg/m^3)	Percentiles (µg/m^3)						
				99th	98th	95th	90th	75th	50th	25th
1998 (1)	83.6	0	18.8	16.4	14.8	12.6	11.4	9.1	7.3	5.7
1999 (1)	98.6	0	19.4	16.1	14.9	12.5	11.4	9.3	7.5	6.1
2000 (1)	100.0	1	**31.1**	18.9	17.2	15.1	12.4	9.6	7.6	6.2
2001 (1)	96.2	**2**	**53.4**	20.6	19.3	17.0	14.9	11.0	8.2	6.4
2002 (1)	95.9	**18**	**93.8**	**40.2**	**30.1**	24.5	18.4	13.5	9.3	7.2
2003 (1)	96.7	**7**	**112.5**	**32.4**	23.6	18.3	15.9	11.9	9.3	7.2
2004 (1)	97.3	**2**	**26.7**	21.7	20.6	16.9	15.8	12.2	9.1	6.7
2005 (1)	97.8	1	**25.2**	21.1	19.3	16.5	15.4	11.2	8.7	6.9

AAQ NEPM advisory reporting standard - 25mg/m^3 (24-hour average)

Bold font indicates values that exceed the AAQ NEPM advisory reporting standard

(1) Scaled data (A=3, B=1.03)

(2) Unscaled data

(3) Scaled data until Jun 2004, unscaled post Jun 2004

Table B14: Statistical summary for $PM_{2.5}$ - 24-hour average concentrations

Station: Beresfield

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (µg/m^3)	Percentiles (µg/m^3)						
				99th	98th	95th	90th	75th	50th	25th
1998 (1)	81.9	0	18.5	16.3	15.6	14.1	12.8	10.1	7.8	5.7
1999 (1)	95.9	0	21.4	17.6	17.0	15.7	13.7	10.8	8.0	6.2
2000 (1)	85.2	**2**	**34.1**	22.5	19.7	15.4	13.4	10.1	7.8	6.3
2001 (1)	69.0	**9**	**66.4**	**33.1**	**25.5**	21.1	18.9	15.0	11.3	8.3
2002 (1)	95.1	**26**	**50.4**	**45.6**	**39.8**	**29.3**	21.4	15.8	11.3	8.8
2003 (1)	90.7	**5**	**40.9**	**27.5**	22.4	16.6	14.1	10.8	8.2	6.2
2004 (1)	90.2	1	**31.7**	23.6	23.0	19.9	16.5	12.9	10.3	7.8
2005 (1)	93.7	0	22.1	20.7	19.5	18.4	15.7	12.0	9.1	7.2

Table B15: Statistical summary for $PM_{2.5}$ - 24-hour average concentrations

Station: Wallsend

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (µg/m^3)	Percentiles (µg/m^3)						
				99th	98th	95th	90th	75th	50th	25th
1997 (1)	86.8	**3**	**43.4**	23.3	21.5	17.3	14.0	11.4	8.4	6.7
1998 (1)	95.6	1	**38.2**	17.5	16.9	15.4	13.6	10.4	7.9	5.8
1999 (1)	88.8	0	21.9	15.1	14.0	12.7	11.6	9.5	7.6	5.9
2000 (1)	88.5	1	**61.5**	17.4	15.7	14.5	13.1	9.8	7.3	6.1
2001 (1)	94.8	**7**	**56.4**	**30.1**	23.8	18.1	15.5	11.6	8.6	7.1
2002 (1)	85.8	**13**	**59.6**	**37.0**	**31.5**	22.8	17.3	12.9	9.3	7.3
2003 (1)	88.5	**3**	**34.1**	24.9	20.8	16.4	14.7	11.7	8.8	7.0
2004 (1)	87.4	1	**26.9**	20.1	18.3	16.4	14.3	11.6	9.0	7.3
2005 (1)	96.2	0	23.5	19.9	19.0	16.8	14.4	11.6	9.0	7.2

AAQ NEPM advisory reporting standard - 25mg/m^3 (24-hour average)

Bold font indicates values that exceed the AAQ NEPM advisory reporting standard

(1) Scaled data (A=3, B=1.03)

Appendix C: Calculating data availability

Throughout this report data availability rates are presented as either percentages of available data, or as days available. These two rates are calculated using different methods. When presented as a percentage, the value is the number of averaging periods where data is valid, divided by the total number of averaging periods in the year. When presented as number of valid days, this value represents the number of days during the year when at least seventy-five percent of averaging periods during the day are valid.

For example the carbon monoxide standard is based on eight hour rolling averages. A valid hour (the end point of an eight hour average) is the average, over the preceding eight hours, of the valid one-hour averages, when at least six of those hours hold valid data. A valid day has at least eighteen valid hours. If we hypothesize that on each day throughout the year we had *exactly* eighteen valid hours, then annual data availability would be seventy-five percent. The number of valid days would be 365.

For the gaseous pollutants, carbon monoxide, nitrogen dioxide, ozone and sulfur dioxide, the NSW DEC undertakes daily an automated instrument calibration check. This occurs during the early hours of the morning, and sample data obtained during the calibration check is considered as invalid data. Hence for these pollutants the maximum number of valid one-hour averages in a day is twenty-three. All calculations for data availability given in this report *include* the invalid calibration hour (i.e. calculations assume that there are twenty-four *possible* valid hours in a day). Therefore for these pollutants the maximum that the annual one-hour data availability can be is 95.8 %.

For a pollutant that is reported against more than one standard, data availability rates may not be the same for each standard. For instance when measuring ozone, one hour of each day is lost during instrument calibration checks. This affects the data availability rates when reporting against the one hour standard but does not affect data availability rates when reporting against the four hour standard. The maximum data availability rates are thus 95.8% and 100% respectively.

For compliance reporting on standards with averaging periods less than twenty-four hours, peak daily values are given regardless of the number of valid hours in that day. For reporting of statistics, such as percentiles of daily maxima, on standards with averaging periods less than twenty-four hours, only days that have at least seventy-five percent of valid hours are used.