Queensland

2003 air monitoring report

This report fulfils the annual reporting requirements for Queensland under clause 18 of the National Environment Protection (Ambient Air Quality) Measure

Environment technical report No. 55

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Summary

Air monitoring at National Environment Protection (Ambient Air Quality) Measure (AAQ NEPM) monitoring stations in Queensland between January and December 2003 indicated that:

Exceedences of the AAQ NEPM standards occurred for:

- 1-hour and 24-hour sulfur dioxide at the Menzies site in Mount Isa due to industrial emissions; and
- 24-hour PM_{10} at the Mountain Creek, Rocklea, Springwood and Flinders View sites in south-east Queensland due to windblown dust, the North Toowoomba site due to windblown dust, and the West Mackay site due to dust emissions generated during loading and unloading of soils at a nearby commercial premises. Smoke from pre- and post-harvest sugarcane burning in the Pioneer Valley west of Mackay also contributed to one of the PM_{10} exceedences at the West Mackay site.

The AAQ NEPM 2008 goal was met in all regions during 2003, with the exception of:

- 1-hour and 24-hour sulfur dioxide at the Menzies site in Mount Isa due to industrial emissions; and
- 24-hour PM_{10} at the West Mackay site due to dust emissions generated during loading and unloading of soils at a nearby commercial premises.

Compliance with the standards and the 2008 goal could not be demonstrated at the North Toowoomba and Stuart monitoring stations because data availability was below the level required to make a valid assessment. There were no exceedences of standards in the available measurement data from these two stations.

$PM_{2.5}$ levels greater than the AAQ NEPM 24-hour advisory reporting standard (measured using continuous TEOM instrumentation) occurred once at the Rocklea site in south-east Queensland due to bushfire smoke and once at the North Toowoomba site due to windblown dust.

Implementation of monitoring in Toowoomba (site established July 2003) and Townsville (ozone, nitrogen dioxide and PM_{10}) has proceeded more slowly than the timeframes contained in the Queensland AAQ NEPM ambient air monitoring plan due to delays in obtaining siting approvals. Campaign monitoring in Mackay (ozone and nitrogen dioxide) and Cairns (ozone, nitrogen dioxide and PM_{10}) has been deferred pending the results of campaign monitoring in Townsville.

The Environmental Protection Agency's (EPA) quality assurance system for ambient air quality monitoring and data validation procedures was assessed by the National Association of Testing Authorities Australia (NATA) in March 2002. The EPA is currently addressing the conditions raised in the assessment report.

Introduction

Under clause 18 of the AAQ NEPM, jurisdictions are required to submit an annual report on their compliance with the measure in an approved form by the end of June of the year following the reporting year. The National Environment Protection (Ambient Air Quality) Measure Technical Paper No. 8, "Annual Reports" (available from *www.ephc.gov.au*) details the format and data requirements of the annual report.

This report documents compliance information for Queensland for 2003 in accordance with the requirements of technical paper No. 8. The report is divided into four sections as follows:

Section A: Overview of the AAQ NEPM monitoring network and related activities during 2003.

Section B: Assessment of compliance with the AAQ NEPM Standards and Goals.

Section C: Assessment of monitoring data against the standards (including details of exceedences and the circumstances which led to these exceedences, and information on the highest values measured for all pollutants and regions).

Section D: Data analysis (including pollutant distribution summaries and selected multi-year data for trend stations).

Additional information on the circumstances which led to exceedences of standards during 2003 are provided in an appendix.

Section A – Monitoring summary

Queensland's ambient air monitoring plan (available from *www.epa.qld.gov.au/environmental_management/air/air_quality_monitoring/national_measures*) outlines the monitoring to be undertaken in Queensland to determine compliance with the Standards and 2008 Goal of the AAQ NEPM. It should be noted that this monitoring is only a part of the overall air monitoring network operated by the EPA. Details of AAQ NEPM monitoring and related activities in Queensland during 2003 follow.

Current AAQ NEPM monitoring stations

During 2003 monitoring was conducted in six of the ten regions identified in the Queensland monitoring plan – south-east Queensland (consisting of four sub-regions), Toowoomba, Gladstone, Mackay, Townsville and Mount Isa. Monitoring site locations are shown in figure 1.

Table 1 contains a descriptive summary of each monitoring site. In line with the descriptions contained in the AAQ NEPM, sites are identified as:

- Performance monitoring station (PMS) – nominated location to measure achievement against the goal of the AAQ NEPM.
- Trend station – nominated location to measure long-term changes in air quality in addition to achievement against the goal of the AAQ NEPM.
- Campaign station – short-term investigation location (typically operational for one year) to assess the need for ongoing monitoring in the region to measure achievement against the goal of the AAQ NEPM.

Sites are further characterised using the population coverage descriptors contained in the National Environment Protection (Ambient Air Quality) Measure Technical Paper No. 3, "Monitoring Strategy" (available from *www.ephc.gov.au*):

- Generally representative upper bound (GRUB) – indicative of pollutant concentrations in the upper range of levels occurring in populated areas in the region.
- Population-average – indicative of air quality experienced by most of the population.

Exposed population is a qualitative measure of the population density in the vicinity of the monitoring station.

Figure 1: 2003 AAQ NEPM monitoring station locations

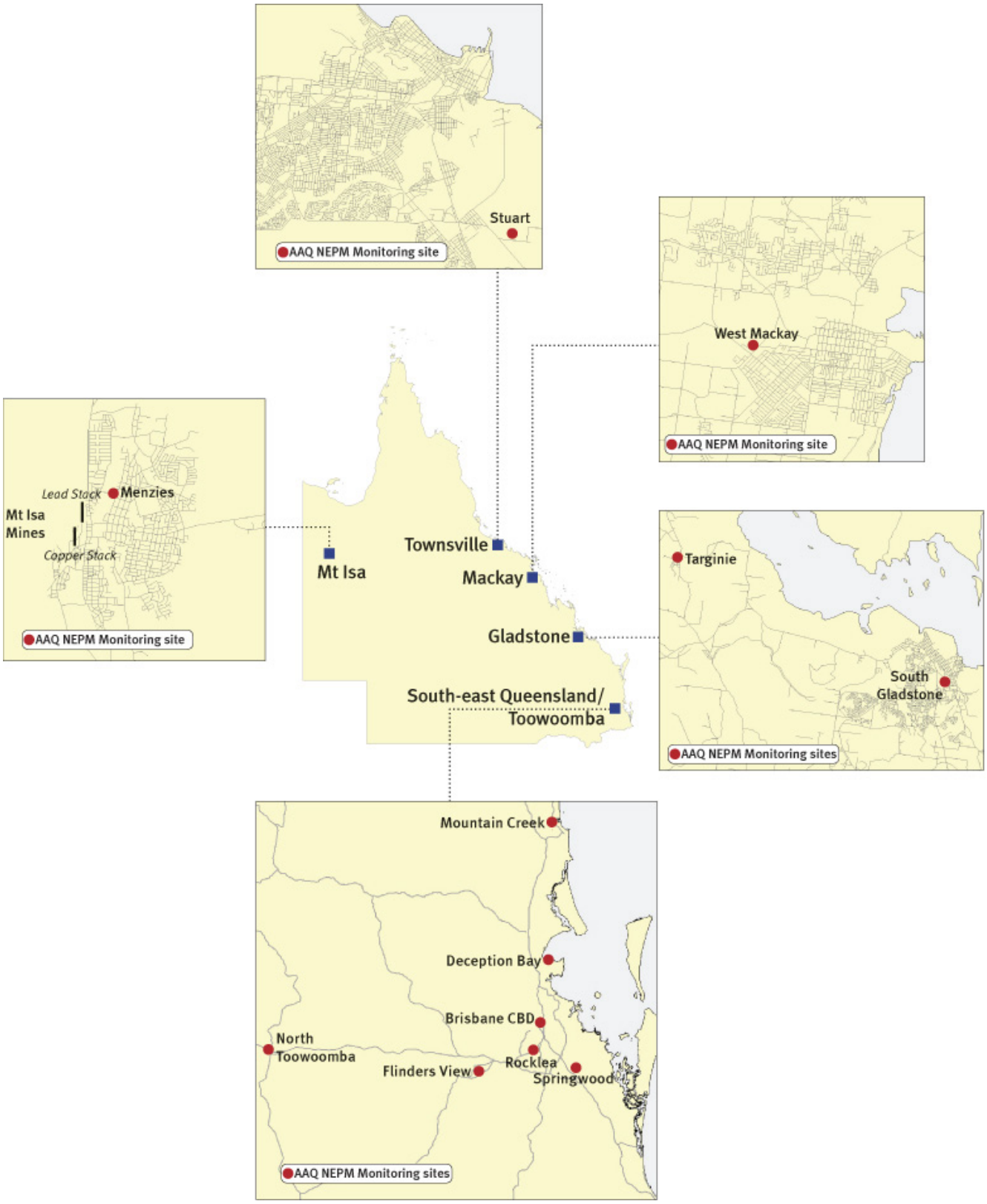


Table 1: 2003 Queensland AAQ NEPM monitoring sites

Site	Station type	Established	Pollutants monitored	Monitoring techniques	Exposed population	Non-conformance with AS2922 siting criteria	Pollutant sources
South-east Queensland *North Coast sub-region*							
Mountain Creek	PMS - GRUB	July 2001	Ozone Nitrogen dioxide PM_{10}	AS3580.6.1-1990 AS3580.5.1-1993 AS3580.9.8-2001	Medium	Nil	Major roads Forestry/agricultural burning
Brisbane sub-region							
Deception Bay	Trend - GRUB	June 1994	Ozone Nitrogen dioxide	AS3580.6.1-1990 AS3580.5.1-1993	Medium	Trees within 20m west of site	Major roads
Brisbane CBD	Trend - GRUB	April 1998	Carbon monoxide	AS3580.7.1-1992	High	Height above ground (10m) Clear sky angle ‹120deg (inlet mounted on side of building)	Major roads
Rocklea	Trend - GRUB	April 1994	Ozone Nitrogen dioxide PM_{10} $PM_{2.5}$	AS3580.6.1-1990 AS3580.5.1-1993 AS3580.9.8-2001 TEOM, based on AS3580.9.8-2001	High	Nil	Major roads
Springwood	PMS - population average	March 1999	Ozone Nitrogen dioxide Sulfur dioxide PM_{10} $PM_{2.5}$	DOAS DOAS DOAS AS3580.9.8-2001 TEOM, based on AS3580.9.8-2001	High	Nil	Major roads
Ipswich sub-region							
Flinders View	Trend - GRUB	January 1993	Ozone Nitrogen dioxide Sulfur dioxide PM_{10}	AS3580.6.1-1990 AS3580.5.1-1993 AS3580.4.1-1990 AS3580.9.8-2001	Medium	Trees within 20m of site (kept pruned below inlet height)	Major roads Industry (power generation)

Table 1: 2003 Queensland AAQ NEPM monitoring sites (continued)

Site	Station type	Established	Pollutants monitored	Monitoring techniques	Exposed population	Non-conformance with AS2922 siting criteria	Pollutant sources
Toowoomba							
North Toowoomba	Campaign - GRUB	July 2003	Carbon monoxide Ozone Nitrogen dioxide PM_{10} $PM_{2.5}$	AS3580.7.1-1992 AS3580.6.1-1990 AS3580.5.1-1993 AS3580.9.8-2001 TEOM. Based on AS3580.9.8-2001	High	Nil	Major roads Solid fuel heaters
Gladstone							
South Gladstone	Trend - GRUB	July 1992	Nitrogen dioxide Sulfur dioxide PM_{10}	AS3580.5.1-1993 AS3580.4.1-1990 AS3580.9.8-2001	Medium	Trees within 20m to north-west of site	Major roads Industry (power generation, metals processing)
Targinie	Campaign - GRUB	December 2000	Ozone	DOAS	Low	Trees within 20m of DOAS light path	Industry (cement manufacture, metals processing, petroleum refining, power generation)
Mackay							
West Mackay	PMS - GRUB	September 1997	PM_{10}	AS3580.9.8-2001	Medium	Nil	Agricultural burning
Townsville							
Stuart	Campaign - GRUB	September 2001	Sulfur dioxide	AS3580.4.1-1990	Low	Nil	Industry (metals processing)
Mount Isa							
Menzies	Trend - GRUB	January 1983	Sulfur dioxide	AS3580.4.1-1990	Low	Tress within 20m of site (kept pruned below inlet height)	Industry (metals smelting, sulfuric acid manufacture)

Implementation Activities

The EPA has continued to upgrade its ambient air monitoring network in line with the implementation schedule set out in the Queensland air monitoring plan. Expansion activities during 2003 included commencement of carbon monoxide, ozone, nitrogen dioxide, PM_{10} and $PM_{2.5}$ monitoring in Toowoomba in July 2003. The station is located at North Toowoomba, a mixed light industry/residential suburb close to the major north-south traffic corridor. The station's location in a 'valley' should provide an upper-bound measure of ambient pollutant concentrations caused by emissions from domestic solid fuel heaters, which are used extensively throughout Toowoomba for heating during winter months.

Continuous $PM_{2.5}$ monitoring using the tapered element oscillating microbalance (TEOM) method described in the AAQ NEPM "Technical Paper on Monitoring for Particles as $PM_{2.5}$" commenced at two sites in south-east Queensland and at the North Toowoomba site during 2003.

The EPA has completed the development of a quality assurance system for its ambient air quality monitoring and data validation procedures. The system was assessed by NATA in March 2002 and the EPA is currently addressing a number of conditions raised in the assessment report (including the purchase of new reference flow calibration equipment capable of meeting NATA requirements). NATA have indicated that accreditation will be recommended once all these conditions are satisfactorily addressed.

Variations to the approved monitoring plan for Queensland

Difficulties in identifying and obtaining siting approvals delayed commencement of monitoring in Toowoomba and Townsville (for ozone, nitrogen dioxide and PM_{10} only). As mentioned above, monitoring in Toowoomba commenced in July 2003. It is anticipated that monitoring will be in place in Townsville by the middle of 2004.

The delay in commencement of monitoring in Toowoomba has meant the deferment of campaign PM_{10} monitoring in Cairns until monitoring equipment currently in use in Toowoomba becomes available.

Campaign monitoring of ozone and nitrogen dioxide in Cairns and Mackay has been deferred pending a screening assessment based on the results of campaign monitoring in Townsville and the outcome of modelling studies commissioned by the AAQ NEPM Peer Review Committee.

Repeated vandalism necessitated the closure of the Northern Gold Coast (Helensvale) station in south-east Queensland in October 2002. To date, the EPA has been unable to identify an alternative monitoring location within the Gold Coast sub-region that satisfies the requirements of the AAQ NEPM, but will endeavour to have a new station operating by the beginning of 2005.

Changes in commercial activities around the West Mackay monitoring station led to a significant increase in localised dust emissions in 2003, resulting in PM_{10} measurements at the site no longer being representative of regional PM_{10} concentrations. The EPA intends to relocate the monitoring equipment to a more representative location in Mackay in mid-2004.

Co-location of Australian Standard instrumentation to confirm the equivalence of ozone, nitrogen dioxide and sulfur dioxide measurements obtained from DOAS instrumentation at the Springwood site in south-east Queensland has yet to be undertaken. The results of this study will be applied to the DOAS ozone measurements obtained at Targinie in the Gladstone region.

Section B – Assessment of compliance with standards and 2008 goal

This section provides details of the annual compliance assessment for January to December 2003. Compliance criteria are applied on an individual basis at each performance monitoring station operating in the various Queensland regions during the year. South-east Queensland performance monitoring stations are further classified under the respective sub-region.

The National Environment Protection (Ambient Air Quality) Measure Technical Paper No. 8 specifies that to make a valid assessment of compliance, a data availability rate of at least 75 percent in each calendar quarter is required. For this reason, compliance with the standards and 2008 goal could not be demonstrated at the North Toowoomba and Stuart monitoring stations. There were no exceedences of standards in the available measurement data from these two stations.

Tables 2 to 6 summarise compliance of monitoring with the standards and 2008 goal for AAQ NEPM pollutants for 2003. Performance is assessed as meeting the standards and goals if the number of exceedences of the standard is no more than the number specified in schedule 2 of the AAQ NEPM and data availability was at least 75 percent in each quarter of the year. Regions where monitoring has not been conducted can also be considered to meet the standards and goals on the basis that screening shows pollutant levels are reasonably expected to be consistently below the relevant standard (National Environment Protection (Ambient Air Quality) Measure Technical Paper No. 4, "Screening Procedures" (available from *www.ephc.gov.au*)).

TEOM PM_{10} data quoted in this report have been adjusted using the temperature-dependent factor described in option 2 in the National Environment Protection (Ambient Air Quality) Measure Technical Paper No. 10, "Collection and Reporting of TEOM PM_{10} Data" (available from *www.ephc.gov.au*). The resulting adjustments vary linearly from no change at daily average temperatures at or above 15deg to an increase of 40 percent at a temperature of 5deg.

Carbon monoxide

Table 2: 2003 compliance summary for carbon monoxide in Queensland

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		
South-east Queensland							
Brisbane sub-region							
Brisbane CBD	99.8	94.0	100.0	96.5	97.5	0	Met
Toowoomba							
North Toowoomba	0.0	0.0	81.1	87.0	42.4	0	ND

ND = "not demonstrated" due to insufficient data

Regions which do not require monitoring on the basis of screening arguments that pollutant levels are reasonably expected to be consistently below the relevant NEPM standard (i.e. performance is "met").

- Bundaberg
- Cairns
- Gladstone
- Mackay
- Maryborough/Hervey Bay
- Rockhampton
- Townsville

Motor vehicles are the major contributor to ambient carbon monoxide levels in urban areas where the use of combustion stoves and wood heaters in winter is minimal. Peak carbon monoxide concentrations in the south-east Queensland region for the period 2000 to 2003 have been consistently less than 40 percent of the AAQ NEPM standard (see section D). On this basis, carbon monoxide monitoring in coastal Queensland centres with lower traffic density and warmer winter temperatures than south-east Queensland is not required under screening procedure F in table 1 of the National Environment Protection (Ambient Air Quality) Measure Technical Paper No. 4, "Screening Procedures".

Regions which may not require monitoring but for which screening has not yet been carried out (i.e. performance is "not demonstrated").

- Mount Isa

Nitrogen dioxide

Table 3: 2003 compliance summary for nitrogen dioxide in Queensland

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 exceedences (days)	Annual mean (ppm)	Performance against the standards and goal	
	Q1	Q2	Q3	Q4	Annual			1-hour	1-year
South-east Queensland									
North Coast sub-region									
Mountain Creek	90.7	88.9	91.0	95.2	91.4	0	0.005	met	met
Brisbane sub-region									
Deception Bay	83.4	90.7	87.1	86.8	87.0	0	0.006	met	met
Rocklea	90.1	91.1	88.6	93.0	90.7	0	0.009	met	met
Springwood	98.0	96.4	99.1	99.2	98.2	0	0.008	met	met
Ipswich sub-region									
Flinders View	82.0	90.6	90.1	89.9	88.2	0	0.009	met	met
Toowoomba									
North Toowoomba	0.0	0.0	81.1	92.2	43.7	0	0.006	ND	ND
Gladstone									
South Gladstone	91.1	91.2	82.2	92.3	89.2	0	0.004	met	met

ND = "not demonstrated" due to insufficient data

Regions for which monitoring has not yet been carried out (i.e. performance is "not demonstrated").

- Townsville

Regions which may not require monitoring but for which screening has not yet been carried out (i.e. performance is "not demonstrated").

- Bundaberg
- Cairns
- Mackay
- Maryborough/Hervey Bay
- Mount Isa
- Rockhampton

Ozone

Table 4: 2003 compliance summary for ozone in Queensland

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
South-east Queensland									
North Coast sub-region									
Mountain Creek	91.0	89.7	90.8	95.0	91.6	0	0	met	met
Brisbane sub-region									
Deception Bay	90.4	90.8	87.1	89.2	89.3	0	0	met	met
Rocklea	90.9	91.2	93.7	92.9	92.2	0	0	met	met
Springwood	99.8	96.3	99.3	99.7	98.8	0	0	met	met
Ipswich sub-region									
Flinders View	89.8	90.6	90.3	90.9	90.4	0	0	met	met
Toowoomba									
North Toowoomba	0.0	0.0	81.2	92.3	43.7	0	0	ND	ND
Gladstone									
Targinie	99.2	99.6	99.1	91.9	97.4	0	0	met	met

ND = "not demonstrated" due to insufficient data

Regions for which monitoring has not yet been carried out (i.e. performance is "not demonstrated").

- Townsville

Regions which may not require monitoring but for which screening has not yet been carried out (i.e. performance is "not demonstrated").

- Bundaberg
- Cairns
- Mackay
- Maryborough/Hervey Bay
- Mount Isa
- Rockhampton

Sulfur dioxide

Table 5: 2003 compliance summary for sulfur dioxide in Queensland

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

Region/ Performance monitoring station	Data availability rates (% of hours)					Number of exceedences (days)		Annual mean (ppm)	Performance against the standards and goal		
	Q1	Q2	Q3	Q4	Annual	1h	24h		1h	24h	1y
South-east Queensland											
Brisbane sub-region											
Springwood	99.8	96.3	99.3	99.6	98.8	0	0	0.001	met	met	met
Ipswich sub-region											
Flinders View	90.0	90.7	90.2	88.4	89.8	0	0	0.001	met	met	met
Gladstone											
South Gladstone	91.4	91.1	78.8	88.0	87.3	0	0	0.001	met	met	met
Townsville											
Stuart	94.5	95.7	94.7	31.3	78.9	0	0	0.000	ND	ND	ND
Mount Isa											
Menzies	91.5	91.1	95.4	94.1	93.0	42	2	0.007	not met	not met	met

ND = "not demonstrated" due to insufficient data

Regions which do not require monitoring on the basis of screening arguments that pollutant levels are reasonably expected to be consistently below the relevant NEPM standard (i.e. performance is "met").

- Bundaberg
- Cairns
- Mackay
- Maryborough/Hervey Bay
- Toowoomba

Unless significant industrial point sources of sulfur dioxide exist in a region (e.g. coal-fired power stations and metals smelting), emissions of sulfur dioxide are low. Peak sulfur dioxide concentrations in the Brisbane sub-region of south-east Queensland are less than 40 percent of the AAQ NEPM standard (see section D). On this basis, sulfur dioxide monitoring in other Queensland centres with lower population and no significant sulfur dioxide point sources is not required under screening procedure F in table 1 of National Environment Protection (Ambient Air Quality) Measure Technical Paper No. 4, "Screening Procedures".

Regions for which monitoring has not yet been carried out (i.e. performance is "not demonstrated").

- Rockhampton

Particles as PM_{10}

Table 6: 2003 compliance summary for PM_{10} in Queensland

AAQ NEPM Standard
50 µg/m³ (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		
South-east Queensland							
North Coast sub-region							
Mountain Creek	100.0	98.9	98.9	100.0	99.5	1	met
Brisbane sub-region							
Rocklea	100.0	100.0	100.0	93.5	98.4	2	met
Springwood	91.1	100.0	100.0	97.8	97.3	1	met
Ipswich sub-region							
Flinders View	96.7	98.9	97.8	90.2	95.9	1	met
Toowoomba							
North Toowoomba	0.0	0.0	63.0	100.0	41.1	1	ND
Gladstone							
South Gladstone	100.0	98.9	92.4	100.0	97.8	0	met
Mackay							
West Mackay	75.6	95.6	100.0	97.8	92.3	7	not met

ND = "not demonstrated" due to insufficient data

Regions for which monitoring has not yet been carried out (i.e. performance is "not demonstrated").

- Bundaberg
- Cairns
- Maryborough/Hervey Bay
- Mount Isa
- Rockhampton
- Townsville

Lead

No lead monitoring was conducted in Queensland in 2003. In the absence of non-vehicle sources of lead (e.g. metals smelting), no significant sources of lead now exist in most Queensland regions following the phase-out of leaded motor vehicle fuel from March 2001. Annual lead concentrations measured at the south-east Queensland performance monitoring station (Woolloongabba) were less than 10 percent of the AAQ NEPM standard for both 2001 (0.03 µg/m^3) and 2002 (0.02 µg/m^3). As outlined in the National Environment Protection (Ambient Air Quality) Measure Technical Paper No. 9, "Lead Monitoring" (available from *www.ephc.gov.au*), these measurements demonstrate that compliance with the AAQ NEPM standard and 2008 goal has been achieved in south-east Queensland, and monitoring of lead ceased from the end of 2002.

Regions which do not require monitoring on the basis of screening arguments that pollutant levels are reasonably expected to be consistently below the relevant NEPM standard (i.e performance is "met").

- Bundaberg
- Cairns
- Gladstone
- Mackay
- Maryborough/Hervey Bay
- Rockhampton
- South-east Queensland
- Toowoomba
- Townsville

Peak lead concentrations in south-east Queensland have been less than 40 percent of the AAQ NEPM standard since 1999 (see section D, table 46). On this basis, lead monitoring in other Queensland centres with lower population and traffic density (with the exception of Mount Isa where additional lead emission sources exist) is not required under screening procedure F in table 1 of the National Environment Protection (Ambient Air Quality) Measure Technical Paper No. 4, "Screening Procedures".

Regions for which monitoring has not yet been carried out (i.e. performance is "not demonstrated").

- Mount Isa

Section C – Assessment of monitoring data against the standards

Information provided in this section allows qualitative and quantitative assessment and comparison of monitoring data against the standards for 2003. Statistics provided include the listing of exceedences and circumstances which led to these exceedences, and annual maxima, the second highest (for carbon monoxide, nitrogen dioxide, ozone and sulfur dioxide) and sixth highest (for PM_{10}) daily concentrations, together with the date and site of each occurrence. Exceedence details are provided in tables 7 to 9. Summary maxima statistics are provided in tables 10 to 17.

Details of $PM_{2.5}$ measurements obtained using the TEOM method outlined in the AAQ NEPM "Technical Paper on Monitoring for Particles as $PM_{2.5}$" are also provided, however this information cannot be used for comparison with the AAQ NEPM advisory reporting standards until the outcomes of the $PM_{2.5}$ equivalence program have been formally included in the principal measure.

Exceedence summary

During 2003, exceedences of AAQ NEPM standards occurred for sulfur dioxide and PM_{10}. There were no exceedences of the AAQ NEPM standards for carbon monoxide, nitrogen dioxide and ozone. Lead monitoring was not conducted in 2003, as compliance with the standard and 2008 goal was demonstrated in 2002 for all regions with the exception of Mount Isa where monitoring is yet to commence. TEOM $PM_{2.5}$ 24-hour concentrations were greater than the AAQ NEPM advisory reporting standard on two occasions.

Table 7: 2003 sulfur dioxide exceedences in Queensland

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

Region/ Performance monitoring station	Standard	Concentration (ppm)	Date	Time	Circumstances
Mount Isa					
Menzies	1-hour	0.658	May16	12	Industry emissions
		0.654	Nov04	16	Industry emissions
		0.643	Apr02	16	Industry emissions
		0.503	Jul11	18	Industry emissions
		0.501	Mar31	13	Industry emissions
		0.498	Dec09	20	Industry emissions
		0.493	Mar24	16	Industry emissions
		0.477	Aug30	16	Industry emissions
		0.431	Feb24	09	Industry emissions
		0.408	Nov27	19	Industry emissions
		0.397	Sep29	16	Industry emissions
		0.371	Jun24	16	Industry emissions
		0.364	Oct19	19	Industry emissions
		0.364	Oct15	17	Industry emissions
		0.353	Oct18	17	Industry emissions
		0.349	Sep06	16	Industry emissions
		0.322	Mar20	18	Industry emissions
		0.312	Feb08	17	Industry emissions
		0.312	Dec11	17	Industry emissions
		0.309	Apr04	16	Industry emissions
		0.034	Jun27	15	Industry emissions
		0.302	Dec07	15	Industry emissions
		0.302	Dec08	19	Industry emissions
		0.271	Nov20	14	Industry emissions
		0.270	Mar01	17	Industry emissions
		0.268	Feb14	15	Industry emissions
		0.268	Oct06	13	Industry emissions
		0.264	Feb09	19	Industry emissions
		0.249	Mar21	16	Industry emissions
		0.243	Oct02	20	Industry emissions
		0.237	Aug13	18	Industry emissions
		0.229	Oct12	15	Industry emissions
		0.226	Sep26	15	Industry emissions
		0.224	Nov05	15	Industry emissions
		0.221	Feb26	12	Industry emissions
		0.220	Jan30	16	Industry emissions
		0.217	Jul28	16	Industry emissions
		0.214	Jun19	17	Industry emissions
		0.211	Jan29	12	Industry emissions
		0.209	Jan02	16	Industry emissions
		0.208	Dec10	16	Industry emissions
		0.202	Jul02	17	Industry emissions
	24-hour	0.093	Dec09	24	Industry emissions
		0.087	Feb24	24	Industry emissions

Table 8: 2003 PM_{10} exceedences in Queensland

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

Region/ Performance monitoring station	Concentration (µg/m³)	Date	Time	Circumstances
South-east Queensland Mountain Creek	69.0	Oct29	24	Dust storm
South-east Queensland Rocklea	119.9 54.6	Oct29 Sep19	24 24	Dust storm Bushfire smoke
South-east Queensland Springwood	94.1	Oct29	24	Dust storm
South-east Queensland Flinders View	119.1	Oct29	24	Dust storm
Toowoomba North Toowoomba	139.8	Oct29	24	Dust storm
Mackay West Mackay	85.0 71.0 55.8 53.4 52.9 52.8 52.4	Sep16 Oct27 Sep15 Sep17 Oct02 Jul15 Sep23	24 24 24 24 24 24 24	Dust generated by nearby commercial activities Dust generated by nearby commercial activities Dust generated by nearby commercial activities, coupled with smoke from sugarcane burning Dust generated by nearby commercial activities Dust generated by nearby commercial activities Dust generated by nearby commercial activities Dust generated by nearby commercial activities

Table 9: 2003 $PM_{2.5}$ exceedences in Queensland

AAQ NEPM advisory reporting standard
25 µg/m³ (24-hour average)
8 µg/m³ (1-year average)

Region/ Performance monitoring station	Concentration (µg/m³)	Date	Time	Circumstances
South-east Queensland Rocklea	33.1	Sep19	24	Bushfire smoke
Toowoomba North Toowoomba	28.1	Oct29	24	Dust storm

2003 maximum, second-highest and sixth-highest concentration summaries

Table 10: 2003 summary statistics for daily peak 8-hour CO in Queensland

AAQ NEPM standard
9.0 ppm (8-hour average)

Region/ Performance monitoring station	Number of valid days	Highest (ppm)	Highest (date:hour)	2nd highest (ppm)	2nd highest (date:time)
South-east Queensland Brisbane CBD	359	2.7	Aug07:02	2.4	Jun07:01
Toowoomba North Toowoomba	167	2.6	Jul28:02	2.5	Jul29:02

Table 11: 2003 summary statistics for daily peak 1-hour nitrogen dioxide in Queensland

AAQ NEPM standard
0.12 ppm (1-hour average)

Region/ Performance monitoring station	Number of valid days	Highest (ppm)	Highest (date:hour)	2nd highest (ppm)	2nd highest (date:time)
South-east Queensland					
Mountain Creek	365	0.033	Apr29:19	0.030	May26:18
Deception Bay	355	0.053	Oct05:09	0.037	Apr29:20
Rocklea	360	0.050	Apr09:19	0.047	Sep19:21
Springwood	365	0.041	Jun07:19	0.040	Sep19:09
Flinders View	355	0.046	May19:18	0.044	Apr09:19
Toowoomba					
North Toowoomba	170	0.057	Sep18:08	0.042	Sep24:20
Gladstone					
South Gladstone	362	0.035	Sep18:11	0.033	Sep03:19

Table 12: 2003 summary statistics for daily peak 1-hour ozone in Queensland

AAQ NEPM standard
0.10 ppm (1-hour average)

Region/ Performance monitoring station	Number of valid days	Highest (ppm)	Highest (date:hour)	2nd highest (ppm)	2nd highest (date:time)
South-east Queensland					
Mountain Creek	365	0.060	Sep20:13	0.047	Oct22:15
Deception Bay	362	0.095	Sep20:13	0.068	Sep06:15
Rocklea	364	0.065	Oct25:13 Dec23:12		
Springwood	365	0.047	Sep12:15	0.041	Oct25:13
Flinders View	362	0.087	Dec23:13	0.080	Jan22:14
Toowoomba					
North Toowoomba	170	0.066	Dec23:19	0.061	Sep22:15
Gladstone					
Targinie	365	0.045	Jan09:16	0.038	Jan04:06

Table 13: 2003 summary statistics for daily peak 4-hour ozone in Queensland

AAQ NEPM standard
0.08 ppm (4-hour average)

Region/ Performance monitoring station	Number of valid days	Highest (ppm)	Highest (date:hour)	2nd highest (ppm)	2nd highest (date:time)
South-east Queensland					
Mountain Creek	365	0.057	Sep20:15	0.045	Oct22:16
Deception Bay	365	0.076	Sep20:15	0.062	Apr29:18
Rocklea	364	0.059	Dec23:14	0.058	Oct25:15
Springwood	365	0.042	Sep12:16	0.039	Oct25:15
Flinders View	362	0.080	Dec23:15	0.071	Jan30:15
Toowoomba					
North Toowoomba	171	0.062	Dec23:19	0.055	Nov16:17
Gladstone					
Targinie	365	0.041	Jan09:17	0.036	Jan04:07

Table 14: 2003 summary statistics for daily peak 1-hour sulfur dioxide in Queensland

AAQ NEPM standard
0.20 ppm (1-hour average)

Region/ Performance monitoring station	Number of valid days	Highest (ppm)	Highest (date:hour)	2nd highest (ppm)	2nd highest (date:time)
South-east Queensland					
Springwood	365	0.023	Jul28:10	0.014	May19:23
Flinders View	361	0.046	Dec09:12	0.037	Jun20:12
Gladstone					
South Gladstone	350	0.112	Jul07:11	0.066	Dec29:16
Townsville					
Stuart	303	0.008	Mar07:21	0.006	Apr18:18
Mount Isa					
Menzies	365	0.658	May16:12	0.654	Nov04:16

Table 15: 2003 summary statistics for 24-hour sulfur dioxide in Queensland

AAQ NEPM standard
0.08 ppm (24-hour average)

Region/ Performance monitoring station	Number of valid days	Highest (ppm)	Highest (date)	2nd highest (ppm)	2nd highest (date)
South-east Queensland					
Springwood	360	0.004	May19	0.003	Sep25
Flinders View	352	0.006	Jan09 Feb05		
Gladstone					
South Gladstone	340	0.013	Dec17	0.012	Dec16
Townsville					
Stuart	300	0.001	18 days in total		
Mount Isa					
Menzies	361	0.093	Dec09	0.087	Feb24

Table 16: 2003 summary statistics for 24-hour PM_{10} in Queensland

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

Region/ Performance monitoring station	Number of valid days	Highest (µg/m³)	Highest (date)	6th highest (µg/m³)	6th highest (date)
South-east Queensland					
Mountain Creek	363	69.0	Oct29	35.8	Sep20
Rocklea	359	119.9	Oct29	36.9	Oct31
Springwood	355	94.1	Oct29	33.4	Sep19
Flinders View	350	119.1	Oct29	31.4	Sep05
Toowoomba					
North Toowoomba	150	139.8	Oct29	34.0	Sep25
Gladstone					
South Gladstone	357	41.3	Sep18	33.4	Jan10
Mackay					
West Mackay	337	85.0	Sep15	52.8	Jul15

Table 17: 2003 summary statistics for 24-hour $PM_{2.5}$ in Queensland

AAQ NEPM advisory reporting standard
25 µg/m³ (24-hour average)
8 µg/m³ (1-year average)

Region/ Performance monitoring station	Number of valid days	Highest (µg/m³)	Highest (date)
South-east Queensland			
Rocklea	360	33.1	Sep19
Springwood	361	20.6	Sep19
Toowoomba			
North Toowoomba	127	28.1	Oct29

Section D – Data analysis

This section provides pollutant distribution information for 2003 (tables 18 to 25), and multi-year data for nominated trend stations in the Queensland air monitoring plan (tables 26 to 46).

2003 pollutant distribution information

Table 18: Percentiles of daily peak 8-hour carbon monoxide concentrations for 2003

AAQ NEPM standard
9.0 ppm (8-hour average)

	Data availability rates (%)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)	75th percentile (ppm)	50th percentile (ppm)
South-east Queensland								
Brisbane CBD	97.5	2.7	2.2	1.9	1.5	1.2	0.6	0.3
Toowoomba								
North Toowoomba	42.4	2.6	2.5	2.3	2.2	1.9	1.5	0.6

Table 19: Percentiles of daily peak 1-hour nitrogen dioxide concentrations for 2003

AAQ NEPM standard
0.12 ppm (1-hour average)

	Data availability rates (%)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)	75th percentile (ppm)	50th percentile (ppm)
South-east Queensland								
Mountain Creek	91.4	0.033	0.029	0.028	0.026	0.023	0.017	0.011
Deception Bay	87.0	0.053	0.036	0.033	0.030	0.028	0.023	0.016
Rocklea	90.7	0.050	0.039	0.038	0.033	0.030	0.024	0.018
Springwood	98.2	0.041	0.036	0.033	0.031	0.029	0.025	0.019
Flinders View	88.2	0.046	0.039	0.037	0.033	0.029	0.024	0.018
Toowoomba								
North Toowoomba	43.7	0.057	0.042	0.038	0.032	0.029	0.025	0.015
Gladstone								
South Gladstone	89.2	0.035	0.030	0.027	0.024	0.022	0.016	0.011

Table 20: Percentiles of daily peak 1-hour ozone concentrations for 2003

AAQ NEPM standard
0.10 ppm (1-hour average)

	Data availability rates (%)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)	75th percentile (ppm)	50th percentile (ppm)
South-east Queensland								
Mountain Creek	91.6	0.060	0.045	0.044	0.039	0.035	0.031	0.027
Deception Bay	89.3	0.095	0.063	0.057	0.047	0.043	0.038	0.032
Rocklea	92.2	0.065	0.063	0.059	0.052	0.046	0.036	0.030
Springwood	98.8	0.047	0.040	0.039	0.036	0.034	0.027	0.023
Flinders View	90.4	0.087	0.073	0.068	0.056	0.048	0.039	0.031
Toowoomba								
North Toowoomba	43.7	0.066	0.061	0.061	0.051	0.046	0.040	0.035
Gladstone								
Targinie	97.4	0.045	0.035	0.034	0.032	0.031	0.028	0.025

Table 21: Percentiles of daily peak 4-hour ozone concentrations for 2003

AAQ NEPM standard
0.08 ppm (4-hour average)

	Data availability rates (%)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)	75th percentile (ppm)	50th percentile (ppm)
South-east Queensland								
Mountain Creek	91.6	0.057	0.043	0.041	0.036	0.033	0.030	0.026
Deception Bay	89.3	0.076	0.060	0.052	0.044	0.040	0.035	0.030
Rocklea	92.2	0.059	0.053	0.051	0.047	0.042	0.034	0.028
Springwood	98.8	0.042	0.037	0.035	0.033	0.030	0.026	0.021
Flinders View	90.4	0.080	0.067	0.059	0.049	0.044	0.035	0.029
Toowoomba								
North Toowoomba	43.7	0.062	0.055	0.053	0.046	0.043	0.038	0.033
Gladstone								
Targinie	97.4	0.041	0.033	0.032	0.030	0.028	0.026	0.023

Table 22: Percentiles of daily peak 1-hour sulfur dioxide concentrations for 2003

AAQ NEPM standard
0.20 ppm (1-hour average)

	Data availability rates (%)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)	75th percentile (ppm)	50th percentile (ppm)
South-east Queensland								
Springwood	98.8	0.023	0.011	0.009	0.007	0.005	0.003	0.001
Flinders View	89.9	0.046	0.031	0.030	0.023	0.017	0.009	0.003
Gladstone								
South Gladstone	91.4	0.112	0.058	0.041	0.025	0.019	0.011	0.006
Townsville								
Stuart	78.9	0.008	0.006	0.004	0.003	0.002	0.001	0.001
Mount Isa								
Menzies	93.0	0.658	0.503	0.493	0.312	0.217	0.053	0.004

Table 23: Percentiles of daily 24-hour sulfur dioxide concentrations for 2003

AAQ NEPM standard
0.08 ppm (24-hour average)

	Data availability rates (%)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)	75th percentile (ppm)	50th percentile (ppm)
South-east Queensland								
Springwood	98.8	0.004	0.003	0.002	0.002	0.002	0.001	0.001
Flinders View	89.9	0.006	0.005	0.004	0.003	0.002	0.001	0.001
Gladstone								
South Gladstone	91.4	0.013	0.011	0.007	0.005	0.003	0.002	0.001
Townsville								
Stuart	78.9	0.001	0.001	0.001	0.001	0.000	0.000	0.000
Mount Isa								
Menzies	93.0	0.093	0.067	0.057	0.036	0.022	0.005	0.001

Table 24: Percentiles of daily 24-hour PM_{10} concentrations for 2003

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

	Data availability rates (%)	Max conc. (µg/m³)	99th percentile (µg/m³)	98th percentile (µg/m³)	95th percentile (µg/m³)	90th percentile (µg/m³)	75th percentile (µg/m³)	50th percentile (µg/m³)
South-east Queensland								
Mountain Creek	99.5	69.0	37.0	32.4	27.4	22.4	18.2	13.7
Rocklea	98.4	119.9	41.7	33.6	28.2	24.2	19.6	14.9
Springwood	97.3	94.1	33.7	31.7	26.8	22.8	18.6	14.5
Flinders View	95.9	119.1	35.1	30.5	26.0	23.0	19.0	14.7
Toowoomba								
North Toowoomba	41.1	139.8	42.0	35.2	33.2	30.1	24.6	15.7
Gladstone								
South Gladstone	97.8	41.3	35.5	33.1	26.2	23.2	18.0	14.1
Mackay								
West Mackay	92.3	85.0	53.2	49.1	38.9	32.2	25.3	19.2

Table 25: Percentiles of daily 24-hour $PM_{2.5}$ concentrations for 2003

AAQ NEPM advisory reporting standards
25 µg/m³ (24-hour average)
8 µg/m³ (1-year average)

	Data availability rates (%)	Max conc. (µg/m³)	99th percentile (µg/m³)	98th percentile (µg/m³)	95th percentile (µg/m³)	90th percentile (µg/m³)	75th percentile (µg/m³)	50th percentile (µg/m³)
South-east Queensland								
Rocklea	98.6	33.1	14.3	12.4	9.6	7.9	5.7	3.9
Springwood	98.9	20.6	15.8	15.0	10.8	8.8	6.5	4.8
Toowoomba								
North Toowoomba	34.8	28.1	19.0	17.1	15.3	12.1	9.3	5.2

Multi-year statistics for trend stations

Table 26: Daily peak 8-hour carbon monoxide summary 1998 to 2003

Trend station/region: Brisbane CBD, south-east Queensland

AAQ NEPM standard
9.0 ppm (8-hour average)

Year	Data availability (%)	No. of exceedences (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
1998	*73.9**	*0*	*3.4*	*3.3*	*2.7*	*2.6*	*2.3*
1999	80.8*	0	5.8	3.6	3.5	2.9	2.7
2000	95.0	0	2.7	2.6	2.4	2.2	1.8
2001	97.2	0	3.3	2.4	2.2	1.9	1.6
2002	*74.5**	*0*	*2.5*	*2.3*	*2.1*	*1.6*	*1.5*
2003	97.5	0	2.7	2.2	1.9	1.5	1.2

*Data availability less than 75 percent for one or more quarters. Years shown in italics have less than 75 percent annual data availability.

Table 27: Daily peak 1-hour nitrogen dioxide summary 1995 to 2003

Trend station/region: Deception Bay, south-east Queensland

AAQ NEPM standard
0.12 ppm (1-hour average)

Year	Data availability (%)	No. of exceedences (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
1995	91.8	0	0.058	0.054	0.046	0.038	0.033
1996	*67.2**	*0*	*0.048*	*0.043*	*0.042*	*0.034*	*0.030*
1997	91.6	0	0.043	0.038	0.036	0.032	0.028
1998	93.3	0	0.066	0.050	0.039	0.031	0.026
1999	92.4	0	0.058	0.039	0.030	0.028	0.024
2000	94.6	0	0.053	0.038	0.034	0.029	0.025
2001	92.0	0	0.047	0.040	0.039	0.034	0.030
2002	80.5*	0	0.065	0.044	0.042	0.036	0.030
2003	87.0	0	0.053	0.036	0.033	0.030	0.028

*Data availability less than 75 percent for one or more quarters. Years shown in italics have less than 75 percent annual data availability.

Table 28: Daily peak 1-hour nitrogen dioxide summary 1995 to 2003

Trend station/region: Flinders View, south-east Queensland

AAQ NEPM standard
0.12 ppm (1-hour average)

Year	Data availability (%)	No. of exceedences (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
1995	89.9*	0	0.038	0.037	0.035	0.031	0.028
1996	94.3	0	0.055	0.050	0.044	0.037	0.033
1997	93.0	0	0.046	0.042	0.040	0.036	0.030
1998	92.7	0	0.048	0.041	0.039	0.034	0.030
1999	94.1	0	0.046	0.039	0.038	0.032	0.029
2000	94.6	0	0.042	0.040	0.038	0.034	0.031
2001	94.7	0	0.045	0.037	0.036	0.034	0.031
2002	81.9*	0	0.062	0.057	0.043	0.036	0.033
2003	88.2	0	0.046	0.039	0.037	0.033	0.029

*Data availability less than 75 percent for one or more quarters.

Table 29: Daily peak 1-hour nitrogen dioxide summary 1980 to 2003

Trend station/region: Rocklea, south-east Queensland

AAQ NEPM standard
0.12 ppm (1-hour average)

Year	Data availability (%)	No. of exceedences (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
1980	92.3	0	0.070	0.065	0.058	0.043	0.038
1981	76.1*	0	0.070	0.060	0.051	0.041	0.037
1982	92.3	0	0.073	0.058	0.054	0.048	0.040
1983	92.2	0	0.056	0.050	0.042	0.033	0.030
1984	80.5	0	0.076	0.061	0.056	0.048	0.041
1985	88.1	0	0.048	0.044	0.039	0.035	0.031
1986	80.7	2	0.160	0.099	0.069	0.056	0.045
1987	87.8	0	0.089	0.078	0.067	0.060	0.052
1988	*65.1**	*0*	*0.114*	*0.083*	*0.077*	*0.066*	*0.055*
1989	85.3	0	0.073	0.069	0.061	0.054	0.047
1990	75.9	0	0.079	0.070	0.064	0.053	0.046
1991	89.9	0	0.113	0.085	0.071	0.061	0.052
1992	76.7	2	0.157	0.072	0.065	0.052	0.042
1993	87.0	0	0.086	0.066	0.058	0.047	0.040
1994	91.1	0	0.096	0.062	0.057	0.051	0.045
1995	79.6*	0	0.066	0.050	0.048	0.040	0.036
1996	87.9*	0	0.058	0.055	0.044	0.040	0.036
1997	93.0	0	0.061	0.043	0.042	0.039	0.033
1998	93.6	0	0.056	0.046	0.041	0.038	0.033
1999	87.5*	0	0.054	0.044	0.042	0.034	0.029
2000	92.3	0	0.059	0.046	0.043	0.037	0.032
2001	93.7	0	0.049	0.042	0.041	0.035	0.032
2002	90.3	0	0.051	0.046	0.041	0.037	0.033
2003	90.7	0	0.050	0.039	0.038	0.033	0.030

*Data availability less than 75 percent for one or more quarters. Years shown in italics have less than 75 percent annual data availability.

Table 30: Daily peak 1-hour nitrogen dioxide summary 1994 to 2003

Trend station/region: South Gladstone, Gladstone

AAQ NEPM standard
0.12 ppm (1-hour average)

Year	Data availability (%)	No. of exceedences (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
1994	81.8*	0	0.049	0.047	0.044	0.038	0.028
1995	89.4	0	0.038	0.030	0.028	0.025	0.022
1996	80.7*	0	0.045	0.039	0.035	0.032	0.029
1997	*64.2**	*0*	*0.031*	*0.030*	*0.029*	*0.022*	*0.017*
1998	*71.8**	*0*	*0.022*	*0.020*	*0.018*	*0.015*	*0.012*
1999	87.8*	0	0.034	0.029	0.029	0.025	0.021
2000	94.1	0	0.031	0.025	0.024	0.022	0.019
2001	92.3	0	0.048	0.033	0.031	0.026	0.023
2002	90.4	0	0.036	0.031	0.029	0.026	0.021
2003	89.2	0	0.035	0.030	0.027	0.024	0.022

*Data availability less than 75 percent for one or more quarters. Years shown in italics have less than 75 percent annual data availability.

Table 31: Daily peak 1-hour ozone summary 1995 to 2003

Trend station/region: Deception Bay, south-east Queensland

AAQ NEPM standard
0.10 ppm (1-hour average)

Year	Data availability (%)	No. of exceedences (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
1995	91.7	0	0.083	0.075	0.070	0.052	0.047
1996	92.4	0	0.091	0.073	0.064	0.055	0.048
1997	95.5	0	0.079	0.065	0.057	0.048	0.043
1998	90.9	0	0.069	0.060	0.053	0.048	0.044
1999	94.8	0	0.092	0.062	0.057	0.048	0.043
2000	94.9	0	0.070	0.058	0.054	0.046	0.041
2001	84.3*	0	0.079	0.058	0.054	0.048	0.044
2002	82.9*	0	0.071	0.063	0.061	0.048	0.044
2003	89.3	0	0.095	0.063	0.057	0.047	0.043

*Data availability less than 75 percent for one or more quarters.

Table 32: Daily peak 1-hour ozone summary 1980 to 2003

Trend station/region: Rocklea, south-east Queensland

AAQ NEPM standard
0.10 ppm (1-hour average)

Year	Data availability (%)	No. of exceedences (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
1980	92.7	0	0.083	0.078	0.066	0.058	0.050
1981	86.8	0	0.078	0.073	0.062	0.049	0.042
1982	92.3	1	0.102	0.070	0.065	0.057	0.047
1983	93.4	0	0.099	0.071	0.068	0.059	0.041
1984	91.4	1	0.102	0.070	0.064	0.055	0.046
1985	87.5	1	0.105	0.079	0.056	0.047	0.036
1986	81.1*	0	0.074	0.073	0.063	0.057	0.050
1987	*68.2**	*4*	*0.125*	*0.106*	*0.100*	*0.078*	*0.055*
1988	*70.5**	*1*	*0.101*	*0.085*	*0.069*	*0.047*	*0.039*
1989	83.5*	0	0.071	0.058	0.051	0.042	0.036
1990	79.0*	0	0.061	0.051	0.042	0.036	0.031
1991	93.9	0	0.061	0.053	0.045	0.039	0.031
1992	95.4	0	0.069	0.059	0.049	0.039	0.035
1993	95.7	0	0.096	0.063	0.059	0.054	0.050
1994	94.3	1	0.127	0.083	0.073	0.059	0.050
1995	78.1*	0	0.098	0.086	0.070	0.061	0.053
1996	94.1	2	0.135	0.090	0.085	0.071	0.060
1997	94.1	0	0.093	0.085	0.077	0.065	0.053
1998	91.4	1	0.103	0.080	0.078	0.064	0.053
1999	90.5	1	0.135	0.093	0.066	0.057	0.047
2000	92.1	0	0.088	0.076	0.066	0.057	0.049
2001	94.2	0	0.093	0.072	0.063	0.055	0.047
2002	90.4	2	0.118	0.075	0.073	0.060	0.054
2003	92.2	0	0.065	0.063	0.059	0.052	0.046

*Data availability less than 75 percent for one or more quarters. Years shown in italics have less than 75 percent annual data availability.

Table 33: Daily peak 1-hour ozone summary 1994 to 2003

Trend station/region: Flinders View, south-east Queensland

AAQ NEPM standard
0.10 ppm (1-hour average)

Year	Data availability (%)	No. of exceedences (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
1994	93.3	0	0.076	0.069	0.062	0.056	0.048
1995	90.3	0	0.079	0.071	0.065	0.056	0.051
1996	94.9	2	0.125	0.082	0.075	0.063	0.055
1997	93.8	2	0.106	0.094	0.078	0.066	0.056
1998	91.6	0	0.100	0.085	0.076	0.066	0.056
1999	94.0	1	0.127	0.082	0.077	0.055	0.048
2000	94.6	1	0.116	0.073	0.070	0.060	0.054
2001	94.4	0	0.079	0.074	0.070	0.059	0.051
2002	88.6	0	0.098	0.080	0.078	0.070	0.062
2003	90.4	0	0.087	0.073	0.068	0.056	0.048

Table 34: Daily peak 4-hour ozone summary 1995 to 2003

Trend station/region: Deception Bay, south-east Queensland

AAQ NEPM standard
0.08 ppm (4-hour average)

Year	Data availability (%)	No. of exceedences (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
1995	91.7	0	0.077	0.061	0.057	0.047	0.043
1996	92.4	0	0.076	0.065	0.059	0.049	0.045
1997	95.5	0	0.066	0.053	0.050	0.044	0.040
1998	90.9	0	0.059	0.054	0.049	0.043	0.040
1999	94.8	1	0.083	0.055	0.052	0.043	0.039
2000	94.9	0	0.063	0.050	0.049	0.042	0.038
2001	84.3*	0	0.075	0.056	0.050	0.044	0.040
2002	82.9*	0	0.067	0.060	0.053	0.044	0.041
2003	89.3	0	0.076	0.060	0.052	0.044	0.040

*Data availability less than 75 percent for one or more quarters.

Table 35: Daily peak 4-hour ozone summary 1980 to 2003

Trend station/region: Rocklea, south-east Queensland

AAQ NEPM standard 0.08 ppm (4-hour average)

Year	Data availability (%)	No. of exceedences (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
1980	92.7	0	0.076	0.063	0.059	0.049	0.043
1981	86.8	0	0.069	0.056	0.051	0.043	0.038
1982	92.3	0	0.076	0.058	0.053	0.048	0.040
1983	93.4	0	0.078	0.058	0.054	0.047	0.036
1984	91.4	0	0.080	0.059	0.054	0.047	0.041
1985	87.5	1	0.090	0.069	0.051	0.039	0.031
1986	81.1*	0	0.063	0.059	0.052	0.049	0.041
1987	*68.2**	*8*	*0.110*	*0.094*	*0.093*	*0.066*	*0.049*
1988	*70.5**	*1*	*0.081*	*0.065*	*0.050*	*0.041*	*0.035*
1989	83.5*	0	0.060	0.048	0.042	0.037	0.032
1990	79.0*	0	0.053	0.042	0.037	0.030	0.028
1991	93.9	0	0.054	0.043	0.039	0.032	0.026
1992	95.4	0	0.058	0.052	0.042	0.034	0.031
1993	95.7	0	0.074	0.054	0.053	0.048	0.043
1994	94.3	1	0.101	0.075	0.063	0.051	0.043
1995	78.1*	0	0.080	0.070	0.058	0.054	0.047
1996	94.1	1	0.111	0.076	0.070	0.061	0.051
1997	94.1	0	0.080	0.069	0.064	0.056	0.045
1998	91.4	1	0.091	0.068	0.064	0.057	0.049
1999	90.5	1	0.102	0.066	0.058	0.049	0.042
2000	92.1	0	0.072	0.063	0.054	0.049	0.044
2001	94.2	0	0.071	0.063	0.056	0.048	0.043
2002	90.4	1	0.105	0.068	0.061	0.054	0.047
2003	92.2	0	0.059	0.053	0.051	0.047	0.042

*Data availability less than 75 percent for one or more quarters. Years shown in italics have less than 75 percent annual data availability.

Table 36: Daily peak 4-hour ozone summary 1994 to 2003

Trend station/region: Flinders View, south-east Queensland

AAQ NEPM standard 0.08 ppm (4-hour average)

Year	Data availability (%)	No. of exceedences (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
1994	91.7	0	0.072	0.058	0.056	0.047	0.043
1995	92.4	0	0.066	0.062	0.060	0.050	0.044
1996	95.5	2	0.091	0.068	0.065	0.058	0.049
1997	90.9	2	0.090	0.073	0.067	0.056	0.049
1998	94.8	0	0.069	0.065	0.064	0.057	0.049
1999	94.9	1	0.101	0.067	0.064	0.049	0.043
2000	94.6	1	0.089	0.064	0.061	0.052	0.048
2001	94.4	0	0.072	0.066	0.058	0.052	0.047
2002	88.6	1	0.083	0.070	0.066	0.061	0.055
2003	90.4	0	0.080	0.067	0.059	0.049	0.044

Table 37: Daily peak 1-hour sulfur dioxide summary 1993 to 2003

Trend station/region: Flinders View, south-east Queensland

AAQ NEPM standard
0.20 ppm (1-hour average)

Year	Data availability (%)	No. of exceedences (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
1993	89.2*	0	0.049	0.030	0.024	0.018	0.014
1994	99.0	0	0.033	0.027	0.025	0.021	0.017
1995	*59.3**	*0*	*0.041*	*0.029*	*0.027*	*0.020*	*0.014*
1996	85.8*	0	0.047	0.037	0.027	0.023	0.017
1997	93.5	0	0.047	0.040	0.035	0.023	0.019
1998	92.8	0	0.090	0.037	0.033	0.024	0.019
1999	92.8	0	0.070	0.035	0.033	0.028	0.021
2000	86.0*	0	0.081	0.049	0.036	0.027	0.022
2001	94.6	0	0.053	0.048	0.043	0.029	0.023
2002	89.4	0	0.057	0.035	0.033	0.025	0.018
2003	89.8	0	0.046	0.031	0.030	0.023	0.017

*Data availability less than 75 percent for one or more quarters. Years shown in italics have less than 75 percent annual data availability.

Table 38: Daily peak 1-hour sulfur dioxide summary 1991 to 2003

Trend station/region: South Gladstone, Gladstone

AAQ NEPM standard
0.20 ppm (1-hour average)

Year	Data availability (%)	No. of exceedences (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
1991	89.3	0	0.011	0.011	0.009	0.008	0.006
1992	92.1	0	0.052	0.039	0.029	0.020	0.015
1993	95.0	0	0.075	0.059	0.050	0.039	0.032
1994	94.2	0	0.070	0.042	0.040	0.031	0.024
1995	95.9	0	0.168	0.083	0.065	0.047	0.035
1996	96.5	0	0.083	0.053	0.042	0.026	0.018
1997	94.9	0	0.049	0.029	0.023	0.014	0.010
1998	91.0	0	0.076	0.050	0.042	0.027	0.020
1999	90.4	0	0.051	0.042	0.039	0.027	0.022
2000	81.1*	0	0.092	0.071	0.045	0.034	0.024
2001	92.1	0	0.068	0.046	0.035	0.023	0.018
2002	87.6	0	0.123	0.040	0.031	0.025	0.020
2003	91.4	0	0.112	0.058	0.041	0.025	0.019

*Data availability less than 75 percent for one or more quarters. Years shown in italics have less than 75 percent annual data availability.

Table 39: Daily peak 1-hour sulfur dioxide summary 1983 to 2003

Trend station/region: Menzies, Mount Isa

AAQ NEPM standard
0.20 ppm (1-hour average)

Year	Data availability (%)	No. of exceedences (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
1983	*66.6**	*25*	*0.725*	*0.515*	*0.430*	*0.270*	*0.200*
1984	91.4	31	1.155	0.555	0.515	0.330	0.185
1985	93.9	7	1.080	0.325	0.210	0.100	0.055
1986	85.4*	50	1.406	1.255	0.788	0.577	0.296
1987	95.1	51	1.755	1.016	0.853	0.546	0.324
1988	87.5*	31	0.798	0.682	0.562	0.342	0.159
1989	86.7	41	0.957	0.585	0.503	0.348	0.241
1990	*50.9**	*6*	*0.577*	*0.493*	*0.222*	*0.145*	*0.091*
1991	*61.5**	*28*	*0.673*	*0.638*	*0.440*	*0.294*	*0.215*
1992	85.7*	25	0.540	0.457	0.406	0.286	0.170
1993	92.1	24	0.718	0.434	0.403	0.282	0.134
1994	87.0	20	0.688	0.483	0.343	0.250	0.135
1995	91.2	11	0.443	0.254	0.239	0.184	0.109
1996	90.7	16	0.598	0.409	0.285	0.198	0.131
1997	91.3	7	0.300	0.256	0.216	0.128	0.083
1998	*46.6**	*16*	*0.693*	*0.548*	*0.368*	*0.265*	*0.190*
1999	87.1*	17	0.675	0.366	0.269	0.202	0.141
2000	92.1	31	0.584	0.373	0.357	0.250	0.191
2001	94.6	41	0.581	0.438	0.422	0.295	0.222
2002	85.6	49	1.254	0.551	0.526	0.385	0.272
2003	93.0	42	0.658	0.503	0.493	0.312	0.217

*Data availability less than 75 percent for one or more quarters. Years shown in italics have less than 75 percent annual data availability.

Table 40: Daily 24-hour sulfur dioxide summary 1993 to 2003

Trend station/region: Flinders View, south-east Queensland

AAQ NEPM standard
0.08 ppm (24-hour average)

Year	Data availability (%)	No. of exceedences (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
1993	88.4*	0	0.006	0.005	0.005	0.004	0.003
1994	98.9	0	0.008	0.007	0.006	0.006	0.005
1995	*58.9**	*0*	*0.009*	*0.008*	*0.006*	*0.005*	*0.004*
1996	88.4*	0	0.010	0.005	0.005	0.004	0.004
1997	97.2	0	0.009	0.006	0.005	0.004	0.003
1998	95.8	0	0.011	0.007	0.006	0.004	0.004
1999	96.9	0	0.009	0.007	0.007	0.005	0.004
2000	89.8	0	0.013	0.012	0.008	0.006	0.005
2001	99.4	0	0.014	0.007	0.006	0.004	0.003
2002	89.4	0	0.006	0.006	0.005	0.003	0.003
2003	89.8	0	0.006	0.005	0.004	0.003	0.002

*Data availability less than 75 percent for one or more quarters. Years shown in italics have less than 75 percent annual data availability.

Table 41: Daily 24-hour sulfur dioxide summary 1991 to 2003

Trend station/region: South Gladstone, Gladstone

AAQ NEPM standard
0.08 ppm (24-hour average)

Year	Data availability (%)	No. of exceedences (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
1991	92.1	0	0.007	0.006	0.006	0.004	0.004
1992	94.4	0	0.012	0.011	0.010	0.009	0.008
1993	98.9	0	0.014	0.010	0.010	0.008	0.007
1994	96.9	0	0.013	0.007	0.007	0.006	0.005
1995	96.6	0	0.017	0.014	0.012	0.008	0.007
1996	99.2	0	0.010	0.007	0.006	0.005	0.004
1997	98.9	0	0.007	0.004	0.003	0.002	0.002
1998	97.7	0	0.012	0.010	0.007	0.005	0.003
1999	94.1	0	0.009	0.008	0.006	0.005	0.004
2000	84.7*	0	0.022	0.008	0.006	0.004	0.003
2001	98.0	0	0.006	0.005	0.004	0.003	0.002
2002	87.6	0	0.029	0.029	0.006	0.004	0.003
2003	91.4	0	0.013	0.011	0.007	0.005	0.003

*Data availability less than 75 percent for one or more quarters. Years shown in italics have less than 75 percent annual data availability.

Table 42: Daily 24-hour sulfur dioxide summary 1984 to 2003

Trend station/region: Menzies, Mount Isa

AAQ NEPM standard
0.08 ppm (24-hour average)

Year	Data availability (%)	No. of exceedences (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
1984	94.1	3	0.094	0.087	0.071	0.053	0.033
1985	97.5	1	0.111	0.050	0.042	0.030	0.024
1986	88.7	11	0.145	0.123	0.101	0.071	0.052
1987	98.9	12	0.158	0.110	0.099	0.060	0.044
1988	90.7*	3	0.123	0.091	0.064	0.041	0.032
1989	85.3*	1	0.100	0.066	0.062	0.048	0.035
1990	*44.5**	*1*	*0.088*	*0.078*	*0.072*	*0.052*	*0.046*
1991	*55.2**	*3*	*0.117*	*0.100*	*0.073*	*0.053*	*0.038*
1992	88.4*	0	0.064	0.056	0.052	0.033	0.025
1993	95.5	0	0.064	0.052	0.046	0.040	0.027
1994	91.5	2	0.085	0.059	0.054	0.045	0.040
1995	99.2	0	0.049	0.036	0.028	0.018	0.012
1996	98.6	0	0.049	0.043	0.040	0.024	0.015
1997	98.9	0	0.034	0.028	0.022	0.016	0.010
1998	*48.7**	*0*	*0.055*	*0.041*	*0.037*	*0.029*	*0.019*
1999	90.7*	0	0.049	0.036	0.032	0.024	0.015
2000	96.6	0	0.078	0.070	0.055	0.032	0.019
2001	98.6	0	0.075	0.052	0.045	0.033	0.021
2002	85.6	1	0.081	0.057	0.055	0.043	0.033
2003	93.0	2	0.093	0.067	0.057	0.036	0.022

*Data availability less than 75 percent for one or more quarters. Years shown in italics have less than 75 percent annual data availability.

Table 43: Daily 24-hour PM_{10} summary 1997 to 2003

Trend station/region: Rocklea, south-east Queensland

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

Year	Data availability (%)	No. of exceedences (days)	Max conc. (µg/m³)	99th percentile (µg/m³)	98th percentile (µg/m³)	95th percentile (µg/m³)	90th percentile (µg/m³)
1997	92.9	0	45.8	42.7	32.1	28.9	26.5
1998	90.1	0	34.7	32.4	29.1	25.7	23.3
1999	96.7	1	56.7	31.6	30.4	25.5	22.3
2000	92.3	0	47.6	40.6	38.1	32.8	27.0
2001	97.3	1	69.5	35.2	34.2	27.2	24.4
2002	99.2	8	177.2	95.3	60.1	35.0	30.9
2003	98.4	2	119.9	41.7	33.6	28.2	24.2

Table 44: Daily 24-hour PM_{10} summary 1999 to 2003

Trend station/region: Flinders View, south-east Queensland

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

Year	Data availability (%)	No. of exceedences (days)	Max conc. (µg/m³)	99th percentile (µg/m³)	98th percentile (µg/m³)	95th percentile (µg/m³)	90th percentile (µg/m³)
1999	97.0	0	44.2	28.4	25.5	20.3	17.9
2000	97.8	1	61.1	42.3	38.5	32.0	26.4
2001	99.7	0	42.5	37.5	35.0	25.5	22.9
2002	97.5	7	197.2	103.3	60.8	35.9	31.8
2003	95.9	1	119.1	35.1	30.5	26.0	23.0

Table 45: Daily 24-hour PM_{10} summary 2001 to 2003

Trend station/region: South Gladstone, Gladstone

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

Year	Data availability (%)	No. of exceedences (days)	Max conc. (µg/m³)	99th percentile (µg/m³)	98th percentile (µg/m³)	95th percentile (µg/m³)	90th percentile (µg/m³)
2001	96.7	4	66.6	51.6	36.0	30.3	25.9
2002	99.7	5	197.0	83.0	48.5	33.8	26.3
2003	97.8	0	41.3	35.5	33.1	26.2	23.2

Table 46: Annual lead summary 1980 to 2002

Trend station/region: Woolloongabba, south-east Queensland

AAQ NEPM standard
0.5 µg/m³ (annual average)

Year	Data availability (%)	Annual average (µg/m³)
1980	91.8	2.21
1981	85.2*	2.69
1982	96.7	2.34
1983	96.7	2.21
1984	93.4	2.56
1985	86.9*	2.40
1986	100.0	1.90
1987	96.7	1.91
1988	98.4	2.13
1989	98.4	1.64
1990	98.4	1.47
1991	100.0	0.97
1992	90.2	0.63
1993	93.4	0.57
1994	96.7	0.48
1995	100.0	0.38
1996	98.4	0.25
1997	100.0	0.27
1998	*65.6*	*0.22*
1999	98.3	0.19
2000	88.5	0.14
2001	93.4	0.03
2002	96.7	0.02

*Data availability less than 75 percent for one or more quarters. Years shown in italics have less than 75 percent annual data availability.

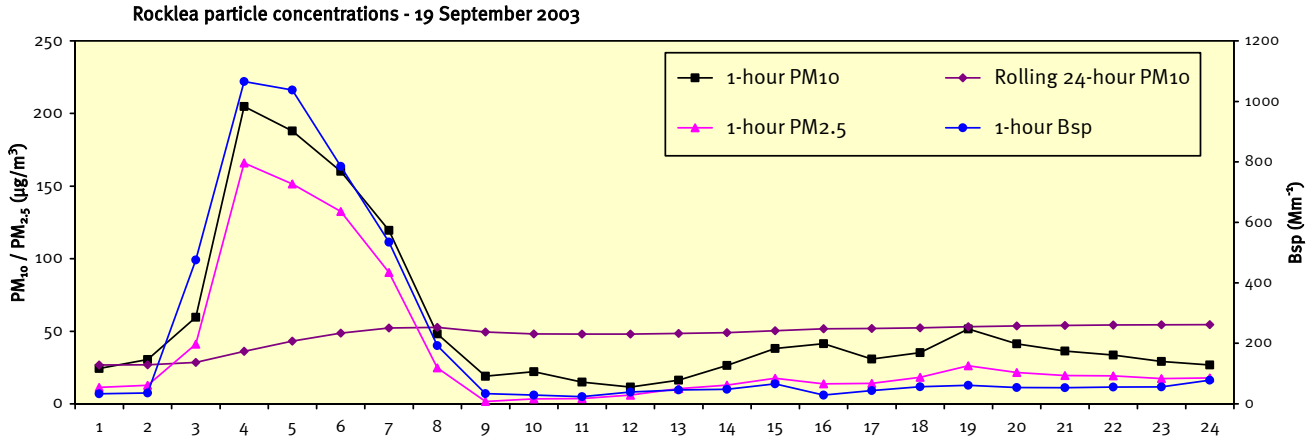
Appendix – Description of 2003 exceedence events

PM_{10} exceedence at Rocklea on 19 September 2003

In September there were two major bushfires in the south-east Queensland region. The first started on 10 September in the vicinity of Cunningham's Gap (50km south-west of Brisbane), and burned out over 8000ha of bushland over a two week period. The second fire started on North Stradbroke Island (20km east of Brisbane) on 15 September and burned out over 3000ha of bushland over the following week.

Smoke from these fires caused an exceedence of the Air NEPM PM_{10} standard at the Rocklea monitoring site on 19 September due to a build-up of particles under relatively calm conditions between 3:00am and 7:00am. Elevated $PM_{2.5}$ and Bsp (nephelometer) measurements at the same time confirm a high proportion of fine particles, consistent with the presence of smoke particles. Particle levels fell sharply with rising wind speeds from 8:00am.

The Air NEPM 24-hour advisory standard (measured by TEOM instrumentation) was also exceeded at the Rocklea site on this day.

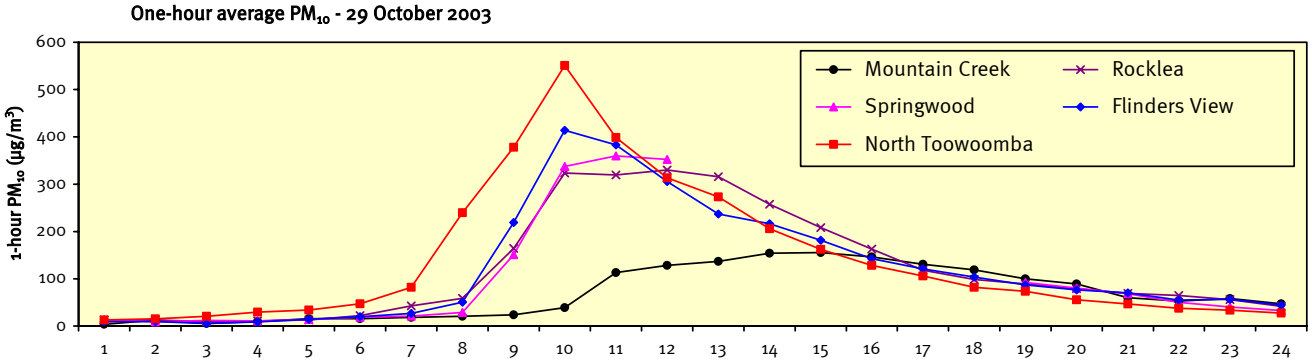


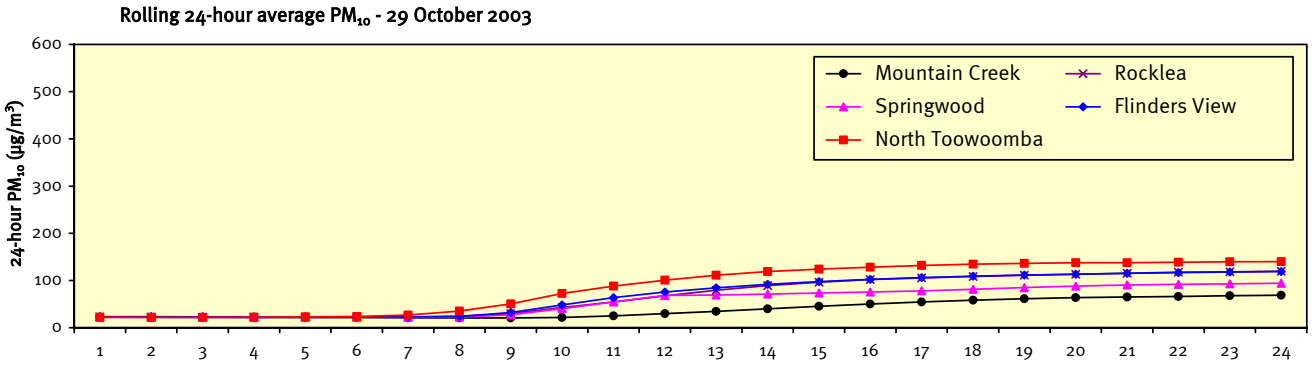
PM_{10} exceedences at south-east Queensland and Toowoomba monitoring sites on 29 October 2003

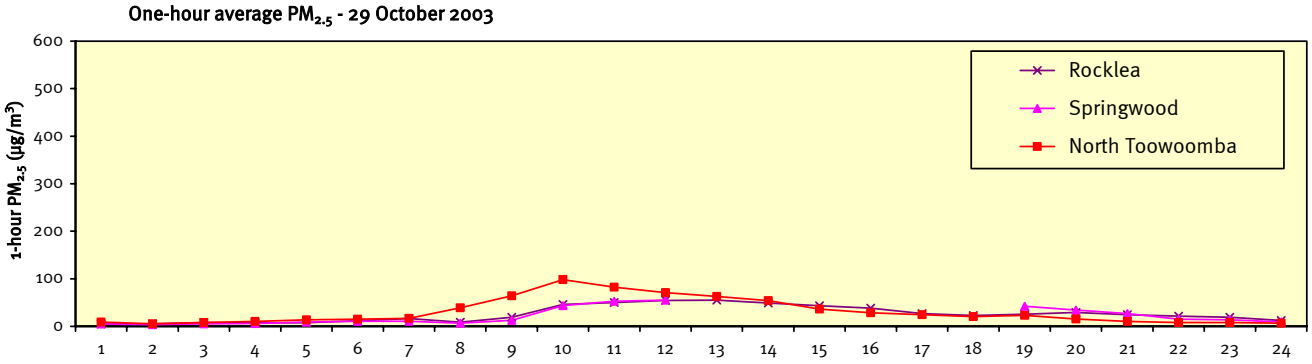
Strong westerly winds associated with a trough extending across south-west Queensland from a deep low over South Australia caused a large scale dust storm across western New South Wales and south-west Queensland on 28 October. The widespread dust and gusty westerlies moved across south-east Queensland on 29 October as the low moved into the Tasman Sea.

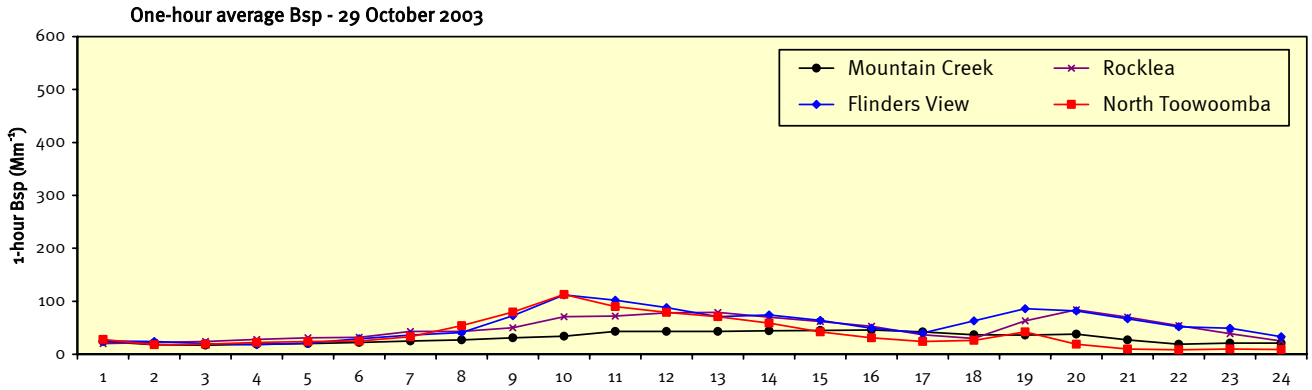
Highest PM_{10} levels occurred at the inland North Toowoomba and Flinders View monitoring sites. PM_{10} levels were lowest at the coastal Mountain Creek site, 40km north of Brisbane. Hourly $PM_{2.5}$ and Bsp (nephelometer) measurements on 29 October were considerably lower than the corresponding PM_{10} measurements, indicating a high proportion of coarse particles consistent with wind-blown dust particles. Average wind speeds of five to eight metres per second were recorded at the monitoring sites during the dust storm.

The Air NEPM 24-hour advisory standard (as measured by non-reference TEOM instrumentation) was also exceeded at the North Toowoomba site on this day.







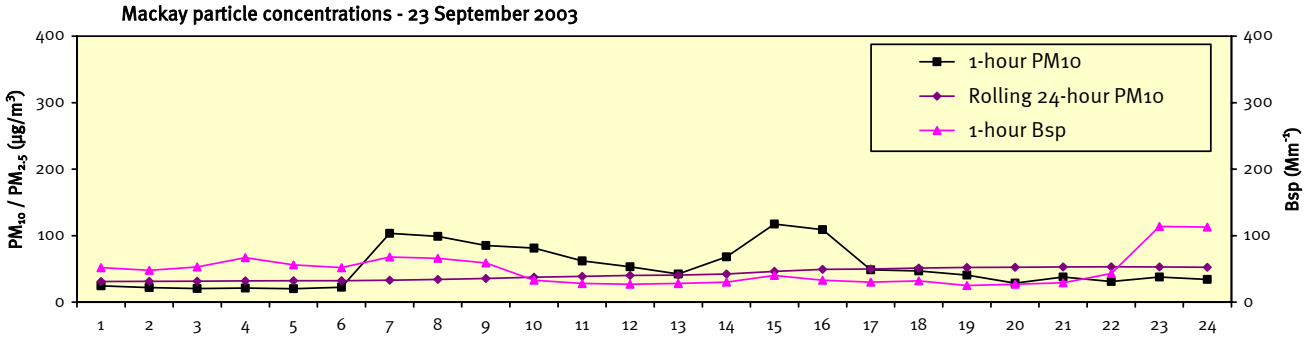


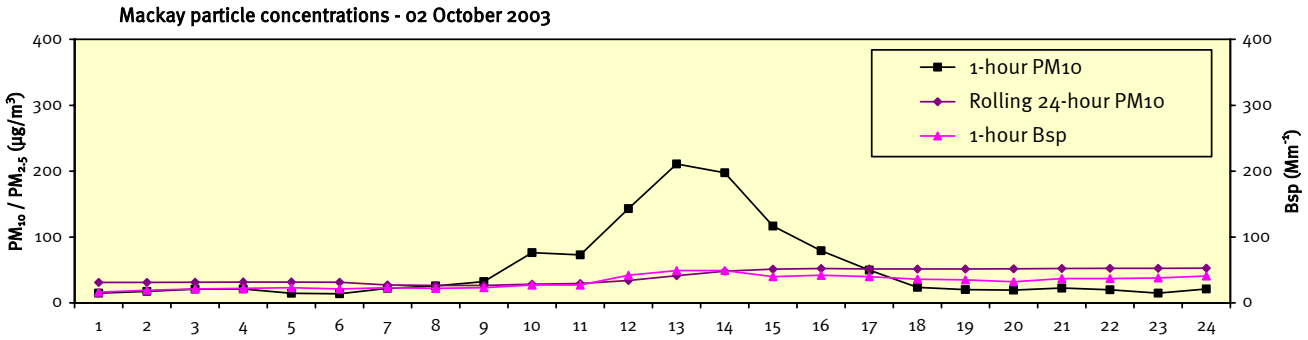
PM_{10} exceedences at West Mackay

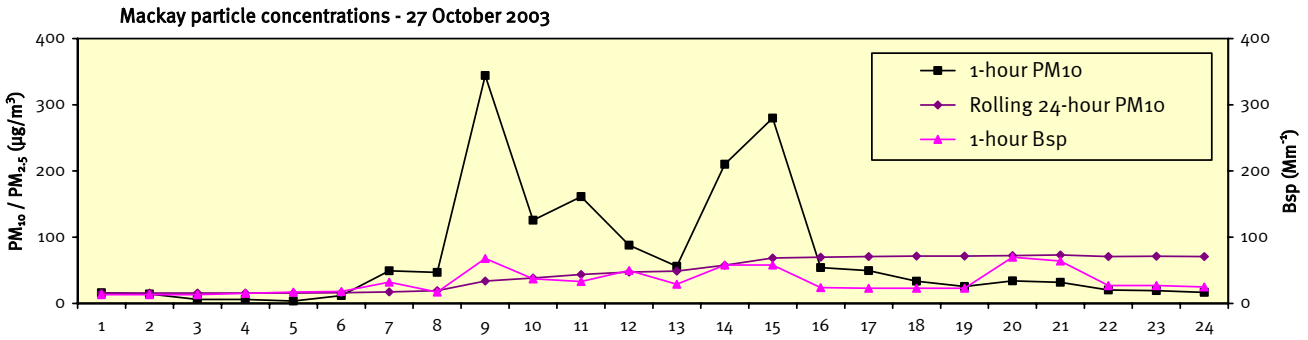
The major source of airborne particles in the Mackay region is pre- and post-harvest burning of sugarcane in the Pioneer Valley west of Mackay between June and November each year. When first established, the West Mackay monitoring site was suitable for measurement of population exposure resulting from agricultural burning activities, as local particle sources made only minimal contribution to PM_{10} levels at the site. However, commercial activities involving loading and unloading of soils in the vicinity of the monitoring site now lead to infrequent but significant local dust episodes. These local dust episodes were responsible for a number of exceedences of the Air NEPM PM_{10} standard during 2003.

The graphs below show that one-hour average PM_{10} concentrations on the days when exceedences occurred were typically elevated between 7:00am and 5:00pm each day, which aligns with the hours of operation at the nearby commercial premises. Corresponding Bsp (nephelometer) readings were low, indicating that coarse particles, rather than smoke particles from agricultural burning activities, made up the majority of the PM_{10} fraction on these days. Significant smoke particle contribution to overall PM_{10} levels was only observed on 15 September, when elevated Bsp readings were measured from 8:00pm to 10:00pm.

As PM_{10} measurements at the West Mackay site are no longer representative of general population exposure within the region, the EPA intends to relocate the monitoring equipment to a more representative location in Mackay during 2004.







Sulfur dioxide exceedences at Menzies

Industrial operations (metals smelting and sulfuric acid manufacture) emit sulfur dioxide into the atmosphere in Mount Isa. Under the *Mount Isa Mines Agreement Act 1985*, smelter operations must be managed to maintain ambient sulfur dioxide concentrations in Mount Isa below the levels specified in the Act (these are currently equivalent to the USEPA three-hour secondary, 24-hour primary and annual average primary sulfur dioxide standards). As smelter operations are only controlled to meet *Mount Isa Mines Agreement Act 1985* air quality limits, sulfur dioxide levels can exceed the more stringent Air NEPM one-hour and 24-hour standards on occasions.

The smelter and sulfuric acid manufacturing plant are situated to the south-southwest of the Menzies monitoring site. The relationship between wind direction and one-hour average sulfur dioxide concentrations greater than 0.200ppm demonstrates that exceedences predominantly occur when the wind is blowing from these plants towards the Menzies site.