



Department of  
**Environment and Conservation**



# 2011 Western Australia Air Monitoring Report

Written to comply with the  
National Environment Protection Measure  
(Ambient Air Quality)



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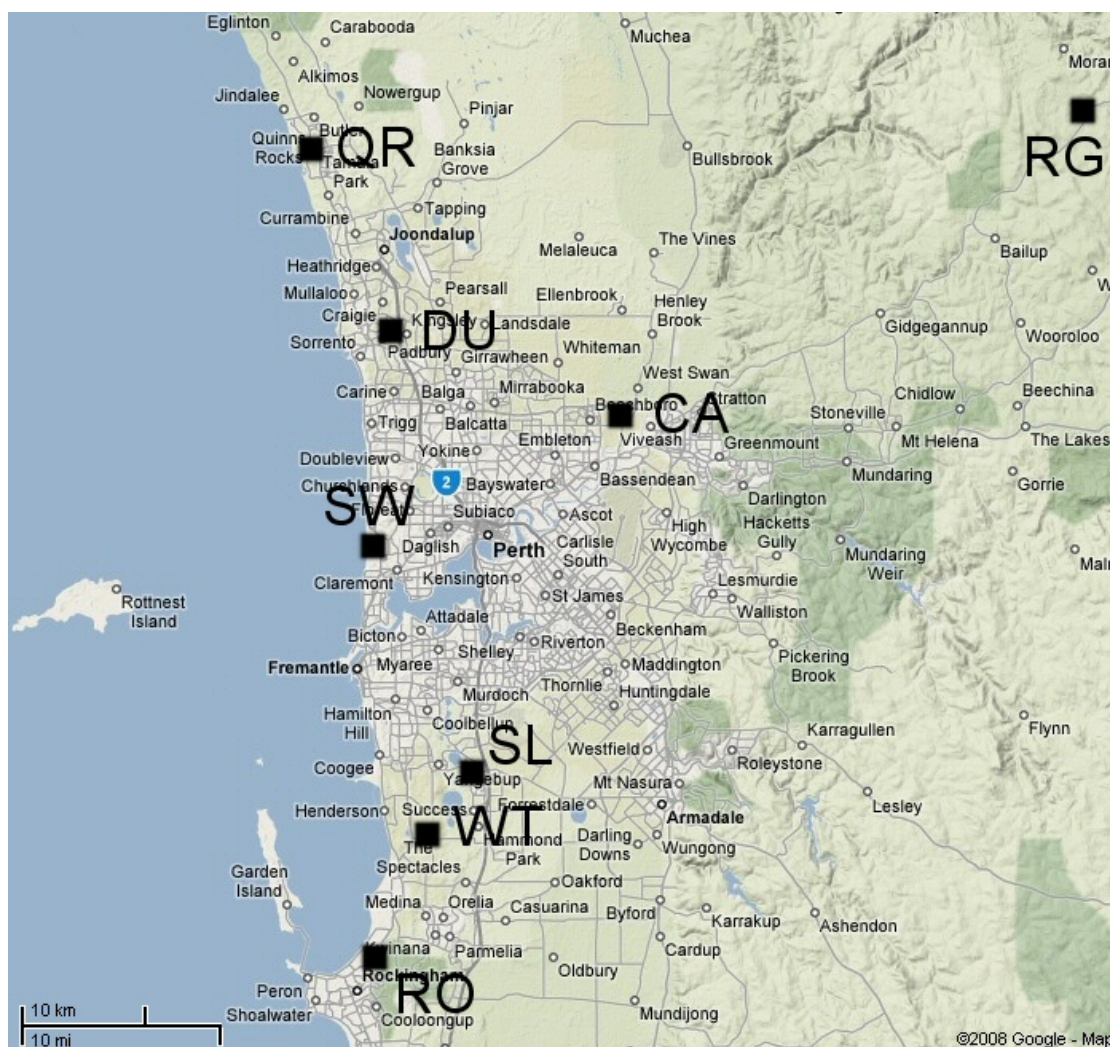
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## SECTION A - MONITORING SUMMARY

### Current monitoring stations

The Department of Environment and Conservation (DEC) monitoring network shown in Figure A1 was the subject of careful design for the purposes of the Perth Photochemical Smog Study, the Perth Haze Study and the management of sulfur dioxide in the Kwinana area. The network's design was based on the knowledge of emissions sources, pollutant chemistry and important features of the meteorology. CSIRO Atmospheric Research provided advice on monitoring site locations for the Perth Photochemical Smog Study and Perth Haze Study. The Bunbury station shown in Figure A2 was established in the southwest of the state to monitor fuel reduction burns, and stations in Busselton and Collie are also in operation for that purpose. The Geraldton station shown in Figure A3 was established in the mid-west of the state to monitor windblown crustal material and smoke from bushfires, hazard reduction or stubble burning and possibly wood-fired home heaters. A particle monitoring station was also established in Albany (Figure A4). Table A1 indicates the pollutants monitored at each site.



<b>CA Caversham</b>	<b>QR Quinns Rock</b>	<b>RG Rolling Green</b>	<b>SW Swanbourne</b>
<b>DU Duncraig</b>	<b>RO Rockingham</b>	<b>SL South Lake</b>	<b>WT Wattleup</b>

*Figure A1 - DEC air quality monitoring stations operating in the Perth metropolitan region.*





**Figure A2 - DEC air quality monitoring stations operating in Bunbury, Busselton and Collie**





*Figure A3 - DEC air quality monitoring station operating in Geraldton*



**Figure A4 - DEC air quality monitoring station operating in Albany**

**Table A1. Air quality parameters measured at DEC monitoring stations.**

<b>Monitoring Site</b>	<b>CO</b>	<b>O<sub>3</sub></b>	<b>NO<sub>2</sub></b>	<b>SO<sub>2</sub></b>	<b>PM<sub>10</sub> TEOM</b>	<b>PM<sub>2.5</sub> TEOM</b>
<b>AL</b> Albany					07/06 to present	
<b>BN</b> Bunbury	03/99 to 04/02				06/99 to present	04/97 to present
<b>BS</b> Busselton						11/06 to present
<b>CA</b> Caversham	08/93 to present	11/89 to present	09/90 to present		01/04 to present	03/94 to present
<b>CO</b> Collie					02/08 to present	
<b>DU</b> Duncraig	08/95 to present		08/95 to present		06/96 to present	01/95 to present
<b>GE</b> Geraldton					09/05 to present	
<b>QR</b> Quinns Rock		11/92 to present	11/92 to present			07/06 to present
<b>RO</b> Rockingham		12/95 to present	12/95 to present	07/88 to present		
<b>RG</b> Rolling Green		01/93 to present	01/93 to present			
<b>SL</b> South Lake	03/00 to present	03/00 to present	03/00 to present	03/00 to present	03/00 to present	04/06 to present
<b>SW</b> Swanbourne	01/93 to 05/95	01/93 to present	03/93 to present			06/94 to 07/95
<b>WT</b> Wattleup				01/88 to present		

The grey indicates those pollutants that are no longer monitored at that site.

DEC has from time to time performed campaign monitoring for various projects. Whilst these short-term monitoring projects are not reported within this document, detailed reports and/or data can be obtained by contacting us at [airquality@dec.wa.gov.au](mailto:airquality@dec.wa.gov.au).

**Table A2. Methods used to monitor air quality at DEC monitoring stations.**

<b>Pollutant</b>	<b>Standard</b>	<b>Method</b>
Carbon monoxide	AS 3580.7.1 1992 – Methods for sampling and analysis of ambient air – Determination of carbon monoxide – Direct-reading instrumental method	Gas filter correlation spectrophotometry
Ozone	AS 3580.6.1 1990 – Methods for sampling and analysis of ambient air – Determination of ozone – Direct-reading instrumental method	Ultraviolet absorption
Nitrogen dioxide	AS 3580.5.1 1993 – Methods for sampling and analysis of ambient air – Determination of oxides of nitrogen – Chemiluminescence method	Chemiluminescence
Sulfur dioxide	AS 3580.4.1 2008 – Methods for sampling and analysis of ambient air – Determination of sulfur dioxide – Direct-reading instrumental method	Ultraviolet fluorescence
Particles as PM <sub>10</sub>	AS 3580.9.8 2008 – Methods for sampling and analysis of ambient air – Determination of suspended particulate matter – PM <sub>10</sub> continuous direct mass method using a tapered element oscillating microbalance analyser	Tapered element oscillating microbalance
Particles as PM <sub>2.5</sub>		Tapered element oscillating microbalance

**Table A3. Monitoring in Western Australia.**

<b>Site:</b>	<b>CO</b>	<b>O<sub>3</sub></b>	<b>NO<sub>2</sub></b>	<b>SO<sub>2</sub></b>	<b>PM<sub>10</sub></b>	<b>PM<sub>2.5</sub></b>
AL – Albany					M	
BN – Bunbury					M	DEC
BS – Busselton						DEC
CA – Caversham	DEC	T	T		P	DEC
CO - Collie					DEC	
DU - Duncraig	T		DEC		T	DEC
GE – Geraldton					M	
QR - Quinns Rock		DEC	DEC			DEC
RG - Rolling Green		DEC	DEC			
RO - Rockingham		DEC	DEC	DEC		
SL - South Lake	P	T	P	T	P	DEC
SW - Swanbourne		T	P		DEC	
WT - Wattleup				DEC		

Key to symbols:**P** – performance monitoring station**P<sup>(1)</sup>** – performance monitoring for lead was removed on 31 December 2001 after the annual average concentration reduced to less than 10 per cent of the NEPM standard in accordance with the WA monitoring plan.**M** – Campaign monitoring**T** – trend performance monitoring station**DEC** – station will be maintained by DEC for the foreseeable future

**Table A4. Screening procedures used to demonstrate whether pollutants are consistently below standards.**

Screening procedures
A. Campaign monitoring at a Generally Representative Upper Bound (GRUB) monitoring location (with no significant deterioration expected over 5-10 years).
B. Use of historical data within a region which will contain one or more GRUB monitoring stations to demonstrate that the full number of stations (according to 14(1)) is not required, either to detect exceedences or gain a more representative depiction of pollutant distribution.
C. Use of modelling within a region which will contain one or more GRUB monitoring stations to demonstrate that the full number of stations (according to 14(1)) is not required, either to detect exceedences or gain a more representative depiction of pollutant distribution.
D. In a region with no performance monitoring, use of validated (1) modelling with detailed and reliable estimates of emissions and meteorological data.
E. In a region with no performance monitoring, and in the absence of emissions and detailed meteorological data, use of generic model results based on gross emissions estimates, 'worst case' meteorology estimates and other conservative assumptions.
F. In a region with no performance monitoring, comparison with a NEPM compliant region with greater population, emissions and pollution potential.
P. Performance monitoring.
T. Trend monitoring.
M. Campaign monitoring.

**Table A5. Screening procedures satisfied at each station.**

Site:	Pop'n <sup>a</sup>	CO	O <sub>3</sub>	NO <sub>2</sub>	SO <sub>2</sub>	Pb	PM <sub>10</sub>
Perth & Rockingham	1,740,000				B&C	A	
Mandurah <sup>b</sup>	74,127	P	P	P	F	F	P
Albany	36,551						
Bunbury	35,242	A&F	E&F	E&F	D&F	F	
Kalgoorlie-Boulder <sup>c</sup>	33,092	M	E&F	E&F	T	F	P
Geraldton	39,404	F	E&F	E&F	D&F	F	M

a – 2011 data (www.abs.gov.au/ )

b – Mandurah station has yet to be established

c – Kalgoorlie station has yet to be established

Details of screening procedures are given in the monitoring plan available at

[http://www.dec.wa.gov.au/component/option.com\\_docman/Itemid.980/gid.1085/task.doc\\_download/](http://www.dec.wa.gov.au/component/option.com_docman/Itemid.980/gid.1085/task.doc_download/)

Shaded cells represent Performance, Trend or Campaign sites where monitoring is currently underway.



**Table A6. Stations site compliance with AS 2922 - 1987**

	Height above ground	Min. distance to support structures	Clear sky angle of 120°	Unrestricted airflow of 270°/360°	20m from trees	No boilers or incinerators nearby	Minimum distance from road or traffic	Sample line material	Sample line length	Comments
<b>Perth Region</b>										
Caversham	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Duncraig	✓	✓	✗	✓	✗	✓	✓	✓	✓	6 metres to medium sized trees and presence of power pole.
Quinns Rocks	✓	✓	✓	✓	✗	✓	✓	✓	✓	15 metres to small to medium size trees. Surrounding area dominated by low scrub.
Rockingham	✓	✓	✓	✓	✗	✓	✓	✓	✓	12 metres to trees. Northern vector dominated by grain storage facility.
Rolling Green	✓	✓	✓	✓	✓	✓	✓	✓	✓	
South Lake	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Swanbourne	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Wattleup	✓	✓	✓	✓	✗	✓	✓	✓	✓	10 metres to medium to large eucalyptus trees.
<b>Southwest Region</b>										
Albany	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Bunbury	✓	✓	✓	✓	✗	✓	✓	✓	✓	15 metres to small to medium eucalyptus trees.
Busselton	✓	✓	✓	✓	✗	✓	✓	✓	✓	5 metres to small to medium eucalyptus trees.
Collie	✓	✓	✗	✓	✗	✓	✓	✓	✓	Some trees and containers nearby
<b>Midwest Region</b>										
Geraldton	✓	✓	✓	✓	✓	✓	✓	✓	✓	

## Carbon monoxide

Duncraig is an upper bound site for monitoring the combined effects of emissions from vehicles on the nearby Mitchell Freeway and domestic wood fires. The site is about 200 metres from the freeway, so it is well beyond the distance of roadside measurement. By Perth's standards the site is representative of dense population. The site lies in a dunal depression through which the freeway passes, hence the effect of stable air pooling in the depression is likely to lead to elevated concentrations. This feature would be found in many other places across the coastal plain.

South Lake lies in a growing urban area and is likely to see increasing levels of CO from wood fires in particular. It is not as close as Duncraig to major roads and is therefore more typical of a population-average site.

Caversham is located in a region of low population density and so is not considered as a performance monitoring station.

In summary, WA maintained performance monitoring of CO at nominated trend stations of Duncraig and South Lake.

## Photochemical oxidants as ozone

Statistics for the coastal sites of Quinns Rocks, Swanbourne and Rockingham indicate there is little difference between each station over the long term. Swanbourne was selected as a performance monitoring station while maintaining monitoring stations at Quinns Rocks and at or near Rockingham for the foreseeable future, as resources allow.

Given its location, there is reason to be confident that Caversham represents an upper bound, middle distance, inland site. Accordingly Caversham was selected as a performance monitoring station site.

South Lake is the third performance monitoring station. It has the following desirable attributes:

- it provides spatial spread of stations (it will measure ozone returning on shore in the southern part of the metropolitan area);
- it is a moderate distance inland in a growing urban area, hence it is well classed as a population average station;
- it may occasionally detect the interactions of O<sub>3</sub>-rich air with the NO<sub>x</sub>-rich plumes from Kwinana industry (potentially giving elevated NO<sub>2</sub> concentrations);

Caversham, Swanbourne and South Lake are all nominated as trend stations.

DEC will continue to maintain the stations at Rockingham, Quinns Rocks and Rolling Green for the foreseeable future as part of its wider ozone network.

## Nitrogen dioxide

For purposes of scientific understanding, NO<sub>2</sub> is currently being monitored at all stations where O<sub>3</sub> is monitored. Caversham, Swanbourne and South Lake were therefore chosen as performance monitoring stations for NO<sub>2</sub> as these provide a good spatial distribution.

Caversham, Swanbourne and South Lake are also trend stations.

DEC will continue to measure NO<sub>2</sub> at Quinns Rocks, Rolling Green and Duncraig for the foreseeable future as part of its wider network.

## Sulfur dioxide

DEC operates one performance monitoring station at South Lake for sulfur dioxide, while maintaining a source management network which includes Wattleup and Rockingham.

South Lake is an upper bound performance monitoring station for sulfur dioxide, and a trend station. South Lake is near the southern extent of the main urban population and downwind of Kwinana in sea breeze conditions.

## Lead

Since 1995, lead levels within the Perth CBD have been below 60 % of the 0.5 µg/m<sup>3</sup> annual NEPM standard. In 2001, the average lead level in Perth was 0.022 µg/m<sup>3</sup>, less than 5% of the NEPM standard. In accordance with NEPM (Ambient Air Quality) Technical Paper No. 4, Screening Procedures, and the WA Monitoring Plan, a performance monitoring station for lead has not been maintained since 2001.

## Particles as PM<sub>10</sub>

Duncraig is an upper bound performance monitoring station site for PM<sub>10</sub> caused by the combination of vehicle and domestic wood heater emissions during strongly stable

meteorological conditions. Likewise, the site at South Lake measures significant PM<sub>10</sub> concentrations from wood fires.

Duncraig and South Lake are both nominated as trend stations.

Campaign monitoring stations were established at Geraldton in September 2005, Albany in July 2006 and Collie in February 2008.

## Particles as PM<sub>2.5</sub>

To make assessments against the advisory standard, four PM<sub>2.5</sub> TEOMs were installed in the greater Perth metropolitan area at Quinns Rocks, Caversham, Duncraig and South Lake and one each in Bunbury and Busselton. All will remain in use at these locations indefinitely with the intention of developing trend data.

## Status of NATA accreditation

WA has made substantial progress towards meeting its goal of receiving NATA accreditation, with all infrastructure upgrades and systems development now complete. Work on this program continues however, and so the data within this report meets Department of Environment and Conservation quality standards.

## Exceedence Summary

In 2011, all exceedences were due to particle matter from smoke haze and dust. All PM<sub>10</sub> particle sites met the PM<sub>10</sub> NEPM goal of no more than five exceedences of 50 µg/m<sup>3</sup> averaged over 24 hours in any calendar year.

All other sites met the NEPM goal.

**Table A7. Air NEPM exceedences recorded during 2011**

Site	Pollutant	Concentration	Date / Time	Reason
Bunbury	PM <sub>10</sub> – 24 hour	64.1 µg/m <sup>3</sup>	03/01/2011	Smoke Haze
Bunbury	PM <sub>2.5</sub> – 24 hour	45.5 µg/m <sup>3</sup>	03/01/2011	Smoke Haze
Bunbury	PM <sub>2.5</sub> – 24 hour	35.7 µg/m <sup>3</sup>	04/01/2011	Smoke Haze
Bunbury	PM <sub>2.5</sub> – 24 hour	26.7 µg/m <sup>3</sup>	28/05/2011	Smoke Haze
Bunbury	PM <sub>2.5</sub> – 24 hour	26.5 µg/m <sup>3</sup>	20/11/2011	Smoke Haze
Bunbury	PM <sub>2.5</sub> – 24 hour	26.9 µg/m <sup>3</sup>	21/11/2011	Smoke Haze
Bunbury	PM <sub>10</sub> – 24 hour	68.4 µg/m <sup>3</sup>	26/11/2011	Smoke Haze
Busselton	PM <sub>2.5</sub> – 24 hour	46.0 µg/m <sup>3</sup>	01/01/2011	Smoke Haze
Busselton	PM <sub>2.5</sub> – 24 hour	85.2 µg/m <sup>3</sup>	02/01/2011	Smoke Haze
Busselton	PM <sub>2.5</sub> – 24 hour	79.7 µg/m <sup>3</sup>	05/05/2011	Smoke Haze
Busselton	PM <sub>2.5</sub> – 24 hour	49.9 µg/m <sup>3</sup>	12/05/2011	Smoke Haze
Busselton	PM <sub>2.5</sub> – 24 hour	27.7 µg/m <sup>3</sup>	13/05/2011	Smoke Haze
Busselton	PM <sub>2.5</sub> – 24 hour	31.7 µg/m <sup>3</sup>	01/12/2011	Smoke Haze
Caversham	PM <sub>10</sub> – 24 hour	76.1 µg/m <sup>3</sup>	26/11/2011	Smoke Haze
Caversham	PM <sub>2.5</sub> – 24 hour	41.4 µg/m <sup>3</sup>	26/11/2011	Smoke Haze
Collie	PM <sub>10</sub> – 24 hour	59.4 µg/m <sup>3</sup>	14/02/2011	Smoke Haze
Collie	PM <sub>10</sub> – 24 hour	59.6 µg/m <sup>3</sup>	28/05/2011	Smoke Haze
Collie	PM <sub>10</sub> – 24 hour	56.6 µg/m <sup>3</sup>	22/11/2011	Smoke Haze
Collie	PM <sub>10</sub> – 24 hour	61.5 µg/m <sup>3</sup>	25/11/2011	Smoke Haze
Duncraig	PM <sub>10</sub> – 24 hour	65.9 µg/m <sup>3</sup>	26/11/2011	Smoke Haze
Duncraig	PM <sub>2.5</sub> – 24 hour	52.1 µg/m <sup>3</sup>	26/11/2011	Smoke Haze
Geraldton	PM <sub>10</sub> – 24 hour	61.3 µg/m <sup>3</sup>	01/01/2011	Crustal

Site	Pollutant	Concentration	Date / Time	Reason
Geraldton	PM <sub>10</sub> – 24 hour	63.0 µg/m <sup>3</sup>	05/02/2011	Crustal
Geraldton	PM <sub>10</sub> – 24 hour	53.2 µg/m <sup>3</sup>	11/12/2011	Indeterminate
Quinns Rocks	PM <sub>2.5</sub> – 24 hour	28.1 µg/m <sup>3</sup>	20/11/2011	Smoke Haze
Quinns Rocks	PM <sub>2.5</sub> – 24 hour	43.2 µg/m <sup>3</sup>	26/11/2011	Smoke Haze
South Lake	PM <sub>10</sub> – 24 hour	66.2 µg/m <sup>3</sup>	26/11/2011	Smoke Haze
South Lake	PM <sub>2.5</sub> – 24 hour	48.2 µg/m <sup>3</sup>	26/11/2011	Smoke Haze

**Key:**

Crustal	A small proportion of PM <sub>2.5</sub> within PM <sub>10</sub> .
Indeterminate	The cause was unknown due to a lack of confirming data or observations.
Smoke Haze	A high proportion of PM <sub>2.5</sub> within PM <sub>10</sub> .

## SECTION B - ASSESSMENT OF COMPLIANCE WITH STANDARDS AND GOALS

**Table B1. 2011 compliance summary for carbon monoxide**

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

Regional Performance Monitoring Station	Data availability rates (% of hours)					Number of exceedences (days)	Performance against the standards and goal
	Q1	Q2	Q3	Q4	Annual		
<u>Perth Region</u>							
Caversham (North East Metro)	99.7	99.8	96.6	96.9	98.2	0	met
Duncraig (North Metro)	98.8	99.8	98.7	99.9	99.3	0	met
South Lake (South East Metro)	98.1	96.5	99	99.5	98.3	0	met

Performance against the standards and goal: "met", "not met", "not demonstrated"

**Table B2. 2011 compliance summary for nitrogen dioxide**

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

Regional Performance Monitoring Station	Data availability rates (% of hours)					Annual mean (ppm)	Number of exceedences (days)	Performance against the standards and goal	
	Q1	Q2	Q3	Q4	Annual			1-hour	1-year
<u>Perth Region</u>									
Caversham (North East Metro)	99.3	99.7	99.9	99.1	99.5	0.006	0	met	met
Duncraig (North Metro)	98.8	99.8	98.9	99.7	99.3	0.007	0	met	met
Quinns Rocks (Outer North Coast)	99.1	97.7	99.9	99.5	99	0.003	0	met	met
Rockingham (South Coast)	99.7	92.9	94.7	99.3	96.6	0.004	0	met	met
Rolling Green (Outer East Rural)	99.1	100	97.5	92.1	97.1	0.002	0	met	met
South Lake (South East Metro)	90.6	98.8	95.2	99.5	96.1	0.008	0	met	met
Swanbourne (Inner West Coast)	99.5	99.5	99.8	98.9	99.4	0.005	0	met	met

Performance against the standards and goal: "met", "not met", "not demonstrated"

**Table B3. 2011 compliance summary for ozone**

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

Regional 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
<u>Perth Region</u>									
Caversham (North East Metro)	98.8	99	99.9	99.2	99.2	0	0	met	met
Quinns Rocks (Outer North Coast)	98	99	100	99.4	99.1	0	0	met	met
Rockingham (South Coast)	88	92.3	99.2	99.9	94.9	0	0	met	met
Rolling Green (Outer East Rural)	94.2	99.6	97.5	92.1	95.9	0	0	met	met
South Lake (South East Metro)	99.5	98.8	99.9	99.5	99.4	0	0	met	met
Swanbourne (Inner West Coast)	99.6	99.9	99.9	99	99.6	0	0	met	met

Performance against the standards and goal: "met", "not met", "not demonstrated"

**Table B4. 2011 compliance summary for sulfur dioxide**

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

Regional Performance Monitoring Station	Data availability rates (% of hours)					Annual mean (ppm)	Number of Exceedences (days)		Performance against the standards and goal		
	Q1	Q2	Q3	Q4	Annual		1-hour	24-hour	1-hour	24-hour	1-year
<u>Perth Region</u>											
Rockingham (South Coast)	94	88.4	95.6	96.7	93.7	0.001	0	0	met	met	met
South Lake (South East Metro)	97.2	94.9	95.8	95	95.7	0.001	0	0	met	met	met
Wattleup (South Metro)	95	95.1	95.7	91.4	94.3	0.001	0	0	met	met	met

Performance against the standards and goal: "met", "not met", "not demonstrated"



**Table B5. 2011 compliance summary for particles as PM<sub>10</sub>**

Table D6: 2017 compliance summary for particles as PM<sub>10</sub>

Regional Performance Monitoring Station	Data availability rates					Number of exceedences  (Days)	Performance against the standards and goal
	AAQ NEPM Standard 50 µg/m <sup>3</sup> (24-hour average)						
	(% of days)						
	Q1	Q2	Q3	Q4	Annual		
<u>Perth Region</u>							
Caversham (North East Metro)	99.5	99.8	99.1	98	99.1	1	met
Duncraig (North Metro)	98.7	100	98.9	99.8	99.3	1	met
South Lake (South East Metro)	99.4	98.7	99.4	99.5	99.2	1	met
<u>Southwest Region</u>							
Albany	98	99.9	99.7	99.7	99.3	0	met
Bunbury	100	99.8	99.8	99	99.6	2	met
Collie	99.7	99.4	97.5	94.2	97.6	4	met
<u>Midwest Region</u>							
Geraldton	99.7	99.9	94.9	99.8	98.6	3	met

Performance against the standards and goal: "met", "not met", "not demonstrated"

**Table B6. 2011 compliance summary for particles as PM<sub>2.5</sub>**

						AAQ NEPM Advisory Standard 25 µg/m <sup>3</sup> (24-hour average)	
Regional Performance Monitoring Station	Data availability rates					Number of exceedences  (Days)	Performance against the standards and goal
	(% of days)						
	Q1	Q2	Q3	Q4	Annual		
<u>Perth Region</u>							
Caversham (North East Metro)	99.6	99.4	99.7	99.1	99.4	1	n/a
Duncraig (North Metro)	99	99.9	98.9	99.9	99.4	1	n/a
Quinns Rocks (Outer North Coast)	99.2	98.9	99.9	98	99	2	n/a
South Lake (South East Metro)	99.3	98.6	99.8	99	99.2	1	n/a
<u>Southwest Region</u>							
Bunbury	99.8	99.6	99.7	96.6	98.9	5	n/a
Busselton	99.8	99.8	99.8	99.8	99.8	6	n/a

## SECTION C – ANALYSIS OF AIR QUALITY MONITORING

### Carbon monoxide

The NEPM standard for carbon monoxide of 9.0 ppm averaged over eight hours was not exceeded at any site during 2011. The NEPM goal of no more than 1 exceedence at each site was met. Table C1 contains the summary statistics for daily peak eight-hour CO in Western Australia.

**Table C1. 2011 summary statistics for daily peak eight-hour carbon monoxide**

Regional Performance Monitoring Station	Data Recovery Rates (%)	Highest (ppm)	AAQ NEPM Standard 9.0 ppm (8-hour average)			
			Highest		2 <sup>nd</sup> Highest	2 <sup>nd</sup> Highest
			(date)	(time)	(ppm)	(date) (time)
<u>Perth Region</u>						
Caversham (North East Metro)	98.2	1.5	14/07/2011	0900	1.3	06/07/2011 1000
Duncraig (North Metro)	99.3	1.9	17/06/2011	0400	1.8	22/05/2011 0500
South Lake (South East Metro)	98.3	1.7	17/06/2011	0200	1.7	22/05/2011 0500

## Nitrogen dioxide

The NEPM standard for nitrogen dioxide of 0.12 ppm averaged over one hour and the 0.03 ppm annual average were not exceeded at any site during 2011. The NEPM goal of no more than 1 exceedence at each site was met. Table C2 contains the summary statistics for daily peak 1-hour NO<sub>2</sub> in Western Australia.

**Table C2. 2011 summary statistics for daily peak one-hour nitrogen dioxide**

Regional Performance Monitoring Station	Data Recovery Rates (%)	Highest (ppm)	Highest		2 <sup>nd</sup> Highest (ppm)	2 <sup>nd</sup> Highest	
			(date)	(time)		(date)	(time)
<b>Perth Region</b>							
Caversham (North East Metro)	99.5	0.035	28/05/2011	1900	0.034	23/11/2011	2100
Duncraig (North Metro)	99.3	0.035	15/04/2011	1900	0.034	24/03/2011	2200
Quinns Rocks (Outer North Coast)	99.0	0.031	28/05/2011	2100	0.030	02/06/2011	2200
Rockingham (South Coast)	96.6	0.034	15/04/2011	2000	0.030	28/05/2011	2000
Rolling Green (Outer East Rural)	97.1	0.023	09/01/2011	2200	0.021	08/01/2011	2300
South Lake (South East Metro)	96.1	0.041	03/02/2011	1700	0.037	24/03/2011	1800
Swanbourne (Inner West Coast)	99.4	0.032	26/07/2011	2300	0.031	29/06/2011	2000

## Photochemical smog as ozone

The NEPM standard for ozone of 0.10 ppm averaged over one hour was not exceeded at any site during 2011. The NEPM goal of no more than one exceedence at each site was met. Table C3 contains the summary statistics for daily peak one-hour O<sub>3</sub> in Western Australia.

**Table C3. 2011 summary statistics for daily peak 1-hour ozone**

Table 3: 2011 Summary Statistics for daily peak 1-hour Ozone						AAQ NEPM Standard 0.10 ppm (1-hour average)	
Regional Performance Monitoring Station	Data Recovery Rates (%)	Highest	Highest		2 <sup>nd</sup> Highest	2 <sup>nd</sup> Highest	
		(ppm)	(date)	(time)	(ppm)	(date)	(time)
<u>Perth Region</u>							
Caversham (North East Metro)	99.2	0.077	25/03/2011	1600	0.072	27/02/2011	1500
Quinns Rocks (Outer North Coast)	99.1	0.083	28/02/2011	1400	0.076	25/02/2011	1400
Rockingham (South Coast)	94.9	0.065	09/01/2011	1400	0.064	02/11/2011	1500
Rolling Green (Outer East Rural)	95.9	0.073	10/03/2011	1500	0.071	17/01/2011	1500
South Lake (South East Metro)	99.4	0.076	04/01/2011	1300	0.073	26/02/2011	1200
Swanbourne (Inner West Coast)	99.6	0.085	28/02/2011	1400	0.076	25/02/2011	1400

The NEPM standard for ozone of 0.08 ppm averaged over four hours was not exceeded at any site during 2011. The NEPM goal of no more than one exceedence at each site was met. Table C4 contains the summary statistics for daily peak four-hour O<sub>3</sub> in Western Australia.

**Table C4. 2011 summary statistics for daily peak 4-hour ozone**

					AAQ NEPM Standard 0.08 ppm (4-hour average)		
Regional Performance Monitoring Station	Data Recovery Rates (%)	Highest	Highest		2 <sup>nd</sup> Highest	2 <sup>nd</sup> Highest	
		(ppm)	(date)	(time)	(ppm)	(date)	(time)
<u>Perth Region</u>							
Caversham (North East Metro)	99.2	0.063	27/02/2011	1600	0.063	26/02/2011	1400
Quinns Rocks (Outer North Coast)	99.1	0.075	28/02/2011	1500	0.069	25/02/2011	1600
Rockingham (South Coast)	94.9	0.061	09/01/2011	1600	0.061	29/01/2011	1600
Rolling Green (Outer East Rural)	95.9	0.061	21/12/2011	1700	0.056	21/01/2011	2100
South Lake (South East Metro)	99.4	0.064	04/01/2011	1400	0.063	26/02/2011	1500
Swanbourne (Inner West Coast)	99.6	0.073	28/02/2011	1500	0.070	25/02/2011	1700

## Sulfur dioxide

The NEPM standard for sulfur dioxide of 0.20 ppm averaged over one hour was not exceeded at any site during 2011. The NEPM goal of no more than one exceedence at each site was met. Table C5 contains the summary statistics for daily peak one-hour SO<sub>2</sub> in Western Australia.

**Table C5. 2011 summary statistics for daily peak 1-hour sulfur dioxide**

AAQ NEPM Standard 0.20 ppm (1-hour average)							
Regional Performance Monitoring Station	Data Recovery Rates (%)	Highest  (ppm)	Highest  (date)      (time)		2 <sup>nd</sup> Highest  (ppm)	2 <sup>nd</sup> Highest  (date)      (time)	
<u>Perth Region</u>							
Rockingham (South Coast)	93.7	0.040	30/06/2011	1000	0.037	25/07/2011	2200
South Lake (South East Metro)	95.7	0.044	17/01/2011	1500	0.040	18/01/2011	1700
Wattleup (South Metro)	94.3	0.067	20/12/2011	1700	0.055	24/09/2011	1700

The NEPM standard for sulfur dioxide of 0.08 ppm averaged over 24 hours was not exceeded at any site during 2011. The NEPM goal of no more than 1 exceedence at each site was met. Table C6 contains the summary statistics for daily peak 24-hour SO<sub>2</sub> in Western Australia.

**Table C6. 2011 summary statistics for 24-hour sulfur dioxide**

Table 33: 2011 Summary Statistics for 24-hour sulfur dioxide					AAQ NEPM Standard 0.08 ppm (24-hour average)		
Regional Performance Monitoring Station	Data Recovery Rates (%)	Highest  (ppm)	Highest  (date)      (time)		2 <sup>nd</sup> Highest  (ppm)	2 <sup>nd</sup> Highest  (date)      (time)	
<u>Perth Region</u>							
Rockingham (South Coast)	93.7	0.008	20/08/2011	2400	0.007	27/06/2011	2400
South Lake (South East Metro)	95.7	0.006	17/01/2011	2400	0.005	09/03/2011	2400
Wattleup (South Metro)	94.3	0.008	26/01/2011	2400	0.007	20/12/2011	2400

The NEPM advisory standard for sulfur dioxide of 0.02 ppm averaged over one year was not exceeded at any site during 2011. Table C7 contains the summary statistics for annual SO<sub>2</sub> in Western Australia.

**Table C7. 2011 summary statistics for annual sulfur dioxide**

AAQ NEPM Advisory Standard 0.02 ppm (annual average)		
Regional Performance Monitoring Station	Data Recovery Rates (%)	annual average (ppm)
<u>Perth Region</u>		
Rockingham (South Coast)	93.7	0.001
South Lake (South East Metro)	95.7	0.001
Wattleup (South Metro)	94.3	0.001

## Particles as PM<sub>10</sub>

The NEPM standard for particles as PM<sub>10</sub> of 50 µg/m<sup>3</sup> averaged over 24 hours was exceeded once at Caversham, Duncraig and South Lake, twice at Bunbury, three times at Geraldton and 4 times at Collie during 2011. The NEPM goal of no more than five exceedences was met at all sites. Table C8 contains the summary statistics for daily peak 24-hour PM<sub>10</sub> in Western Australia.

**Table C8. 2011 summary statistics for 24-hour particles as PM<sub>10</sub>**

Regional Performance Monitoring Station	Data Recovery Rates (%)	Highest (µg/m <sup>3</sup> )	AAQ NEPM Standard 50 µg/m <sup>3</sup> (24-hour average)			
			Highest (date) (time)		6 <sup>th</sup> Highest (date) (time)	
<u>Perth Region</u>						
Caversham <sup>1</sup> (North East Metro)	99.1	76.1	26/11/2011	2400	31.2	30/12/2011 2400
Duncraig <sup>1</sup> (North Metro)	99.3	65.9	26/11/2011	2400	29.7	30/12/2011 2400
South Lake <sup>1</sup> (South East Metro)	99.2	66.2	26/11/2011	2400	32.2	16/06/2011 2400
<u>Southwest Region</u>						
Albany <sup>1</sup>	99.3	37.3	07/09/2011	2400	31.4	30/12/2011 2400
Bunbury <sup>1</sup>	99.6	68.4	26/11/2011	2400	38.0	16/06/2011 2400
Collie <sup>1</sup>	97.6	61.5	25/11/2011	2400	46.4	13/04/2011 2400
<u>Midwest Region</u>						
Geraldton <sup>1</sup>	98.6	63.0	05/02/2011	2400	41.3	17/01/2011 2400

1 – Tapered Element Oscillating Microbalance (TEOM) operating continuously (unadjusted for temperature).



## Particles as PM<sub>2.5</sub>

The NEPM advisory standard for particles as PM<sub>2.5</sub> of 25 micrograms per cubic metre averaged over 24 hours was exceeded once at Caversham, Duncraig and South Lake, twice at Quinns Rocks, five times at Bunbury and six times at and Busselton during 2011. Table C9 contains the summary statistics for daily peak 24-hour PM<sub>2.5</sub> in Western Australia.

**Table C9. 2011 summary statistics for 24-hour particles as PM<sub>2.5</sub>**

**AAQ NEPM Advisory Standard  
25 µg/m<sup>3</sup> (24-hour average)**

Regional Performance Monitoring Station	Data Recovery Rates (%)	Highest (µg/m <sup>3</sup> )	Highest		6th Highest (µg/m <sup>3</sup> )	6th Highest	
			(date)	(time)		(date)	(time)
<u>Perth Region</u>							
Caversham <sup>1</sup> (North East Metro)	99.4	41.5	26/11/2011	2400	12.0	23/03/2011	2400
Duncraig <sup>1</sup> (North Metro)	99.4	52.1	26/11/2011	2400	14.4	17/05/2011	2400
Quinns Rocks <sup>1</sup> (Outer North Coast)	99	43.2	26/11/2011	2400	15.3	21/11/2011	2400
South Lake <sup>1</sup> (South East Metro)	99.2	48.2	26/11/2011	2400	16.0	17/01/2011	2400
<u>Southwest Region</u>							
Bunbury <sup>1</sup>	98.9	45.5	03/01/2011	2400	21.4	21/10/2011	2400
Busselton <sup>1</sup>	99.8	85.2	02/01/2011	2400	27.7	13/05/2011	2400

1 - Tapered Element Oscillating Microbalance (TEOM) operating continuously (unadjusted for temperature) with Const A set to 3.000 and Const B set to 1.030.

The NEPM advisory standard for particles as PM<sub>2.5</sub> of 8 micrograms per cubic metre averaged over one year was exceeded at Bunbury and Busselton during 2011. Table C10 contains the summary statistics for annual PM<sub>2.5</sub> in Western Australia.

**Table C10. 2011 summary statistics for annual particles as PM<sub>2.5</sub>**

**AAQ NEPM Advisory Standard  
8 µg/m<sup>3</sup> (annual average)**

Regional Performance Monitoring Station	Data Recovery Rates (%)	annual average (µg/m <sup>3</sup> )
<u>Perth Region</u>		
Caversham <sup>1</sup> (North East Metro)	99.4	7.0
Duncraig <sup>1</sup> (North Metro)	99.4	7.8
Quinns Rocks <sup>1</sup> (Outer North Coast)	99.0	7.2
South Lake <sup>1</sup> (South East Metro)	99.2	7.8
<u>Southwest Region</u>		
Bunbury <sup>1</sup>	98.9	8.0
Busselton <sup>1</sup>	99.8	8.5

1 - Tapered Element Oscillating Microbalance (TEOM) operating continuously (unadjusted for temperature) with Const A set to 3.000 and Const B set to 1.030.

## SECTION D – DATA ANALYSIS

### Maxima and percentiles by pollutant in 2011

**Table D1. 2011 percentiles of daily peak 8-hour carbon monoxide concentrations**

Regional Performance Monitoring Station	Data availability rates (%)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	AAQ NEPM Standard 9.0 ppm (8-hour average)		
						90th percentile (ppm)	75th percentile (ppm)	50th percentile (ppm)
<u>Perth Region</u>								
Caversham (North East Metro)	98.2	1.5	1.2	1.0	0.6	0.5	0.3	0.2
Duncraig (North Metro)	99.3	1.9	1.3	1.2	1.0	0.7	0.4	0.3
South Lake (South East Metro)	98.3	1.7	1.5	1.3	1.0	0.8	0.5	0.3

**Table D2. 2011 percentiles of daily peak 1-hour nitrogen dioxide concentrations**

AAQ NEPM Standard 0.12 ppm (one-hour average)								
Regional Performance Monitoring Station	Data availability rates (%)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)	75th percentile (ppm)	50th percentile (ppm)
Perth Region								
Caversham (North East Metro)	99.5	0.035	0.031	0.029	0.027	0.025	0.020	0.015
Duncraig (North Metro)	99.3	0.035	0.032	0.030	0.028	0.027	0.024	0.018
Quinns Rocks (Outer North Coast)	99	0.031	0.028	0.027	0.025	0.022	0.016	0.010
Rockingham (South Coast)	96.6	0.034	0.028	0.027	0.025	0.022	0.017	0.011
Rolling Green (Outer East Rural)	97.1	0.023	0.019	0.018	0.015	0.013	0.009	0.005
South Lake (South East Metro)	96.1	0.041	0.033	0.032	0.030	0.028	0.024	0.020
Swanbourne (Inner West Coast)	99.4	0.032	0.029	0.028	0.026	0.024	0.019	0.013

**Table D3. 2011 percentiles of daily peak 1-hour ozone concentrations**

Regional Performance Monitoring Station	Data availability rates  (%)	Max conc.  (ppm)	99th percentile  (ppm)	98th percentile  (ppm)	95th percentile  (ppm)	AAQ NEPM Standard 0.10 ppm (1-hour average)		
						90th percentile  (ppm)	75th percentile  (ppm)	50th percentile  (ppm)
<u>Perth Region</u>								
Caversham (North East Metro)	99.2	0.077	0.070	0.067	0.054	0.045	0.036	0.032
Quinns Rocks (Outer North Coast)	99.1	0.083	0.068	0.057	0.051	0.045	0.038	0.033
Rockingham (South Coast)	94.9	0.065	0.062	0.057	0.048	0.043	0.036	0.031
Rolling Green (Outer East Rural)	95.9	0.073	0.068	0.060	0.052	0.043	0.036	0.031
South Lake (South East Metro)	99.4	0.076	0.064	0.057	0.050	0.044	0.036	0.031
Swanbourne (Inner West Coast)	99.6	0.085	0.069	0.061	0.051	0.046	0.038	0.033

**Table D4. 2011 percentiles percentiles of daily peak 4-hour ozone concentrations**

Table B-4: 2011 percentiles of daily peak 4-hour ozone concentrations						AAQ NEPM Standard 0.08 ppm (4-hour average)		
Regional Performance Monitoring Station	Data availability rates (%)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)	75th percentile (ppm)	50th percentile (ppm)
<u>Perth Region</u>								
Caversham (North East Metro)	99.2	0.063	0.061	0.056	0.049	0.041	0.034	0.030
Quinns Rocks (Outer North Coast)	99.1	0.075	0.060	0.052	0.047	0.041	0.036	0.032
Rockingham (South Coast)	94.9	0.061	0.058	0.053	0.045	0.040	0.034	0.030
Rolling Green (Outer East Rural)	95.9	0.061	0.055	0.051	0.045	0.040	0.034	0.030
South Lake (South East Metro)	99.4	0.064	0.056	0.051	0.046	0.039	0.034	0.030
Swanbourne (Inner West Coast)	99.6	0.073	0.059	0.056	0.047	0.043	0.036	0.032

**Table D5. 2011 percentiles of daily peak 1-hour sulfur dioxide concentrations**

Regional Performance Monitoring Station	Data availability rates (%)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	AAQ NEPM Standard		
						0.20 ppm (1-hour average)		
						90th percentile (ppm)	75th percentile (ppm)	50th percentile (ppm)
<u>Perth Region</u>								
Rockingham (South Coast)	93.7	0.040	0.029	0.024	0.017	0.010	0.004	0.002
South Lake (South East Metro)	95.7	0.044	0.029	0.026	0.017	0.012	0.007	0.002
Wattleup (South Metro)	94.3	0.067	0.049	0.042	0.032	0.026	0.013	0.003

**Table D6. 2011 percentiles of daily peak 24-hour sulfur dioxide concentrations**

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

Regional Performance Monitoring Station	Data availability rates (%)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)	75th percentile (ppm)	50th percentile (ppm)
<u>Perth Region</u>								
Rockingham (South Coast)	93.7	0.008	0.006	0.006	0.003	0.002	0.001	0.001
South Lake (South East Metro)	95.7	0.006	0.004	0.003	0.002	0.002	0.001	0.001
Wattleup (South Metro)	94.3	0.008	0.006	0.005	0.004	0.003	0.002	0.001

**Table D7. 2011 percentiles of daily peak 24-hour particles as PM<sub>10</sub> concentrations**

**AAQ NEPM Standard  
50 µg/m<sup>3</sup> (24-hour average)**

Regional Performance Monitoring Station	Data availability rates (%)	Max conc. (µg/m <sup>3</sup> )	99 <sup>th</sup> percentile (µg/m <sup>3</sup> )	98 <sup>th</sup> percentile (µg/m <sup>3</sup> )	95 <sup>th</sup> percentile (µg/m <sup>3</sup> )	90 <sup>th</sup> percentile (µg/m <sup>3</sup> )	75 <sup>th</sup> percentile (µg/m <sup>3</sup> )	50 <sup>th</sup> percentile (µg/m <sup>3</sup> )
<u>Perth Region</u>								
Caversham (North East Metro)	99.1	76.1	33.2	30.2	27.3	23.8	19.4	15.1
Duncraig (North Metro)	99.3	65.9	30.1	29.5	25.7	23.2	18.2	14.3
South Lake (South East Metro)	99.2	66.2	35.8	31.5	28.1	24.8	19.8	15.1
<u>Southwest Region</u>								
Albany	99.3	37.3	33.6	30.6	26.3	22.0	17.0	13.3
Bunbury	99.6	68.4	39.3	33.8	28.0	23.8	19.8	16.2
Collie	97.6	61.5	52.1	40.4	32.0	29.2	24.2	18.6
<u>Midwest Region</u>								
Geraldton	98.6	63.0	45.4	40.2	35.8	32.2	24.1	17.9

**Table D8. 2011 percentiles of daily peak 24-hour particles as PM<sub>2.5</sub> concentrations****AAQ NEPM Advisory Standard  
25 µg/m<sup>3</sup> (24-hour average)**

Regional Performance Monitoring Station	Data availability rates (%)	Max conc. (µg/m <sup>3</sup> )	99 <sup>th</sup> percentile (µg/m <sup>3</sup> )	98 <sup>th</sup> percentile (µg/m <sup>3</sup> )	95 <sup>th</sup> percentile (µg/m <sup>3</sup> )	90 <sup>th</sup> percentile (µg/m <sup>3</sup> )	75 <sup>th</sup> percentile (µg/m <sup>3</sup> )	50 <sup>th</sup> percentile (µg/m <sup>3</sup> )
<u>Perth Region</u>								
Caversham (North East Metro)	99.4	41.5	12.4	11.7	10.8	9.8	8.2	6.7
Duncraig (North Metro)	99.4	52.1	14.7	13.4	11.5	10.4	8.6	7.4
Quinns Rocks (Outer North Coast)	99	43.2	17.3	14.6	11.6	10.1	8.2	6.8
South Lake (South East Metro)	99.2	48.2	16.2	15.3	13.1	11.5	9.1	7.3
<u>Southwest Region</u>								
Bunbury	98.9	45.5	26.6	18.7	13.2	11.2	9.1	7.3
Busselton	99.8	85.2	36.7	20.5	13.9	11.4	9.0	7.3

## Maxima and percentiles by site 2002 to 2011

**Table D9. Daily peak 8-hour carbon monoxide at Caversham (2002–2011)**

Trend station/region: Caversham

AAQ NEPM Standard  
9.0 ppm (8-hour average)

Year	Data Recovery (%)	No. of exceedences (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
2002	98.1	0	1.3	1.0	0.9	0.8	0.7
2003	95.7	0	1.1	0.9	0.8	0.7	0.6
2004	96.2	0	1.3	0.9	0.9	0.7	0.5
2005	98.3	0	1.3	0.9	0.8	0.7	0.6
2006	99.7	0	1.8	0.9	0.9	0.6	0.5
2007	98.2	0	0.9	0.6	0.6	0.5	0.4
2008	99.5	0	0.8	0.7	0.7	0.6	0.5
2009	99.2	0	1.0	0.6	0.5	0.4	0.4
2010	85.0	0	1.6	0.8	0.7	0.6	0.5
2011	98.2	0	1.5	1.2	1.0	0.6	0.5

**Table D10. Daily peak 8-hour carbon monoxide at Duncraig (2002–2011)**

Trend station/region: Duncraig

AAQ NEPM Standard  
9.0 ppm (8-hour average)

Year	Data Recovery (%)	No. of exceedences (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
2002	96.6	0	5.4	3.7	3.6	2.6	1.8
2003	97.8	0	4.1	3.1	2.8	2.0	1.5
2004	99.1	0	4.5	3.2	2.7	2.1	1.2
2005	98.5	0	3.3	2.7	2.2	1.7	1.2
2006	99.3	0	3.4	2.8	2.3	1.8	1.3
2007	99.5	0	2.0	1.6	1.4	1.2	0.8
2008	99.0	0	3.1	1.9	1.7	1.4	1.0
2009	98.2	0	2.6	1.7	1.4	1.0	0.7
2010	87.5	0	2.3	2.0	1.8	1.5	1.1
2011	99.3	0	1.9	1.3	1.2	1.0	0.7



**Table D11. Daily peak 8-hour carbon monoxide at South Lake (2002–2011)**

Trend station/region: South Lake

AAQ NEPM Standard

9.0 ppm (8-hour average)

Year	Data Recovery (%)	No. of exceedences (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
2002	97.6	0	3.2	2.8	2.4	1.9	1.3
2003	98.9	0	3.1	2.5	2.3	1.7	1.3
2004	99.5	0	3.5	2.3	2.1	1.5	1.0
2005	96.9	0	2.9	2.5	2.0	1.6	1.1
2006	98.6	0	2.5	2.4	2.2	1.6	1.0
2007	99.3	0	1.7	1.4	1.2	1.0	0.8
2008	99.6	0	2.0	1.6	1.4	1.2	0.9
2009	99.3	0	1.8	1.4	1.1	0.9	0.7
2010	87.8	0	2.2	1.6	1.5	1.2	0.9
2011	98.3	0	1.7	1.5	1.3	1.0	0.8

**Table D12. Daily peak 1-hour nitrogen dioxide at Caversham (2002–2011)**

Trend station/region: Caversham

AAQ NEPM Standard

0.12 ppm (1-hour average)

Year	Data Recovery (%)	No. of exceedences (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
2002	99.5	0	0.055	0.035	0.033	0.031	0.028
2003	95.7	0	0.043	0.037	0.034	0.031	0.028
2004	98.9	0	0.046	0.036	0.033	0.029	0.028
2005	98.3	0	0.048	0.040	0.034	0.031	0.027
2006	98.3	0	0.084	0.037	0.034	0.031	0.028
2007	98.5	0	0.044	0.037	0.033	0.028	0.026
2008	99.5	0	0.036	0.033	0.032	0.028	0.026
2009	99.3	0	0.044	0.034	0.033	0.028	0.026
2010	84.9	0	0.054	0.040	0.037	0.032	0.029
2011	99.5	0	0.035	0.031	0.029	0.027	0.025

**Table D13. Daily peak 1-hour nitrogen dioxide at Duncraig (2002–2011)**

Trend station/region: Duncraig

AAQ NEPM Standard

0.12 ppm (1-hour average)

Year	Data Recovery (%)	No. of exceedences (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
2002	97.1	0	0.049	0.040	0.037	0.034	0.031
2003	97.4	0	0.057	0.042	0.037	0.033	0.031
2004	94.5	0	0.043	0.037	0.035	0.031	0.029
2005	96.7	0	0.051	0.039	0.036	0.032	0.030
2006	99.5	0	0.056	0.037	0.036	0.032	0.030
2007	99.6	0	0.053	0.034	0.032	0.030	0.028
2008	97.7	0	0.038	0.034	0.030	0.029	0.027
2009	98.5	0	0.042	0.037	0.034	0.030	0.027
2010	87.5	0	0.038	0.035	0.033	0.030	0.028
2011	99.3	0	0.035	0.032	0.030	0.028	0.027

**Table D14. Daily peak 1-hour nitrogen dioxide at Quinns Rocks (2002–2011)**

Trend station/region: Quinns Rocks

AAQ NEPM Standard

0.12 ppm (1-hour average)

Year	Data Recovery (%)	No. of exceedences (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
2002	99.5	0	0.037	0.031	0.030	0.028	0.026
2003	97.4	0	0.035	0.032	0.030	0.027	0.025
2004	90.8	0	0.041	0.032	0.030	0.028	0.025
2005	96.9	0	0.041	0.031	0.030	0.027	0.024
2006	96.9	0	0.065	0.051	0.042	0.035	0.029
2007	99.5	0	0.035	0.031	0.029	0.028	0.025
2008	96.1	0	0.037	0.033	0.032	0.028	0.025
2009	99.0	0	0.034	0.032	0.031	0.027	0.024
2010	88.8	0	0.040	0.032	0.032	0.030	0.027
2011	99.0	0	0.031	0.028	0.027	0.025	0.022

**Table D15. Daily peak 1-hour nitrogen dioxide at Rockingham (2002–2011)**

Trend station/region: Rockingham

AAQ NEPM Standard

0.12 ppm (1-hour average)

Year	Data Recovery (%)	No. of exceedences (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
2002	99.6	0	0.042	0.039	0.038	0.035	0.032
2003	98.4	0	0.051	0.040	0.036	0.034	0.032
2004	99.4	0	0.055	0.043	0.039	0.035	0.031
2005	99.1	0	0.045	0.038	0.036	0.032	0.030
2006	98.9	0	0.054	0.040	0.036	0.034	0.031
2007	99.4	0	0.040	0.034	0.030	0.028	0.025
2008	99.3	0	0.031	0.028	0.027	0.025	0.024
2009	98.6	0	0.031	0.029	0.028	0.026	0.024
2010	88.7	0	0.036	0.032	0.030	0.028	0.026
2011	96.6	0	0.034	0.028	0.027	0.025	0.022

**Table D16. Daily peak 1-hour nitrogen dioxide at Rolling Green (2002–2011)**

Trend station/region: Rolling Green

AAQ NEPM Standard

0.12 ppm (1-hour average)

Year	Data Recovery (%)	No. of exceedences (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
2002	97.6	0	0.025	0.022	0.020	0.017	0.015
2003	94.0	0	0.032	0.020	0.017	0.016	0.015
2004	95.6	0	0.025	0.023	0.021	0.018	0.016
2005	97.9	0	0.029	0.025	0.023	0.020	0.017
2006	98.0	0	0.026	0.020	0.019	0.017	0.015
2007	98.8	0	0.020	0.019	0.018	0.016	0.014
2008	99.3	0	0.023	0.020	0.019	0.016	0.015
2009	99.5	0	0.035	0.023	0.019	0.017	0.015
2010	87.5	0	0.030	0.022	0.019	0.017	0.016
2011	97.1	0	0.023	0.019	0.018	0.015	0.013

**Table D17. Daily peak 1-hour nitrogen dioxide at South Lake (2002–2011)**

Trend station/region: South Lake

AAQ NEPM Standard

0.12 ppm (1-hour average)

Year	Data Recovery (%)	No. of exceedences (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
2002	95.5	0	0.048	0.035	0.032	0.030	0.028
2003	98.9	0	0.048	0.039	0.038	0.030	0.028
2004	98.4	0	0.043	0.038	0.036	0.032	0.029
2005	87.1	0	0.052	0.043	0.039	0.033	0.028
2006	98.0	0	0.045	0.039	0.037	0.032	0.029
2007	99.1	0	0.057	0.041	0.038	0.032	0.029
2008	99.6	0	0.044	0.040	0.038	0.033	0.030
2009	99.3	0	0.048	0.039	0.036	0.033	0.029
2010	87.8	0	0.058	0.045	0.040	0.036	0.030
2011	96.1	0	0.041	0.033	0.032	0.030	0.028

**Table D18. Daily peak 1-hour nitrogen dioxide at Swanbourne (2002–2011)**

Trend station/region: Swanbourne

AAQ NEPM Standard

0.12 ppm (1-hour average)

Year	Data Recovery (%)	No. of exceedences (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
2002	92.1	0	0.051	0.040	0.036	0.031	0.029
2003	99.2	0	0.048	0.036	0.034	0.031	0.029
2004	70.2	0	0.042	0.039	0.035	0.032	0.028
2005	96.2	0	0.039	0.037	0.033	0.029	0.026
2006	99.5	0	0.043	0.034	0.033	0.031	0.028
2007	98.7	0	0.038	0.033	0.032	0.030	0.027
2008	98.2	0	0.035	0.034	0.033	0.031	0.029
2009	99.2	0	0.037	0.034	0.032	0.028	0.026
2010	86.6	0	0.038	0.033	0.032	0.031	0.029
2011	99.4	0	0.032	0.029	0.028	0.026	0.024

**Table D19. Daily peak 1-hour ozone at Caversham (2002–2011)**

Trend station/region: Caversham

AAQ NEPM Standard

0.10 ppm (1-hour average)

Year	Data Recovery (%)	No. of exceedences (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
2002	99.6	0	0.091	0.074	0.065	0.057	0.048
2003	93.8	0	0.083	0.070	0.062	0.052	0.044
2004	98.9	0	0.079	0.070	0.062	0.052	0.045
2005	99.3	0	0.094	0.078	0.063	0.054	0.043
2006	99.6	0	0.080	0.072	0.067	0.058	0.049
2007	98.6	0	0.085	0.073	0.066	0.059	0.047
2008	99.5	0	0.083	0.067	0.066	0.053	0.046
2009	99.3	1	0.104	0.072	0.067	0.056	0.050
2010	84.5	0	0.082	0.069	0.059	0.055	0.046
2011	99.2	0	0.077	0.070	0.067	0.054	0.045

**Table D20. Daily peak 1-hour ozone at Quinns Rocks (2002–2011)**

Trend station/region: Quinns Rocks

AAQ NEPM Standard

0.10 ppm (1-hour average)

Year	Data Recovery (%)	No. of exceedences (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
2002	99.5	0	0.079	0.069	0.060	0.055	0.046
2003	86.1	0	0.086	0.060	0.057	0.049	0.045
2004	97.9	0	0.079	0.064	0.060	0.056	0.046
2005	98.0	0	0.095	0.068	0.063	0.055	0.045
2006	99.0	0	0.085	0.065	0.063	0.052	0.045
2007	98.8	0	0.081	0.061	0.057	0.050	0.045
2008	99.4	0	0.083	0.073	0.060	0.052	0.043
2009	94.3	0	0.070	0.063	0.061	0.053	0.045
2010	88.7	0	0.091	0.061	0.058	0.054	0.048
2011	99.1	0	0.083	0.068	0.057	0.051	0.045

**Table D21. Daily peak 1-hour ozone at Rockingham (2002–2011)**

Trend station/region: Rockingham

AAQ NEPM Standard

0.10 ppm (1-hour average)

Year	Data Recovery (%)	No. of exceedences (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
2002	99.6	0	0.079	0.067	0.057	0.050	0.043
2003	98.4	0	0.064	0.053	0.050	0.045	0.039
2004	99.1	1	0.102	0.067	0.059	0.048	0.040
2005	99.1	0	0.081	0.064	0.056	0.044	0.040
2006	98.9	0	0.072	0.061	0.056	0.050	0.041
2007	99.5	0	0.084	0.065	0.056	0.049	0.042
2008	99.4	0	0.077	0.063	0.053	0.045	0.038
2009	99.0	0	0.078	0.064	0.054	0.048	0.041
2010	88.2	0	0.067	0.060	0.057	0.052	0.044
2011	94.9	0	0.065	0.062	0.057	0.048	0.043

**Table D22. Daily peak 1-hour ozone at Rolling Green (2002–2011)**

Trend station/region: Rolling Green

AAQ NEPM Standard

0.10 ppm (1-hour average)

Year	Data Recovery (%)	No. of exceedences (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
2002	99.6	0	0.091	0.080	0.068	0.059	0.049
2003	94.3	0	0.087	0.076	0.071	0.059	0.049
2004	97.9	1	0.101	0.076	0.071	0.060	0.049
2005	97.9	0	0.079	0.071	0.064	0.058	0.050
2006	98.6	0	0.093	0.075	0.072	0.060	0.053
2007	98.9	0	0.095	0.081	0.078	0.062	0.053
2008	99.5	0	0.087	0.080	0.071	0.056	0.047
2009	99.5	1	0.103	0.081	0.069	0.059	0.052
2010	85.6	0	0.088	0.077	0.070	0.056	0.046
2011	95.9	0	0.073	0.068	0.060	0.052	0.043

**Table D23. Daily peak 1-hour ozone at South Lake (2002–2011)**

Trend station/region: South Lake

AAQ NEPM Standard

0.10 ppm (1-hour average)

Year	Data Recovery (%)	No. of exceedences (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
2002	99.5	0	0.067	0.062	0.054	0.049	0.043
2003	99.1	0	0.071	0.061	0.055	0.048	0.041
2004	99.0	0	0.076	0.061	0.057	0.047	0.041
2005	97.0	0	0.080	0.062	0.056	0.049	0.041
2006	99.6	0	0.066	0.057	0.054	0.045	0.040
2007	99.4	0	0.067	0.056	0.053	0.047	0.040
2008	99.6	0	0.082	0.061	0.056	0.044	0.037
2009	99.4	0	0.065	0.057	0.053	0.045	0.039
2010	88.0	0	0.070	0.067	0.062	0.052	0.045
2011	99.4	0	0.076	0.064	0.057	0.050	0.044

**Table D24. Daily peak 1-hour ozone at Swanbourne (2002–2011)**

Trend station/region: Swanbourne

AAQ NEPM Standard

0.10 ppm (1-hour average)

Year	Data Recovery (%)	No. of exceedences (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
2002	95.9	0	0.081	0.063	0.057	0.051	0.046
2003	99.7	0	0.082	0.060	0.052	0.045	0.041
2004	99.4	0	0.077	0.065	0.059	0.049	0.042
2005	96.4	0	0.076	0.066	0.061	0.051	0.043
2006	99.7	0	0.075	0.066	0.060	0.050	0.044
2007	99.3	0	0.077	0.064	0.057	0.051	0.044
2008	98.2	0	0.076	0.067	0.060	0.048	0.042
2009	99.6	0	0.068	0.063	0.059	0.053	0.044
2010	86.6	0	0.066	0.059	0.056	0.050	0.044
2011	99.6	0	0.085	0.069	0.061	0.051	0.046

**Table D25. Daily peak 4-hour ozone at Caversham (2002–2011)**

Trend station/region: Caversham

AAQ NEPM Standard

0.08 ppm (4-hour average)

Year	Data Recovery (%)	No. of exceedences (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
2002	99.6	0	0.068	0.065	0.058	0.049	0.042
2003	93.8	0	0.069	0.058	0.054	0.046	0.039
2004	98.9	0	0.067	0.057	0.052	0.047	0.040
2005	99.3	0	0.069	0.055	0.052	0.046	0.039
2006	99.6	0	0.072	0.063	0.058	0.049	0.043
2007	98.6	0	0.073	0.062	0.058	0.049	0.042
2008	99.5	0	0.076	0.061	0.056	0.047	0.041
2009	99.3	1	0.092	0.067	0.057	0.051	0.043
2010	84.5	0	0.072	0.056	0.052	0.047	0.041
2011	99.2	0	0.063	0.061	0.056	0.049	0.041

**Table D26. Daily peak 4-hour ozone at Quinns Rocks (2002–2011)**

Trend station/region: Quinns Rocks

AAQ NEPM Standard

0.08 ppm (4-hour average)

Year	Data Recovery (%)	No. of exceedences (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
2002	99.5	0	0.069	0.057	0.053	0.048	0.041
2003	86.1	0	0.071	0.055	0.051	0.043	0.040
2004	97.9	0	0.068	0.059	0.055	0.048	0.041
2005	98.0	0	0.070	0.058	0.057	0.047	0.041
2006	99.0	0	0.074	0.059	0.055	0.046	0.041
2007	98.8	0	0.075	0.056	0.053	0.046	0.041
2008	99.4	0	0.073	0.061	0.055	0.046	0.041
2009	94.3	0	0.062	0.056	0.054	0.048	0.040
2010	88.7	0	0.065	0.056	0.052	0.048	0.042
2011	99.1	0	0.075	0.060	0.052	0.047	0.041

**Table D27. Daily peak 4-hour ozone at Rockingham (2002–2011)**

Trend station/region: Rockingham

AAQ NEPM Standard

0.08 ppm (4-hour average)

Year	Data Recovery (%)	No. of exceedences (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
2002	99.6	0	0.071	0.058	0.050	0.047	0.039
2003	98.4	0	0.059	0.049	0.048	0.041	0.037
2004	99.1	0	0.079	0.060	0.052	0.045	0.038
2005	99.1	0	0.075	0.061	0.052	0.042	0.038
2006	98.9	0	0.067	0.056	0.051	0.046	0.038
2007	99.5	0	0.079	0.057	0.052	0.046	0.038
2008	99.4	0	0.072	0.058	0.049	0.042	0.036
2009	99.0	0	0.066	0.058	0.051	0.045	0.039
2010	88.2	0	0.064	0.054	0.053	0.046	0.041
2011	94.9	0	0.061	0.058	0.053	0.045	0.040

**Table D28. Daily peak 4-hour ozone at Rolling Green (2002–2011)**

Trend station/region: Rolling Green

AAQ NEPM Standard

0.08 ppm (4-hour average)

Year	Data Recovery (%)	No. of exceedences (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
2002	99.6	0	0.071	0.065	0.061	0.052	0.043
2003	94.3	0	0.075	0.063	0.060	0.053	0.043
2004	97.9	0	0.077	0.064	0.061	0.051	0.042
2005	97.9	0	0.068	0.060	0.058	0.049	0.044
2006	98.6	0	0.079	0.065	0.059	0.053	0.046
2007	98.9	0	0.080	0.070	0.066	0.053	0.046
2008	99.5	0	0.075	0.065	0.062	0.051	0.043
2009	99.5	2	0.083	0.064	0.057	0.051	0.043
2010	85.6	0	0.080	0.065	0.056	0.049	0.042
2011	95.9	0	0.061	0.055	0.051	0.045	0.040

**Table D29. Daily peak 4-hour ozone at South Lake (2002–2011)**

Trend station/region: South Lake

AAQ NEPM Standard

0.08 ppm (4-hour average)

Year	Data Recovery (%)	No. of exceedences (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
2002	99.5	0	0.058	0.053	0.050	0.044	0.039
2003	99.1	0	0.063	0.052	0.048	0.043	0.037
2004	99.0	0	0.064	0.053	0.049	0.042	0.035
2005	97.0	0	0.070	0.053	0.052	0.042	0.037
2006	99.6	0	0.063	0.051	0.049	0.041	0.036
2007	99.4	0	0.059	0.051	0.048	0.042	0.037
2008	99.6	0	0.067	0.051	0.046	0.040	0.034
2009	99.4	0	0.057	0.053	0.048	0.040	0.036
2010	88.0	0	0.061	0.055	0.053	0.046	0.042
2011	99.4	0	0.064	0.056	0.051	0.046	0.039

**Table D30. Daily peak 4-hour ozone at Swanbourne (2002–2011)**

Trend station/region: Swanbourne

AAQ NEPM Standard

0.10 ppm (1-hour average)

Year	Data Recovery (%)	No. of exceedences (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
2002	95.9	0	0.066	0.056	0.054	0.047	0.041
2003	99.7	0	0.066	0.054	0.047	0.041	0.037
2004	99.4	0	0.067	0.057	0.054	0.044	0.038
2005	96.4	0	0.066	0.058	0.052	0.044	0.039
2006	99.7	0	0.069	0.060	0.052	0.045	0.040
2007	99.3	0	0.067	0.054	0.051	0.048	0.042
2008	98.2	0	0.070	0.060	0.053	0.045	0.039
2009	99.6	0	0.063	0.058	0.054	0.046	0.039
2010	86.6	0	0.055	0.053	0.050	0.044	0.040
2011	99.6	0	0.073	0.059	0.056	0.047	0.043

**Table D31. Daily peak 1-hour sulfur dioxide at Rockingham (2002–2011)**

Trend station/region: Rockingham

AAQ NEPM Standard

0.20 ppm (1-hour average)

Year	Data Recovery (%)	No. of exceedences (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
2002	99.6	0	0.035	0.021	0.017	0.009	0.006
2003	98.3	0	0.026	0.020	0.016	0.010	0.006
2004	99.4	0	0.039	0.021	0.018	0.011	0.006
2005	99.2	0	0.041	0.024	0.022	0.017	0.010
2006	98.9	0	0.040	0.031	0.022	0.013	0.008
2007	98.6	0	0.041	0.025	0.020	0.013	0.008
2008	98.3	0	0.079	0.026	0.019	0.015	0.008
2009	98.7	0	0.032	0.022	0.017	0.010	0.007
2010	89.9	0	0.037	0.022	0.019	0.013	0.009
2011	93.7	0	0.040	0.029	0.024	0.017	0.010

**Table D32. Daily peak 1-hour sulfur dioxide at South Lake (2002–2011)**

Trend station/region: South Lake

AAQ NEPM Standard

0.20 ppm (1-hour average)

Year	Data Recovery (%)	No. of exceedences (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
2002	97.4	0	0.043	0.036	0.026	0.020	0.015
2003	98.9	0	0.038	0.028	0.026	0.020	0.015
2004	99.5	0	0.042	0.028	0.024	0.019	0.013
2005	96.9	0	0.046	0.033	0.030	0.022	0.017
2006	99.5	0	0.060	0.044	0.032	0.028	0.022
2007	99.4	0	0.040	0.032	0.028	0.019	0.012
2008	99.6	0	0.046	0.025	0.020	0.014	0.010
2009	98.4	0	0.036	0.033	0.029	0.018	0.015
2010	87.8	0	0.073	0.036	0.033	0.025	0.017
2011	95.7	0	0.044	0.029	0.026	0.017	0.012

**Table D33. Daily peak 1-hour sulfur dioxide at Wattleup (2002–2011)**

Trend station/region: Wattleup

AAQ NEPM Standard

0.20 ppm (1-hour average)

Year	Data Recovery (%)	No. of exceedences (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
2002	99.0	0	0.081	0.039	0.030	0.023	0.019
2003	97.5	0	0.062	0.032	0.028	0.023	0.018
2004	97.7	0	0.076	0.044	0.041	0.030	0.021
2005	99.7	0	0.120	0.058	0.045	0.037	0.026
2006	99.0	0	0.062	0.046	0.043	0.035	0.028
2007	93.3	0	0.060	0.045	0.040	0.034	0.025
2008	89.6	0	0.077	0.034	0.028	0.022	0.016
2009	95.6	0	0.059	0.039	0.036	0.029	0.022
2010	86.8	0	0.057	0.049	0.043	0.036	0.023
2011	94.3	0	0.067	0.049	0.042	0.032	0.026

**Table D34. Daily peak 24-hour sulfur dioxide at Rockingham (2002–2011)**

Trend station/region: Rockingham

AAQ NEPM Standard

0.08 ppm (24-hour average)

Year	Data Recovery (%)	No. of exceedences (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
2002	99.6	0	0.006	0.002	0.002	0.002	0.001
2003	98.3	0	0.005	0.003	0.003	0.002	0.001
2004	99.4	0	0.006	0.003	0.003	0.002	0.001
2005	99.2	0	0.009	0.006	0.004	0.003	0.002
2006	98.9	0	0.007	0.004	0.004	0.002	0.002
2007	98.6	0	0.012	0.005	0.004	0.003	0.002
2008	98.3	0	0.007	0.005	0.004	0.002	0.001
2009	98.7	0	0.008	0.003	0.002	0.001	0.001
2010	89.9	0	0.007	0.004	0.003	0.002	0.002
2011	93.7	0	0.008	0.006	0.006	0.003	0.002



**Table D35. Daily peak 24-hour sulfur dioxide at South Lake (2002–2011)**

Trend station/region: South Lake

AAQ NEPM Standard

0.08 ppm (24-hour average)

Year	Data Recovery (%)	No. of exceedences (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
2002	97.4	0	0.006	0.005	0.004	0.003	0.002
2003	98.9	0	0.006	0.005	0.004	0.003	0.002
2004	99.5	0	0.005	0.004	0.004	0.003	0.002
2005	96.9	0	0.007	0.006	0.004	0.004	0.002
2006	99.5	0	0.009	0.006	0.005	0.004	0.003
2007	99.4	0	0.006	0.004	0.003	0.002	0.002
2008	99.6	0	0.005	0.003	0.003	0.002	0.001
2009	98.4	0	0.006	0.005	0.003	0.003	0.002
2010	87.8	0	0.009	0.005	0.004	0.003	0.002
2011	95.7	0	0.006	0.004	0.003	0.002	0.002

**Table D36. Daily peak 24-hour sulfur dioxide at Wattleup (2002–2011)**

Trend station/region: Wattleup

AAQ NEPM Standard

0.08 ppm (24-hour average)

Year	Data Recovery (%)	No. of exceedences (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
2002	99.0	0	0.008	0.005	0.005	0.004	0.003
2003	97.5	0	0.006	0.005	0.005	0.004	0.003
2004	97.7	0	0.009	0.007	0.005	0.004	0.003
2005	99.7	0	0.014	0.008	0.006	0.005	0.004
2006	99.0	0	0.009	0.007	0.006	0.004	0.004
2007	93.3	0	0.010	0.008	0.007	0.005	0.004
2008	89.6	0	0.011	0.005	0.004	0.003	0.002
2009	95.6	0	0.008	0.005	0.005	0.004	0.003
2010	86.8	0	0.010	0.008	0.006	0.005	0.003
2011	94.3	0	0.008	0.006	0.005	0.004	0.003

**Table D37. Daily peak 24-hour particles as PM<sub>10</sub> at Caversham (2002–2011)**

Trend station/region: Caversham

AAQ NEPM Standard

50 µg/m<sup>3</sup> (24-hour average)

Year	Data Recovery (%)	No. of exceedences (days)	Max conc. (µg/m <sup>3</sup> )	99th percentile (µg/m <sup>3</sup> )	98th percentile (µg/m <sup>3</sup> )	95th percentile (µg/m <sup>3</sup> )	90th percentile (µg/m <sup>3</sup> )
2002	0.0	0					
2003	0.0	0					
2004	93.2	1	58.0	39.0	34.4	29.7	25.4
2005	98.2	1	76.8	41.4	37.1	32.2	28.1
2006	97.3	0	42.6	38.4	35.3	29.3	26.4
2007	98.4	1	58.8	39.7	35.9	30.3	26.1
2008	99.3	0	39.1	37.0	32.5	26.1	22.5
2009	99.4	0	45.7	37.2	32.4	29.0	25.8
2010	99.5	1	63.4	40.7	36.1	30.5	26.3
2011	99.1	1	76.1	33.2	30.2	27.3	23.8

**Table D38. Daily peak 24-hour particles as PM<sub>10</sub> at Duncraig (2002–2011)**

Trend station/region: Duncraig

AAQ NEPM Standard

50 µg/m<sup>3</sup> (24-hour average)

Year	Data Recovery (%)	No. of exceedences (days)	Max conc. (µg/m <sup>3</sup> )	99th percentile (µg/m <sup>3</sup> )	98th percentile (µg/m <sup>3</sup> )	95th percentile (µg/m <sup>3</sup> )	90th percentile (µg/m <sup>3</sup> )
2002	97.6	1	54.0	37.5	30.8	26.4	24.2
2003	99.1	1	66.7	33.7	31.0	28.3	25.5
2004	99.0	0	45.1	30.9	30.2	27.6	24.1
2005	98.5	1	59.2	34.8	30.7	26.7	23.9
2006	99.1	0	40.6	32.9	30.5	27.3	24.0
2007	99.7	0	40.3	31.8	29.4	25.8	22.0
2008	99.2	0	46.9	34.4	31.1	25.8	21.9
2009	99.2	0	45.5	36.2	30.4	24.5	22.6
2010	99.4	0	47.9	33.1	30.8	25.1	22.7
2011	99.3	1	65.9	30.1	29.5	25.7	23.2

**Table D39. Daily peak 24-hour particles as PM<sub>10</sub> at South Lake (2002–2011)**

Trend station/region: South Lake

AAQ NEPM Standard

50 µg/m<sup>3</sup> (24-hour average)

Year	Data Recovery (%)	No. of exceedences (days)	Max conc. (µg/m <sup>3</sup> )	99th percentile (µg/m <sup>3</sup> )	98th percentile (µg/m <sup>3</sup> )	95th percentile (µg/m <sup>3</sup> )	90th percentile (µg/m <sup>3</sup> )
2002	99.3	2	82.6	45.8	38.8	32.8	27.9
2003	95.8	0	44.5	40.1	36.3	32.4	28.2
2004	98.8	1	50.5	35.8	32.8	30.2	26.2
2005	98.8	3	98.8	46.1	39.6	33.6	28.7
2006	97.0	0	45.3	39.8	37.0	34.4	29.0
2007	97.9	1	56.7	37.7	36.0	32.9	26.7
2008	99.6	1	55.0	39.9	36.1	30.3	25.8
2009	99.5	0	49.0	38.7	34.3	30.8	27.5
2010	99.7	4	61.0	46.7	39.8	33.9	28.5
2011	99.2	1	66.2	35.8	31.5	28.1	24.8

**Table D40. Daily peak 24-hour particles as PM<sub>10</sub> at Bunbury (2002–2011)**

Trend station/region: Bunbury

AAQ NEPM Standard

50 µg/m<sup>3</sup> (24-hour average)

Year	Data Recovery (%)	No. of exceedences (days)	Max conc. (µg/m <sup>3</sup> )	99th percentile (µg/m <sup>3</sup> )	98th percentile (µg/m <sup>3</sup> )	95th percentile (µg/m <sup>3</sup> )	90th percentile (µg/m <sup>3</sup> )
2002	99.5	0	42.5	38.9	32.9	29.5	27.1
2003	99.2	1	54.5	34.2	33.3	30.2	26.3
2004	92.4	4	99.5	51.8	38.2	29.9	26.3
2005	99.1	3	63.3	37.9	33.3	27.5	24.9
2006	99.2	3	123.5	45.6	38.8	28.3	25.8
2007	99.6	0	46.5	32.8	29.6	27.1	24.5
2008	99.4	0	39.1	31.4	30.3	27.3	23.7
2009	99.5	1	53.8	40.3	36.0	29.5	25.4
2010	99.1	2	134.0	37.6	36.0	29.3	25.3
2011	99.6	2	68.4	39.3	33.8	28.0	23.8

**Table D41. Daily peak 24-hour particles as PM<sub>10</sub> at Albany (2002–2011)**

Trend station/region: Albany

AAQ NEPM Standard

50 µg/m<sup>3</sup> (24-hour average)

Year	Data Recovery (%)	No. of exceedences (days)	Max conc. (µg/m <sup>3</sup> )	99th percentile (µg/m <sup>3</sup> )	98th percentile (µg/m <sup>3</sup> )	95th percentile (µg/m <sup>3</sup> )	90th percentile (µg/m <sup>3</sup> )
2002	0.0	0					
2003	0.0	0					
2004	0.0	0					
2005	0.0	0					
2006	52.4	0	39.4	35.4	33.0	26.6	24.6
2007	99.8	1	55.7	31.3	28.0	24.7	22.1
2008	99.2	2	56.3	34.1	32.8	26.1	22.7
2009	97.7	0	36.7	32.3	28.7	24.5	21.4
2010	99.8	1	52.5	36.1	33.2	27.3	25.3
2011	99.3	0	37.3	33.6	30.6	26.3	22.0

**Table D42. Daily peak 24-hour particles as PM<sub>10</sub> at Geraldton (2002–2011)**

Trend station/region: Geraldton

AAQ NEPM Standard

50 µg/m<sup>3</sup> (24-hour average)

Year	Data Recovery (%)	No. of exceedences (days)	Max conc. (µg/m <sup>3</sup> )	99th percentile (µg/m <sup>3</sup> )	98th percentile (µg/m <sup>3</sup> )	95th percentile (µg/m <sup>3</sup> )	90th percentile (µg/m <sup>3</sup> )
2002	0.0	0					
2003	0.0	0					
2004	0.0	0					
2005	27.7	2	61.3	52.9	47.0	34.8	31.6
2006	99.4	4	78.0	48.6	45.8	40.0	35.4
2007	99.7	10	116.3	87.2	67.9	44.7	36.4
2008	98.9	10	150.7	105.2	58.1	45.9	38.6
2009	99.6	14	128.9	69.2	58.6	48.5	40.3
2010	97.7	4	55.6	49.3	47.8	41.6	37.9
2011	98.6	3	63.0	45.4	40.2	35.8	32.2

**Table D43. Daily peak 24-hour particles as PM<sub>10</sub> at Collie (2002–2011)**

Trend station/region: Collie

AAQ NEPM Standard

50 µg/m<sup>3</sup> (24-hour average)

Year	Data Recovery (%)	No. of exceedences (days)	Max conc. (µg/m <sup>3</sup> )	99th percentile (µg/m <sup>3</sup> )	98th percentile (µg/m <sup>3</sup> )	95th percentile (µg/m <sup>3</sup> )	90th percentile (µg/m <sup>3</sup> )
2002	0.0	0					
2003	0.0	0					
2004	0.0	0					
2005	0.0	0					
2006	0.0	0					
2007	0.0	0					
2008	87.6	7	85.9	56.7	50.1	37.4	30.5
2009	99.5	3	80.4	47.3	46.2	38.0	31.3
2010	99.7	16	163.0	86.7	67.3	46.1	34.9
2011	97.6	4	61.5	52.1	40.4	32.0	29.2

**Table D44. Daily peak 24-hour particles as PM<sub>2.5</sub> at Caversham (2002–2011)**

Trend station/region: Caversham

AAQ NEPM Advisory Standard

25 µg/m<sup>3</sup> (24-hour average)

Year	Data Recovery (%)	No. of exceedences (days)	Max conc. (µg/m <sup>3</sup> )	99th percentile (µg/m <sup>3</sup> )	98th percentile (µg/m <sup>3</sup> )	95th percentile (µg/m <sup>3</sup> )	90th percentile (µg/m <sup>3</sup> )
2002	99.6	1	25.7	16.2	15.0	13.4	12.0
2003	98.6	1	27.3	16.3	14.4	13.4	11.6
2004	5.3	0	16.5	15.7	14.9	12.6	10.4
2005	98.6	1	27.3	16.3	14.4	13.4	11.6
2006	63.8	1	34.0	18.6	15.6	13.4	12.0
2007	98.4	0	24.5	15.1	14.0	12.1	10.7
2008	99.4	1	26.3	15.2	14.0	11.7	10.6
2009	99.5	2	25.5	19.4	17.3	12.9	11.0
2010	99.1	3	45.2	21.9	16.2	13.7	12.1
2011	99.4	1	41.5	12.4	11.7	10.8	9.8

**Table D45. Daily peak 24-hour particles as PM<sub>2.5</sub> at Duncraig (2002–2011)**

Trend station/region: Duncraig

AAQ NEPM Advisory Standard

25 µg/m<sup>3</sup> (24-hour average)

Year	Data Recovery (%)	No. of exceedences (days)	Max conc. (µg/m <sup>3</sup> )	99th percentile (µg/m <sup>3</sup> )	98th percentile (µg/m <sup>3</sup> )	95th percentile (µg/m <sup>3</sup> )	90th percentile (µg/m <sup>3</sup> )
2002	98.9	1	28.3	20.3	17.4	15.7	13.3
2003	98.4	1	25.2	19.2	16.1	14.9	13.1
2004	99.2	0	24.4	17.9	15.6	14.1	11.6
2005	98.6	3	40.6	17.3	15.0	13.1	11.4
2006	99.0	2	33.4	18.7	16.2	13.4	11.9
2007	99.6	0	19.6	14.2	13.5	11.6	10.1
2008	99.3	1	38.3	18.0	15.9	12.6	11.1
2009	99.4	3	32.7	22.1	17.5	13.2	11.5
2010	99.3	3	36.4	20.1	15.9	13.7	12.0
2011	99.4	1	52.1	14.7	13.4	11.5	10.4

**Table D46. Daily peak 24-hour particles as PM<sub>2.5</sub> at Quinns Rocks (2002–2011)**

Trend station/region: Quinns Rocks

AAQ NEPM Advisory Standard

25 µg/m<sup>3</sup> (24-hour average)

Year	Data Recovery (%)	No. of exceedences (days)	Max conc. (µg/m <sup>3</sup> )	99th percentile (µg/m <sup>3</sup> )	98th percentile (µg/m <sup>3</sup> )	95th percentile (µg/m <sup>3</sup> )	90th percentile (µg/m <sup>3</sup> )
2002	0.0	0					
2003	0.0	0					
2004	0.0	0					
2005	0.0	0					
2006	55.3	1	63.9	17.0	14.3	13.2	11.0
2007	99.7	0	19.9	15.4	13.7	12.1	10.1
2008	99.3	1	53.3	17.3	15.4	12.8	11.3
2009	99.8	2	31.3	20.7	15.2	12.7	11.3
2010	99.6	3	33.7	17.6	14.5	12.0	10.9
2011	99.0	2	43.2	17.3	14.6	11.6	10.1

**Table D47. Daily peak 24-hour particles as PM<sub>2.5</sub> at South Lake (2002–2011)**

Trend station/region: South Lake

AAQ NEPM Advisory Standard

25 µg/m<sup>3</sup> (24-hour average)

Year	Data Recovery (%)	No. of exceedences (days)	Max conc. (µg/m <sup>3</sup> )	99th percentile (µg/m <sup>3</sup> )	98th percentile (µg/m <sup>3</sup> )	95th percentile (µg/m <sup>3</sup> )	90th percentile (µg/m <sup>3</sup> )
2002	0.0	0					
2003	0.0	0					
2004	0.0	0					
2005	0.0	0					
2006	76.7	1	30.5	21.5	17.2	14.6	12.8
2007	98.9	0	21.2	15.6	12.9	11.8	10.5
2008	99.4	1	45.2	18.2	14.1	12.7	11.2
2009	99.3	3	32.0	22.8	19.1	14.1	11.7
2010	99.5	2	40.0	22.0	19.2	15.9	13.2
2011	99.2	1	48.2	16.2	15.3	13.1	11.5

**Table D48. Daily peak 24-hour particles as PM<sub>2.5</sub> at Bunbury (2002–2011)**

Trend station/region: Bunbury

AAQ NEPM Advisory Standard

25 µg/m<sup>3</sup> (24-hour average)

Year	Data Recovery (%)	No. of exceedences (days)	Max conc. (µg/m <sup>3</sup> )	99th percentile (µg/m <sup>3</sup> )	98th percentile (µg/m <sup>3</sup> )	95th percentile (µg/m <sup>3</sup> )	90th percentile (µg/m <sup>3</sup> )
2002	99.5	4	36.1	24.5	20.2	15.7	14.0
2003	98.9	3	37.6	20.7	18.3	15.7	13.1
2004	98.0	5	94.8	31.7	21.5	15.8	13.2
2005	99.0	5	64.2	26.9	19.1	15.4	12.1
2006	99.3	8	113.5	32.4	26.0	14.8	13.0
2007	99.4	3	34.5	21.2	17.8	13.2	10.7
2008	99.7	2	27.8	21.0	18.6	13.2	11.4
2009	99.5	7	40.0	26.6	22.3	16.9	12.6
2010	98.6	7	115.3	28.4	24.2	14.8	12.2
2011	98.9	5	45.5	26.6	18.7	13.2	11.2

**Table D49. Daily peak 24-hour particles as PM<sub>2.5</sub> at Busselton (2002–2011)**

Trend station/region: Busselton

AAQ NEPM Advisory Standard

25 µg/m<sup>3</sup> (24-hour average)

Year	Data Recovery (%)	No. of exceedences (days)	Max conc. (µg/m <sup>3</sup> )	99th percentile (µg/m <sup>3</sup> )	98th percentile (µg/m <sup>3</sup> )	95th percentile (µg/m <sup>3</sup> )	90th percentile (µg/m <sup>3</sup> )
2002	0.0	0					
2003	0.0	0					
2004	0.0	0					
2005	0.0	0					
2006	16.7	0	12.7	11.9	11.3	10.8	10.1
2007	99.4	2	51.1	15.6	14.3	11.7	9.9
2008	99.3	3	35.6	20.5	15.5	11.9	10.5
2009	99.8	12	69.0	45.0	31.6	17.7	14.0
2010	99.4	7	62.5	31.6	22.9	15.7	11.6
2011	99.8	6	85.2	36.7	20.5	13.9	11.4

## Maxima by pollutant 2002-2011

**Table D50. Annual daily peak 8-hour carbon monoxide concentrations (ppm) for 2002–2011**  
AAQ NEPM Standard  
9.0 ppm (8-hour average)

Regional Performance Monitoring Station	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
<u>Perth Region</u>										
Caversham (North East Metro)	1.3	1.1	1.3	1.3	1.8	0.9	0.8	1.0	1.6	1.5
Duncraig (North Metro)	5.4	4.1	4.5	3.3	3.4	2.0	3.1	2.6	2.3	1.9
South Lake (South East Metro)	3.2	3.1	3.5	2.9	2.5	1.7	2.0	1.8	2.2	1.7

Highlighted cells indicate NEPM exceedences.

**Table D51. Annual daily peak 1-hour nitrogen dioxide concentrations (ppm) for 2002–2011**  
AAQ NEPM Standard  
0.12 ppm (1-hour average)

Regional Performance Monitoring Station	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
<u>Perth Region</u>										
Caversham (North East Metro)	0.055	0.043	0.046	0.048	0.084	0.044	0.036	0.044	0.054	0.035
Duncraig (North Metro)	0.049	0.057	0.043	0.051	0.056	0.053	0.038	0.042	0.038	0.035
Quinns Rocks (Outer North Coast)	0.037	0.035	0.041	0.041	0.065	0.035	0.037	0.034	0.040	0.031
Rockingham (South Coast)	0.042	0.051	0.055	0.045	0.054	0.040	0.031	0.031	0.036	0.034
Rolling Green (Outer East Rural)	0.025	0.032	0.025	0.029	0.026	0.020	0.023	0.035	0.030	0.023
South Lake (South East Metro)	0.048	0.048	0.043	0.052	0.045	0.057	0.044	0.048	0.058	0.041
Swanbourne (Inner West Coast)	0.051	0.048	0.042	0.039	0.043	0.038	0.035	0.037	0.038	0.032

Highlighted cells indicate NEPM exceedences.

**Table D52. Annual daily peak 1-hour ozone concentrations (ppm) for 2002–2011**AAQ NEPM Standard  
0.10 ppm (1-hour average)

Regional Performance Monitoring Station	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
<u>Perth Region</u>										
Caversham (North East Metro)	0.091	0.083	0.079	0.094	0.080	0.085	0.083	0.104	0.082	0.077
Quinns Rocks (Outer North Coast)	0.079	0.086	0.079	0.095	0.085	0.081	0.083	0.070	0.091	0.083
Rockingham (South Coast)	0.079	0.064	0.102	0.081	0.072	0.084	0.077	0.078	0.067	0.065
Rolling Green (Outer East Rural)	0.091	0.087	0.101	0.079	0.093	0.095	0.087	0.103	0.088	0.073
South Lake (South East Metro)	0.067	0.071	0.076	0.080	0.066	0.067	0.082	0.065	0.070	0.076
Swanbourne (Inner West Coast)	0.081	0.082	0.077	0.076	0.075	0.077	0.076	0.068	0.066	0.085

Highlighted cells indicate NEPM exceedences.

**Table D53. Annual daily peak 4-hour ozone concentrations (ppm) for 2002–2011**AAQ NEPM Standard  
0.08 ppm (4-hour average)

Regional Performance Monitoring Station	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
<u>Perth Region</u>										
Caversham (North East Metro)	0.068	0.069	0.067	0.069	0.072	0.073	0.076	0.092	0.072	0.063
Quinns Rocks (Outer North Coast)	0.069	0.071	0.068	0.070	0.074	0.075	0.073	0.062	0.065	0.075
Rockingham (South Coast)	0.071	0.059	0.079	0.075	0.067	0.079	0.072	0.066	0.064	0.061
Rolling Green (Outer East Rural)	0.071	0.075	0.077	0.068	0.079	0.080	0.075	0.083	0.080	0.061
South Lake (South East Metro)	0.058	0.063	0.064	0.070	0.063	0.059	0.067	0.057	0.061	0.064
Swanbourne (Inner West Coast)	0.066	0.066	0.067	0.066	0.069	0.067	0.070	0.063	0.055	0.073

Highlighted cells indicate NEPM exceedences.

**Table D54. Annual daily peak 1-hour sulfur dioxide concentrations (ppm) for 2002–2011**AAQ NEPM Standard  
0.20 ppm (1-hour average)

Regional Performance Monitoring Station	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
<u>Perth Region</u>										
Rockingham (South Coast)	0.035	0.026	0.039	0.041	0.040	0.041	0.079	0.032	0.037	0.040
South Lake (South East Metro)	0.043	0.038	0.042	0.046	0.060	0.040	0.046	0.036	0.073	0.044
Wattleup (South Metro)	0.081	0.062	0.076	0.120	0.062	0.060	0.077	0.059	0.057	0.067

Highlighted cells indicate NEPM exceedences.

**Table D55. Annual daily peak 24-hour sulfur dioxide concentrations (ppm) for 2002–2011**  
 AAQ NEPM Standard  
 0.08 ppm (24-hour average)

Regional Performance Monitoring Station	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
<u>Perth Region</u>										
Rockingham (South Coast)	0.006	0.005	0.006	0.009	0.007	0.012	0.007	0.008	0.007	0.008
South Lake (South East Metro)	0.006	0.006	0.005	0.007	0.009	0.006	0.005	0.006	0.009	0.006
Wattleup (South Metro)	0.008	0.006	0.009	0.014	0.009	0.010	0.011	0.008	0.010	0.008

Highlighted cells indicate NEPM exceedences.

**Table D56. Annual daily peak 24-hour particles as PM<sub>10</sub> concentrations (µg/m<sup>3</sup>) for 2002–2011**  
 AAQ NEPM Standard  
 50 µg/m<sup>3</sup> (24-hour average)

Regional Performance Monitoring Station	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
<u>Perth Region</u>										
Caversham (North East Metro)	-	-	58.0	76.8	42.6	58.8	39.1	45.7	63.4	76.1
Duncraig (North Metro)	54.0	66.7	45.1	59.2	40.6	40.3	46.9	45.5	47.9	65.9
South Lake (South East Metro)	82.6	44.5	50.5	98.8	45.3	56.7	55.0	49.0	61.0	66.2
<u>Southwest Region</u>										
Bunbury	42.5	54.5	99.5	63.3	123.5	46.5	39.1	53.8	134.0	68.4
Collie	-	-	-	-	-	-	85.9	80.4	163.0	61.5
Albany	-	-	-	-	39.4	55.7	56.3	36.7	52.5	37.3
<u>Mid West Region</u>										
Geraldton	-	-	-	61.3	78.0	116.3	150.7	128.9	55.6	63.0

Highlighted cells indicate NEPM exceedences.

**Table D57. Annual daily peak 24-hour particles as PM<sub>2.5</sub> concentrations (µg/m<sup>3</sup>) for 2002–2011**  
 AAQ NEPM Advisory Standard  
 25 µg/m<sup>3</sup> (24-hour average)

Regional Performance Monitoring Station	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
<u>Perth Region</u>										
Caversham (North East Metro)	25.7	27.3	16.5	27.3	34.0	24.5	26.3	25.5	45.2	41.5
Duncraig (North Metro)	28.3	25.2	24.4	40.6	33.4	19.6	38.3	32.7	36.4	52.1
Quinns Rocks (Outer North Coast)	-	-	-	-	63.9	19.9	53.3	31.3	33.7	43.2
South Lake (South East Metro)	-	-	-	-	30.5	21.2	45.2	32.0	40.0	48.2
<u>Southwest Region</u>										
Bunbury	36.1	37.6	94.8	64.2	113.5	34.5	27.8	40.0	115.3	45.5
Busselton	-	-	-	-	12.7	51.1	35.6	69.0	62.5	85.2

Highlighted cells indicate NEPM exceedences.



**Table D58. Annual averaged particles as PM<sub>2.5</sub> concentrations (µg/m<sup>3</sup>) for 2002–2011**  
 AAQ NEPM Advisory Standard  
 8 µg/m<sup>3</sup> (annual average)

Regional Performance Monitoring Station	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
<u>Perth Region</u>										
Caversham (North East Metro)	8.1	8.0	7.6	8.0	8.1	7.5	7.1	7.8	8.2	7.0
Duncraig (North Metro)	9.2	8.9	7.9	7.8	8.2	7.3	7.7	8.2	8.2	7.8
Quinns Rocks (Outer North Coast)	-	-	-	-	7.8	6.9	7.2	7.8	7.8	7.2
South Lake (South East Metro)	-	-	-	-	8.7	7.6	7.7	8.2	8.7	7.8
<u>Southwest Region</u>										
Bunbury	9.0	8.6	9.2	8.6	8.7	7.8	7.6	8.3	9.2	8.0
Busselton	-	-	-	-	6.9	7.4	7.3	9.0	8.5	8.5

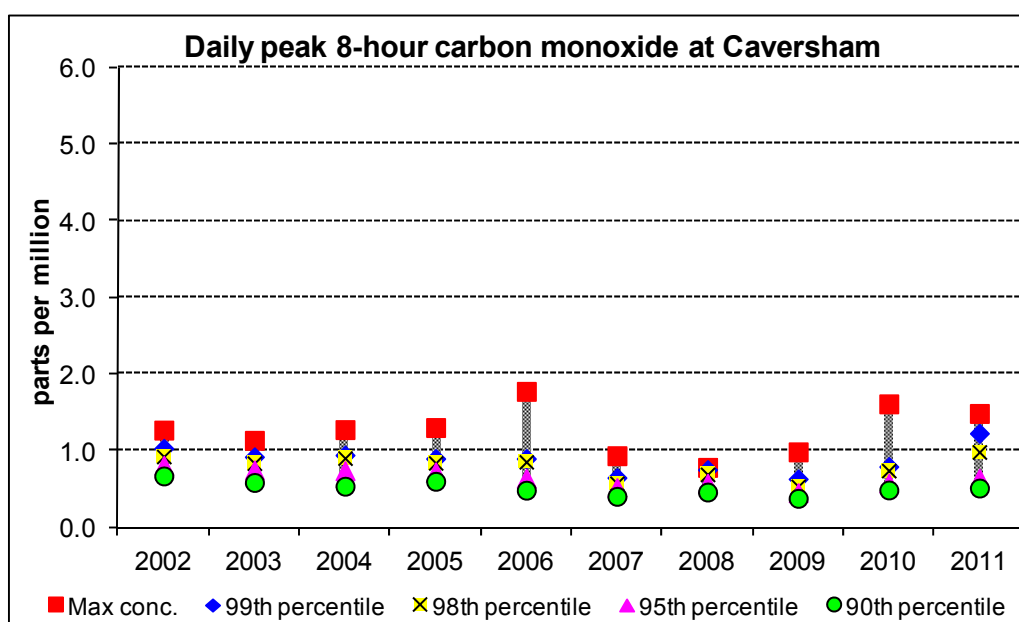
Highlighted cells indicate NEPM exceedences.

## ATTACHMENT 1 - Graphical trends

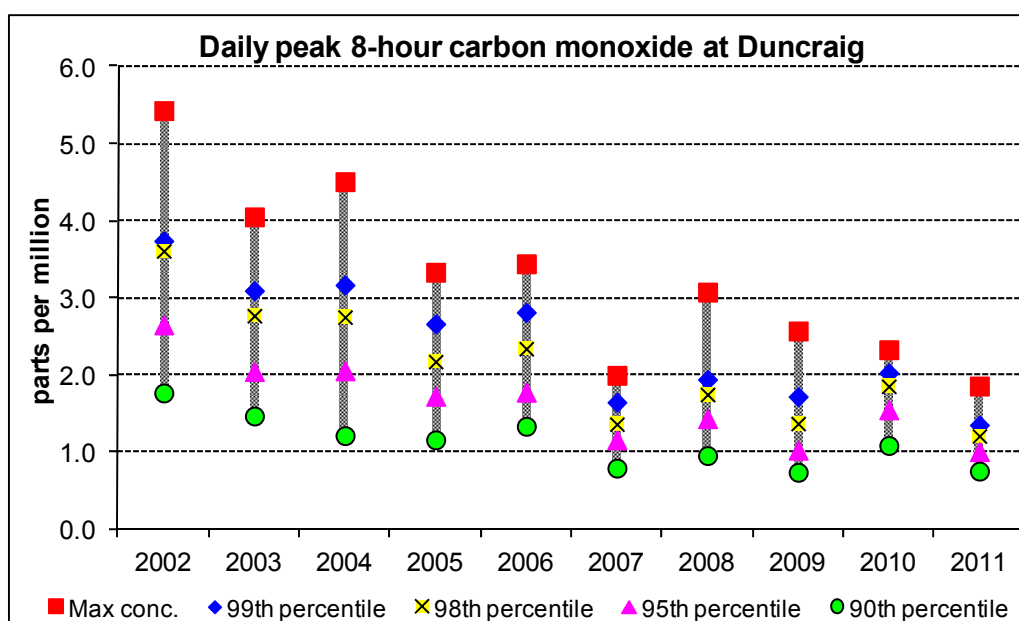
This attachment provides graphical representations of tables D8 to D44 of Section D. Each graph show the maximum, 99<sup>th</sup> percentile, 98<sup>th</sup> percentile, 95<sup>th</sup> percentile and 90<sup>th</sup> percentile of daily maximum concentration for all pollutants monitored by the Department of Environment and Conservation in Western Australia. The nominated percentiles can also be expressed as an Nth highest concentration. Based on 100 per cent data recovery and a normal year (i.e. 365 days), the following table gives each percentile an equivalent Nth highest ordinal value. The bracketed numbers represent the exact (as calculated) value of the ordinal number.

Percentile	Nth highest
100	1 (maximum)
99	5 (4.65)
98	8 (8.3)
95	19 (19.25)
90	38 (37.5)

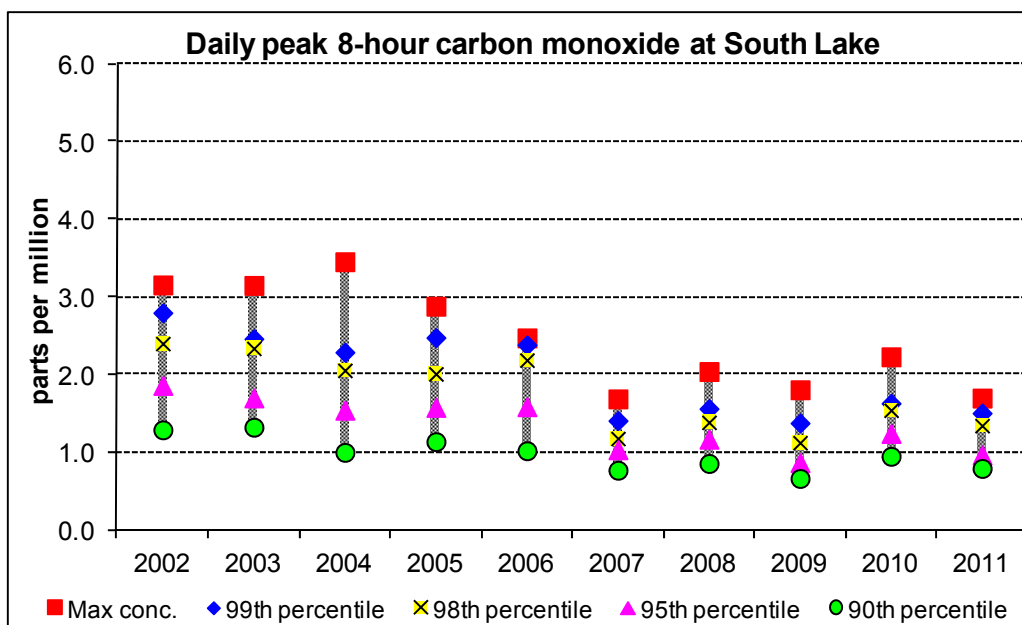
## Carbon monoxide



*Figure A1-1 - 8-hour carbon monoxide at Caversham*

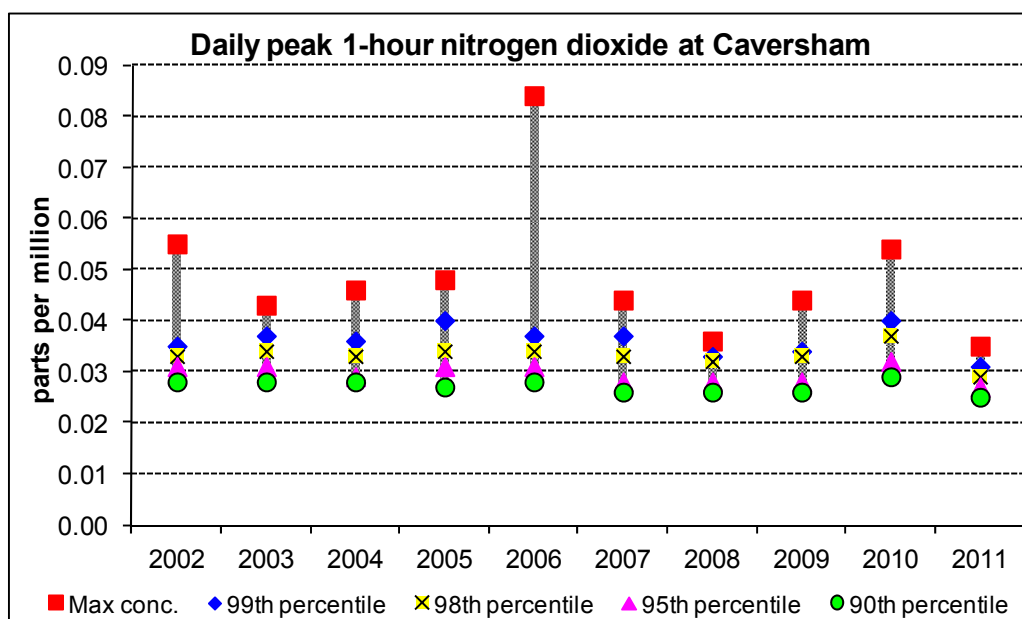


*Figure A1-2 - 8-hour carbon monoxide at Duncraig*

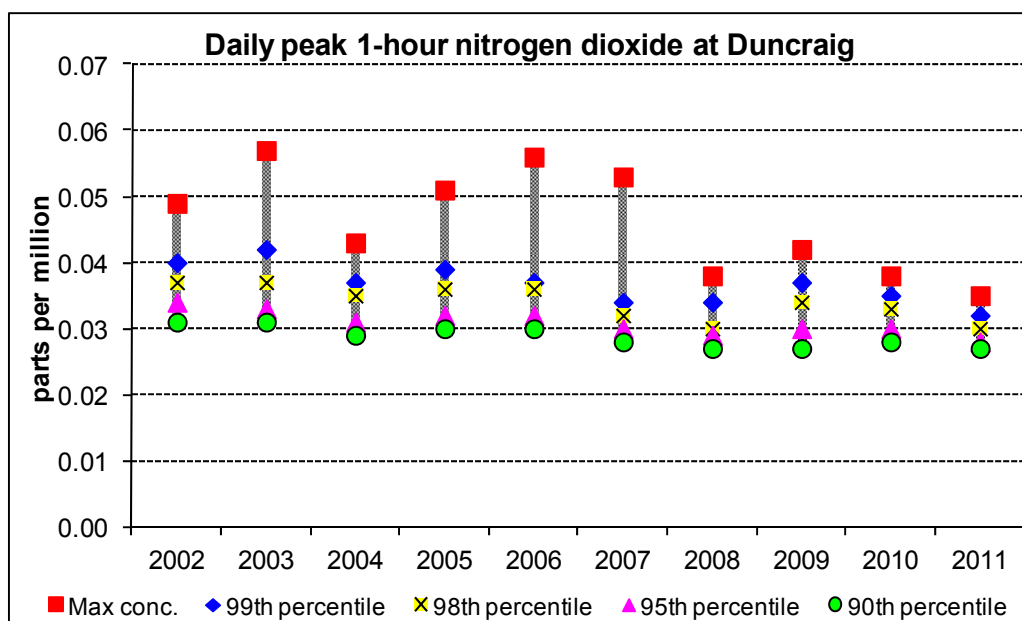


**Figure A1-3 - 8-hour carbon monoxide at South Lake**

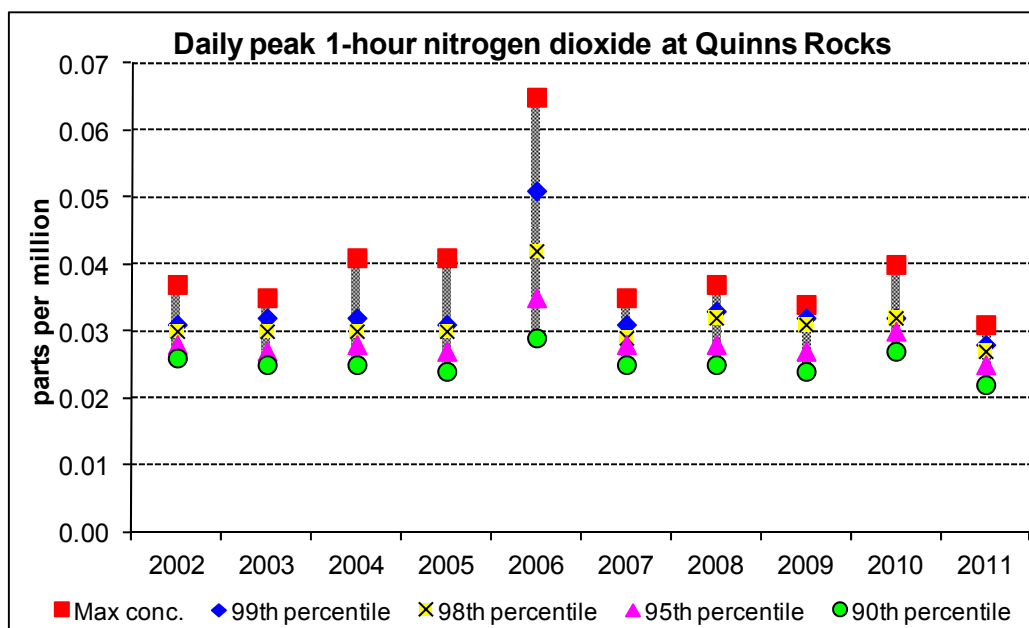
## Nitrogen dioxide



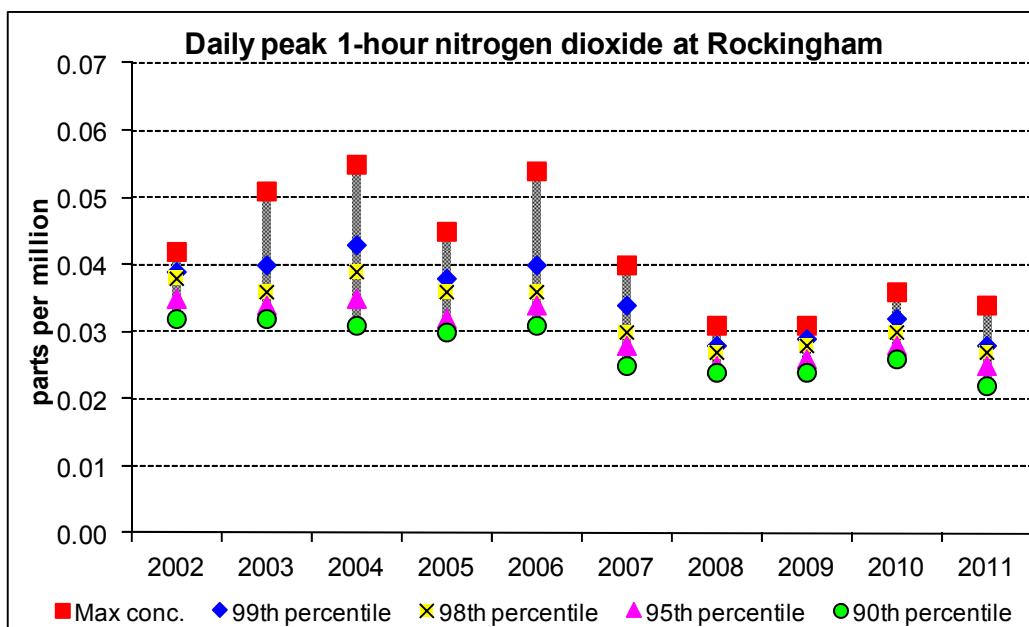
*Figure A1-4 - 1-hour nitrogen dioxide at Caversham*



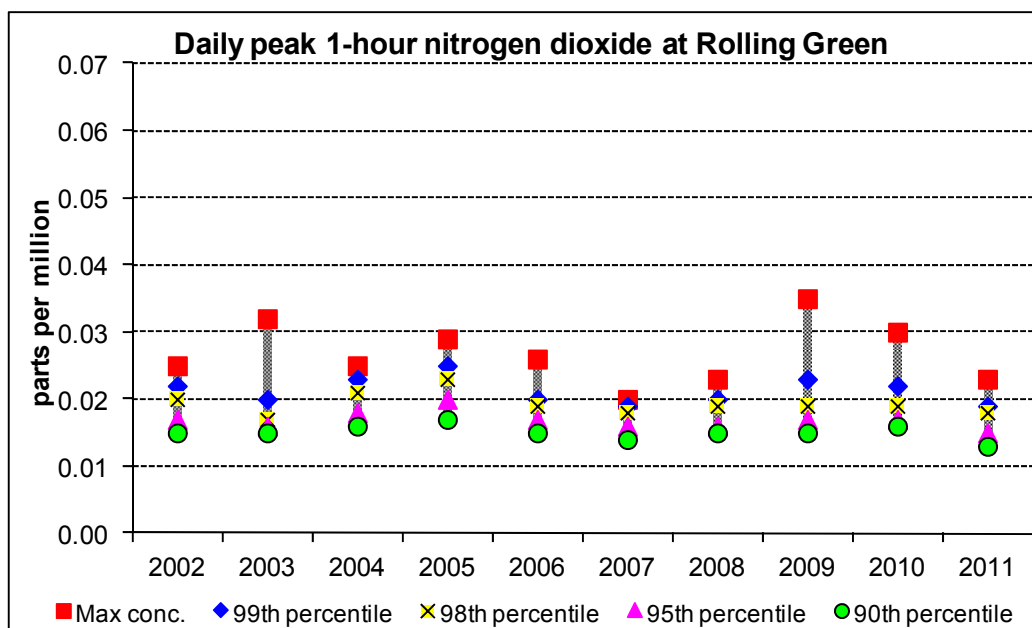
*Figure A1-5 - 1-hour nitrogen dioxide at Duncraig*



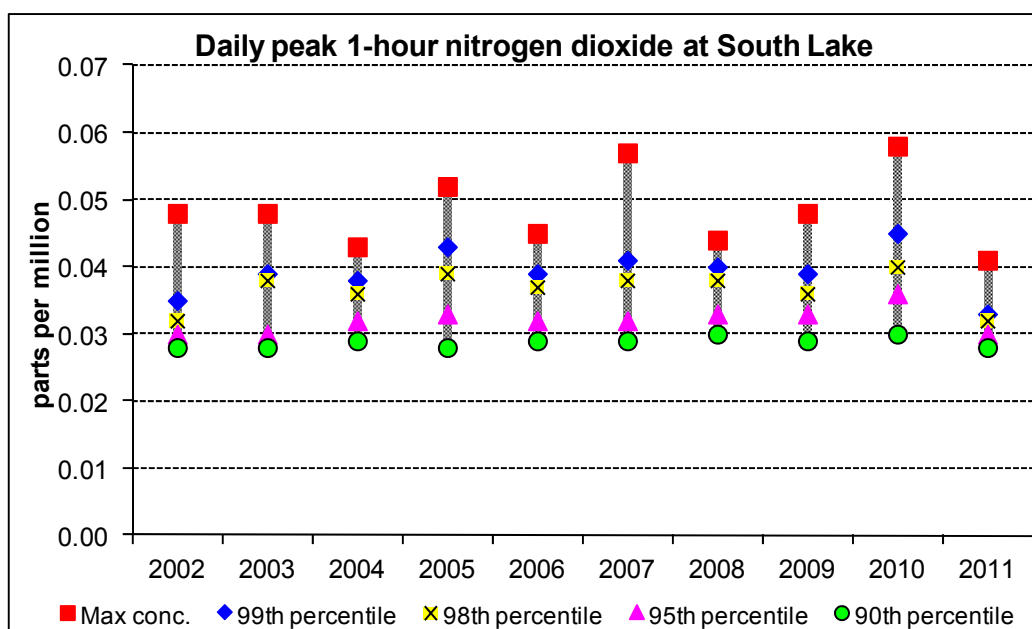
*Figure A1-6 - 1-hour nitrogen dioxide at Quinns Rocks*



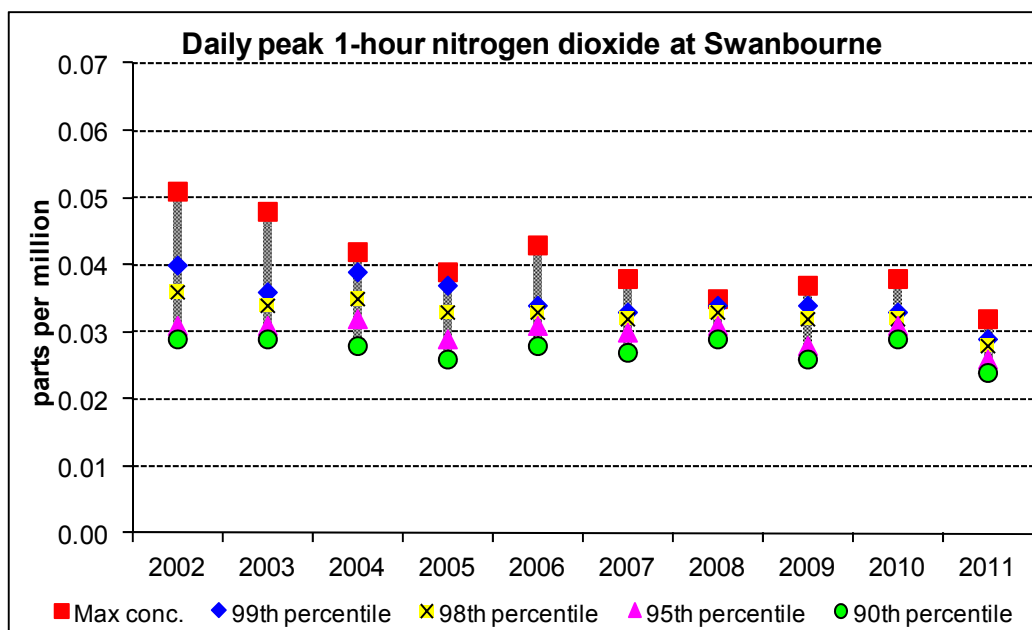
*Figure A1-7 - 1-hour nitrogen dioxide at Rockingham*



*Figure A1-8 - 1-hour nitrogen dioxide at Rolling Green*



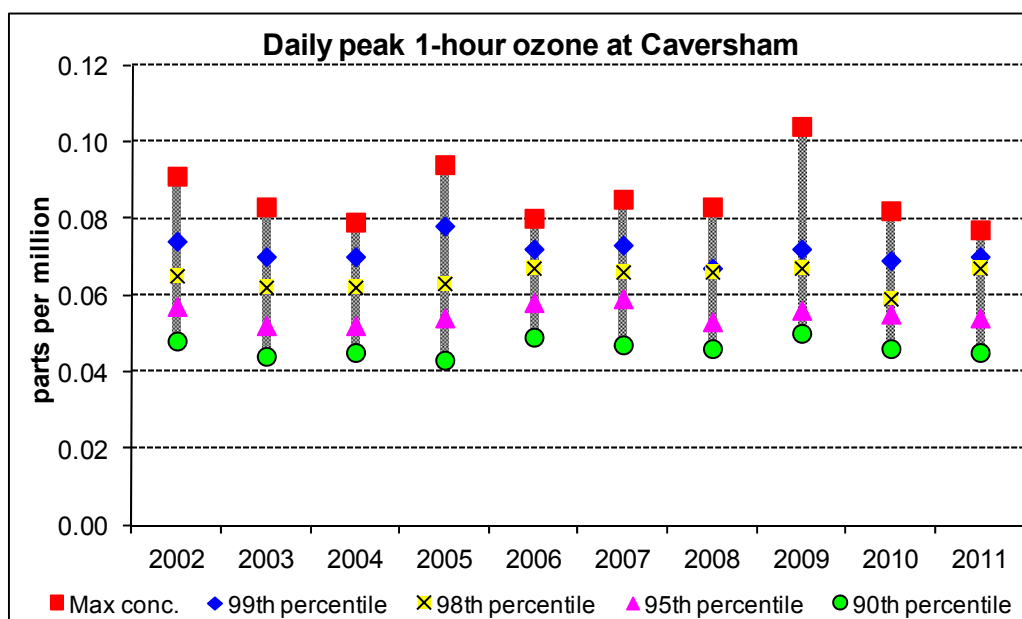
*Figure A1-9 - 1-hour nitrogen dioxide at South Lake*



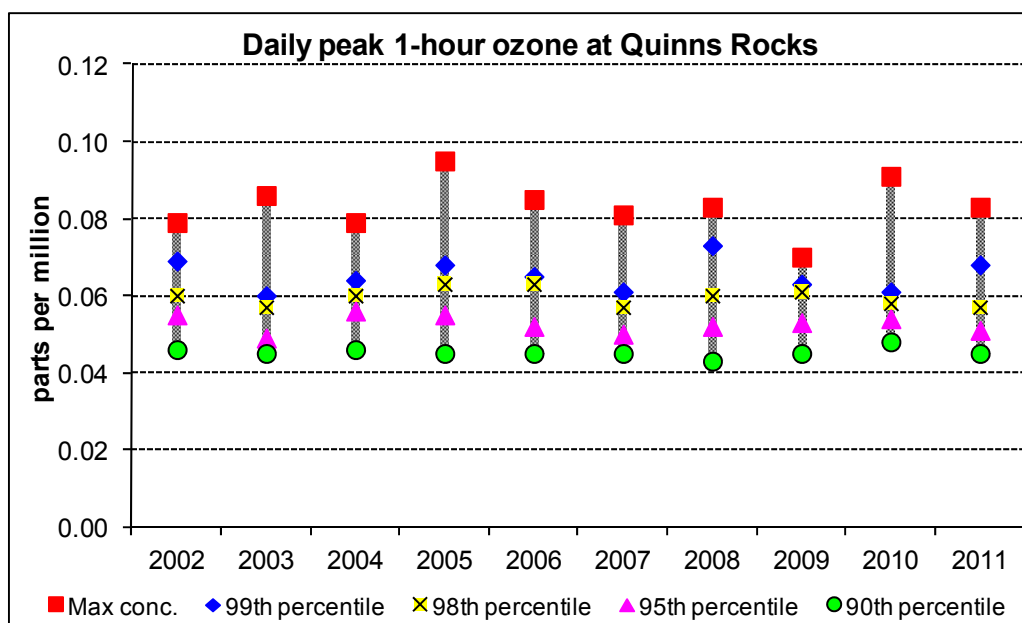
**Figure A1-10 - 1-hour nitrogen dioxide at Swanbourne**



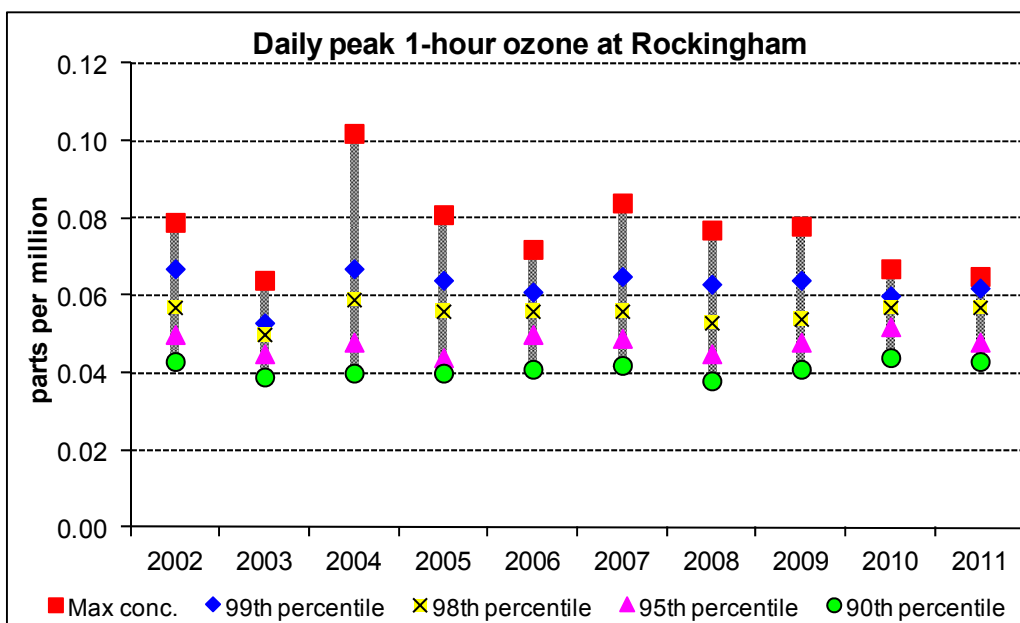
## Ozone



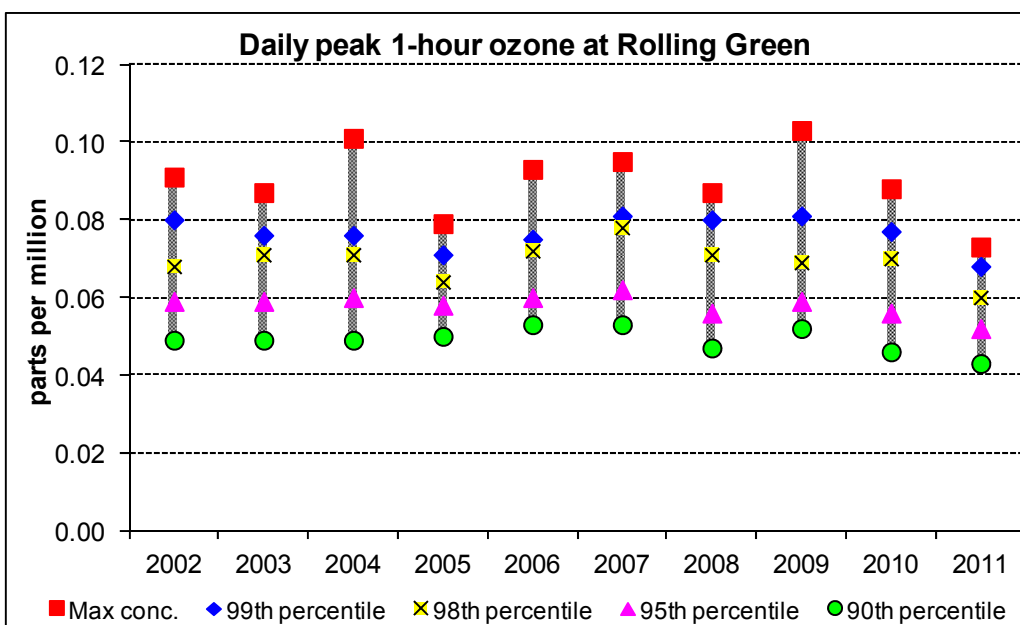
*Figure A1-11 - 1-hour ozone at Caversham*



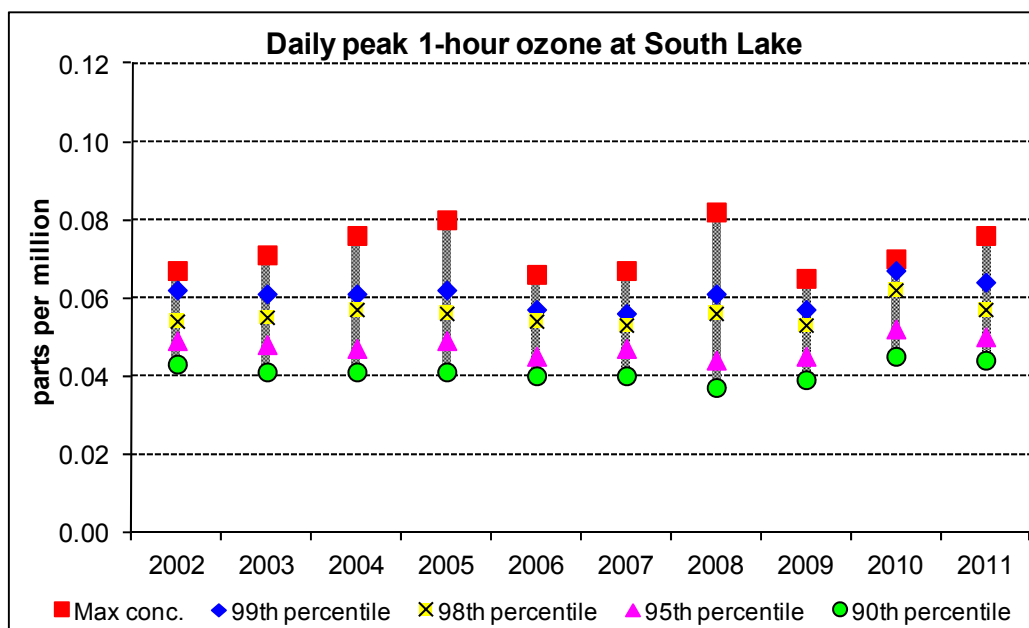
*Figure A1-12 - 1-hour ozone at Quinns Rocks*



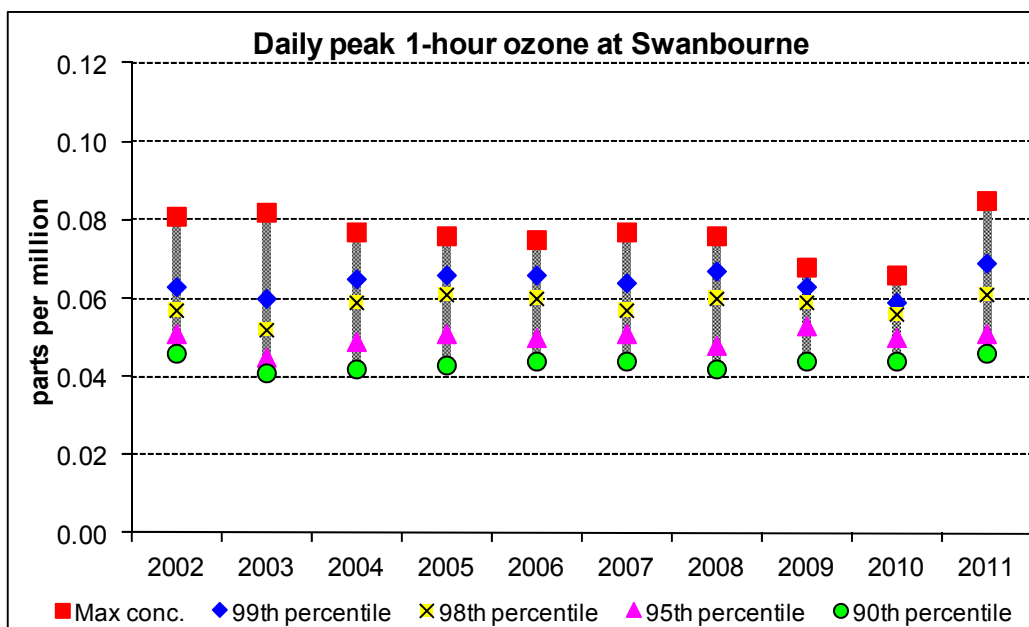
*Figure A1-13 - 1-hour ozone at Rockingham*



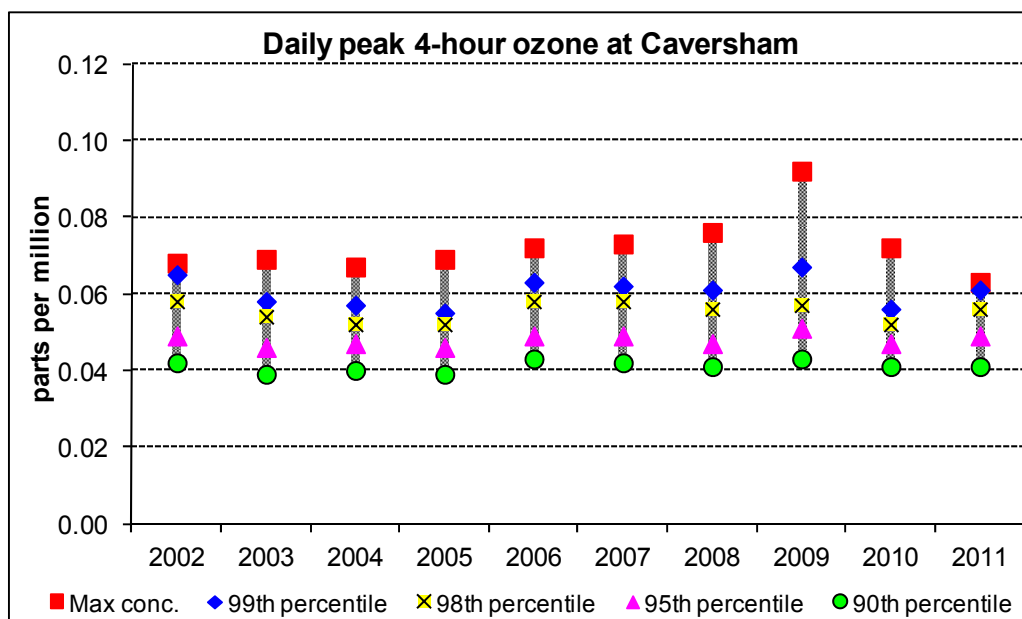
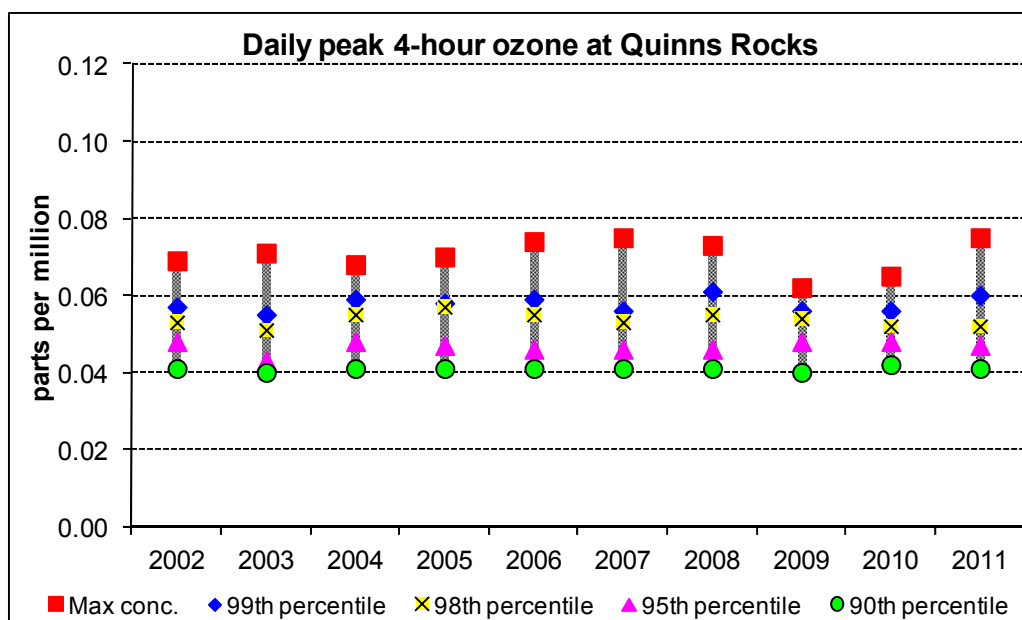
*Figure A1-14 - 1-hour ozone at Rolling Green*

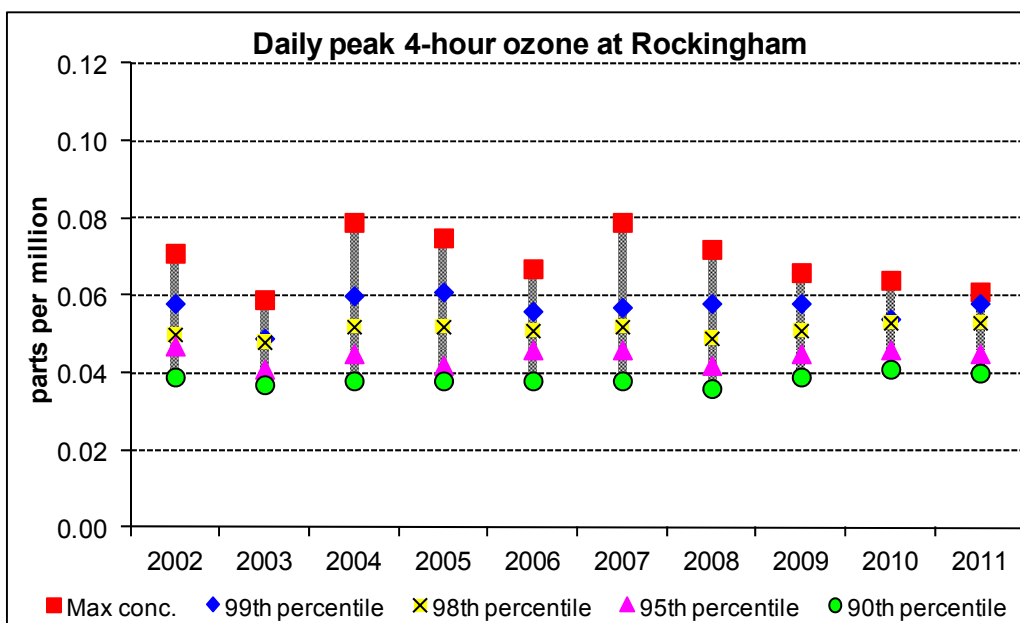
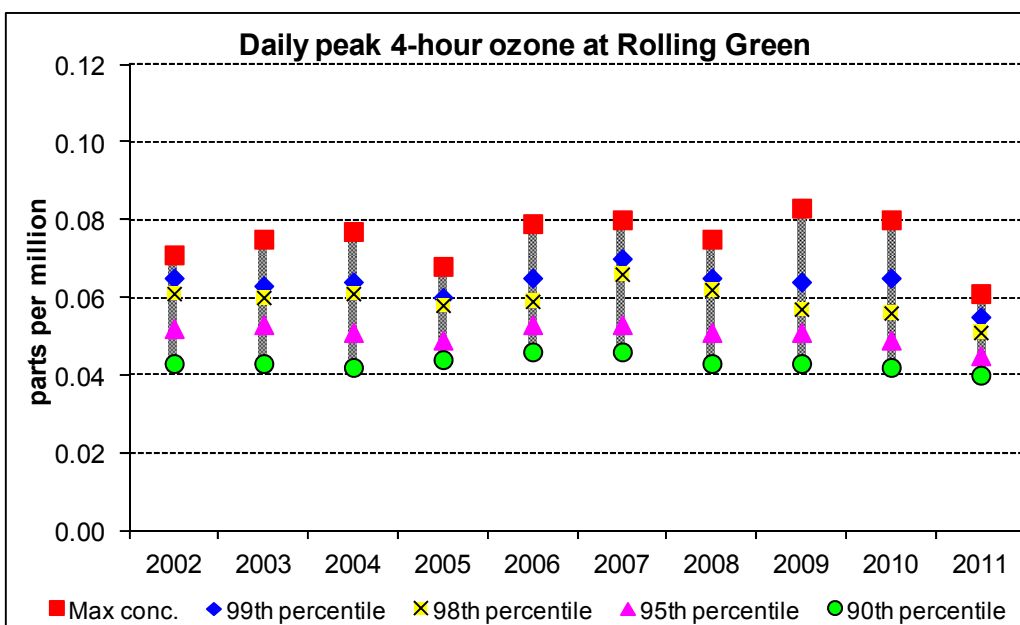


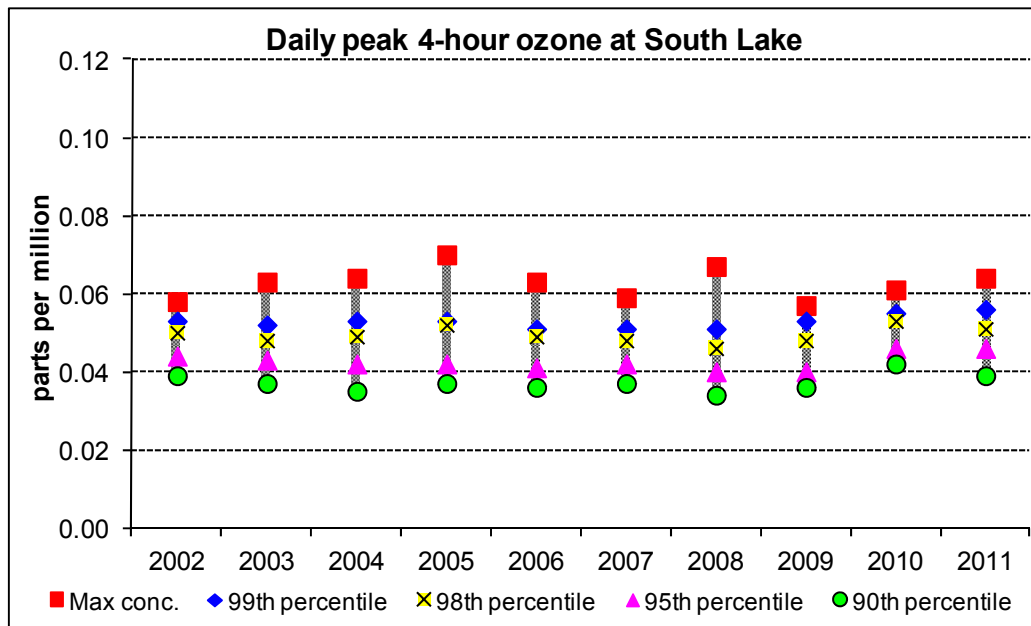
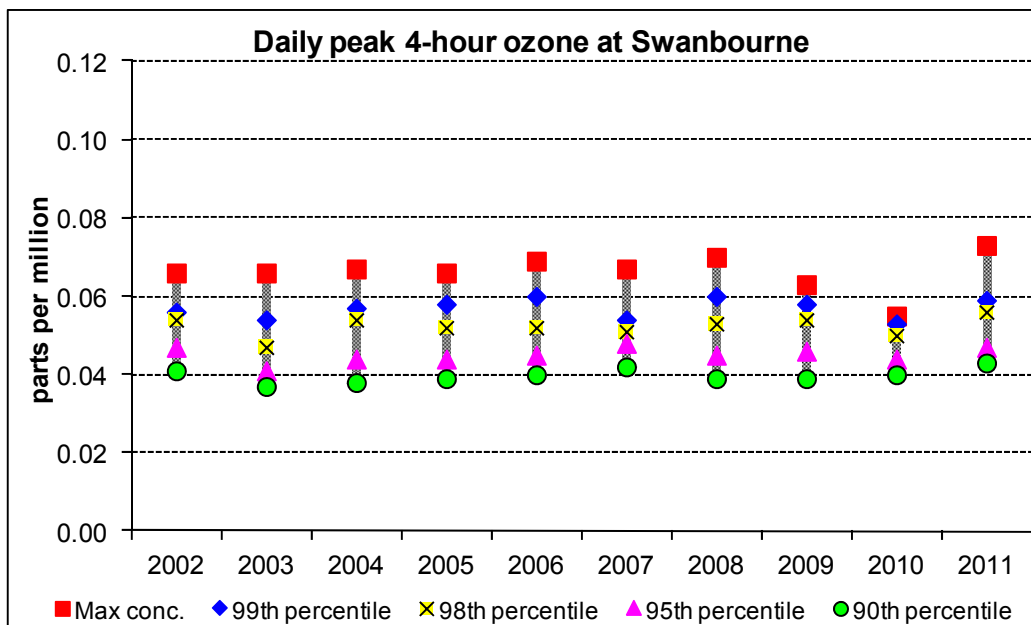
*Figure A1-15 - 1-hour ozone at South Lake*



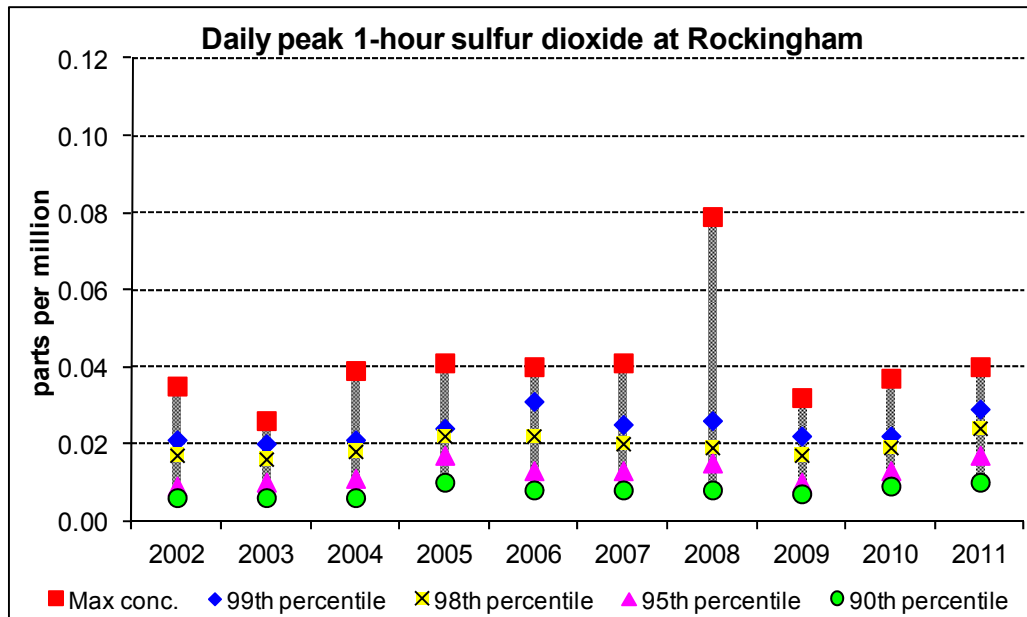
*Figure A1-16 - 1-hour ozone at Swanbourne*

*Figure A1-17 - 4-hour ozone at Caversham**Figure A1-18 - 4-hour ozone at Quinns Rocks*

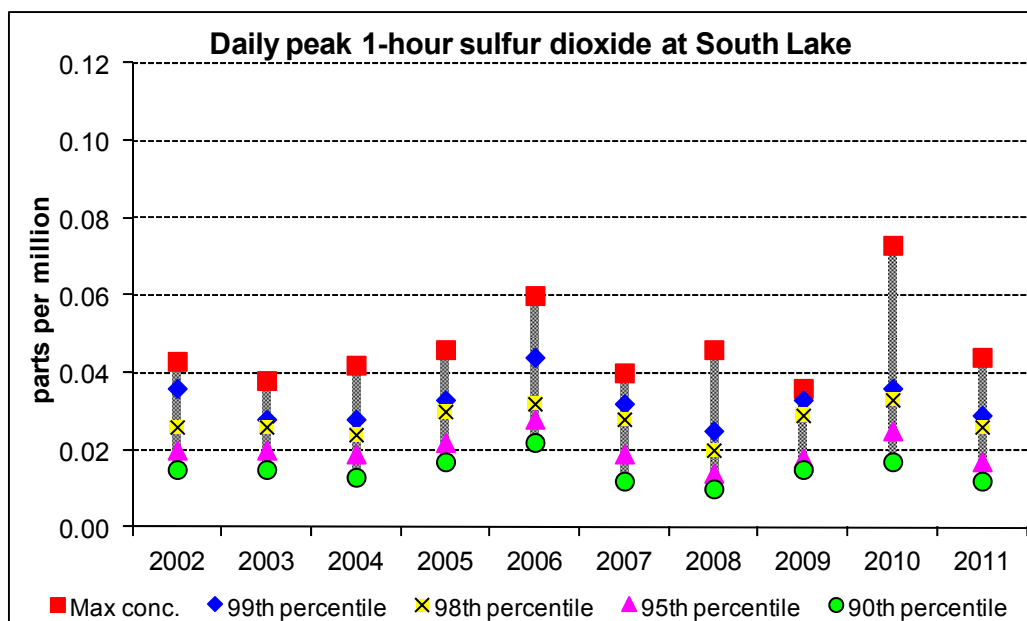
*Figure A1-19 - 4-hour ozone at Rockingham**Figure A1-20 - 4-hour ozone at Rolling Green*

*Figure A1-21 - 4-hour ozone at South Lake**Figure A1-22 - 4-hour ozone at Swanbourne*

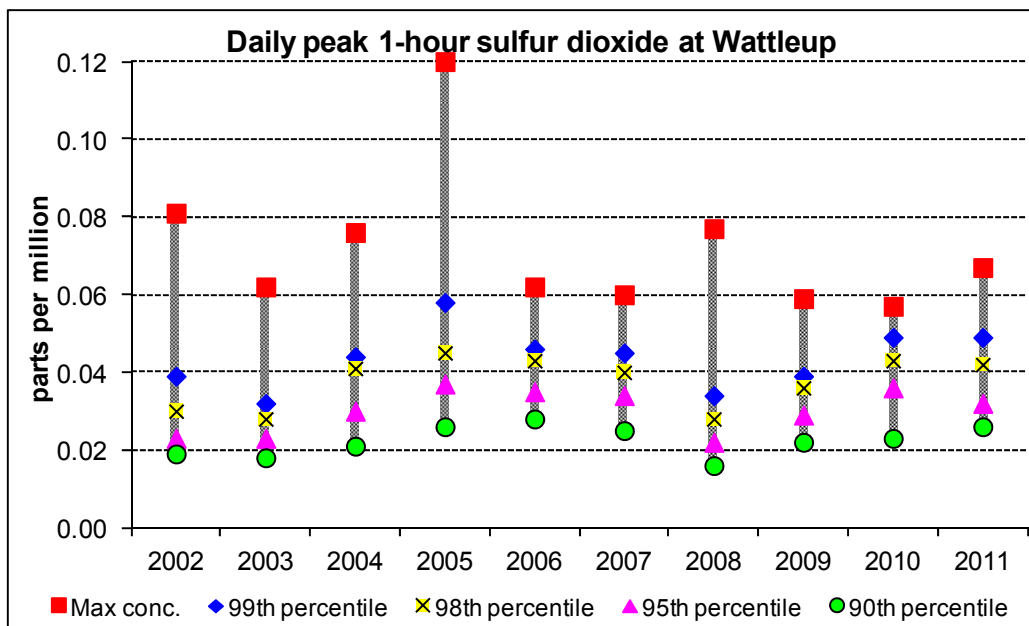
## Sulfur dioxide



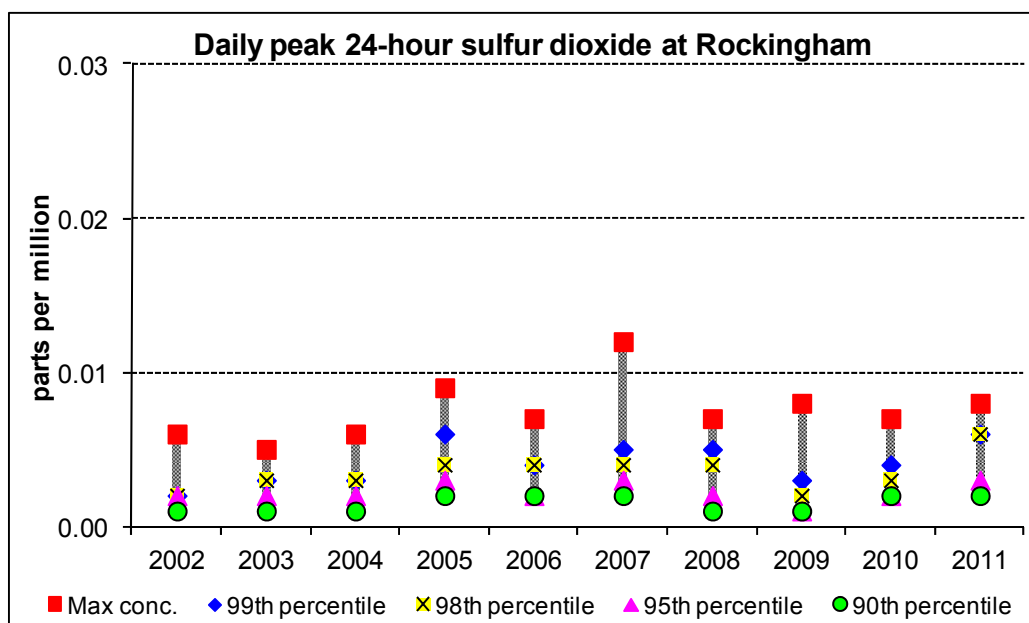
*Figure A1-23 - 1-hour sulfur dioxide at Rockingham*



*Figure A1-24 - 1-hour sulfur dioxide at South Lake*

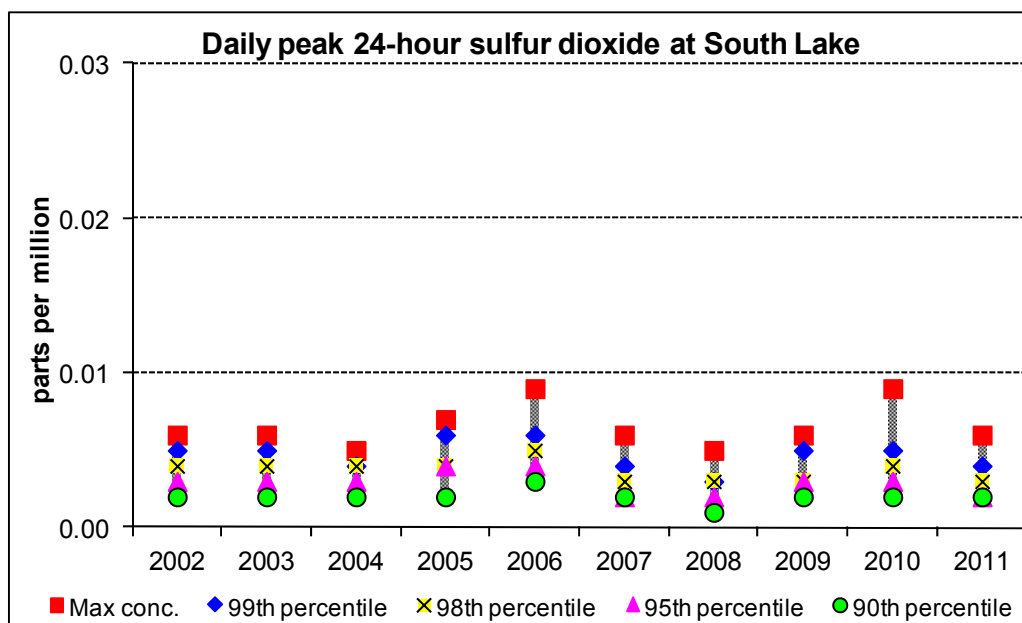


**Figure A1-25 - 1-hour sulfur dioxide at Wattleup**

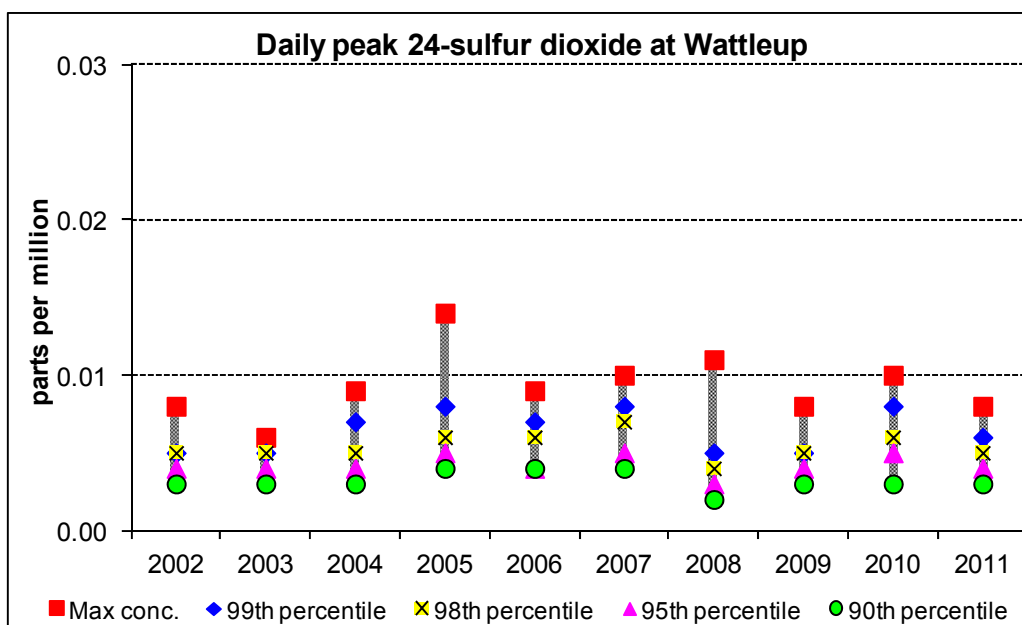


**Figure A1-26 - 24-hour sulfur dioxide at Rockingham**



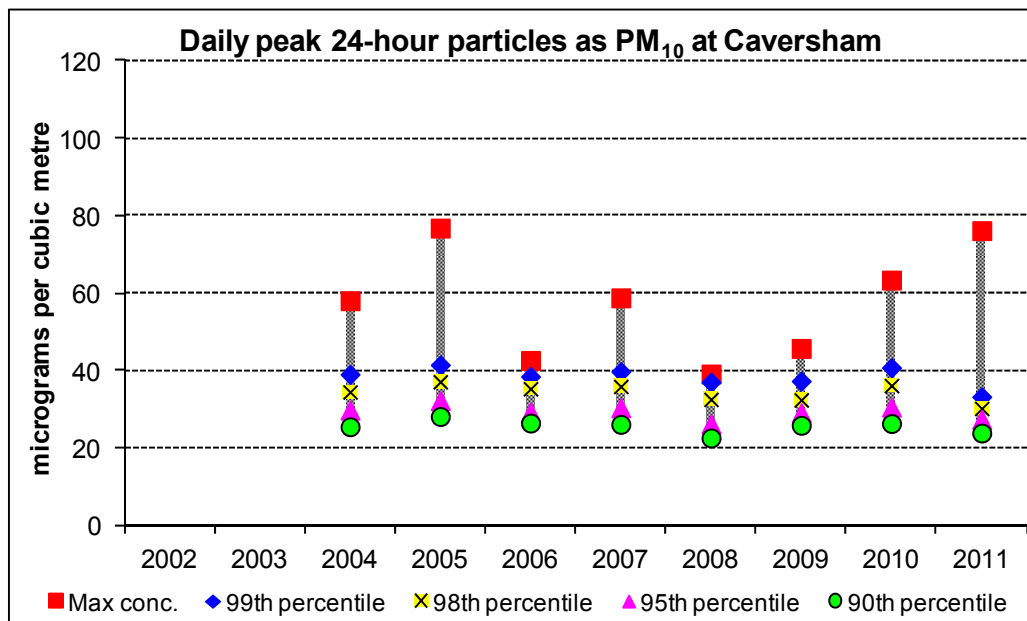


*Figure A1-27 - 24-hour sulfur dioxide at South Lake*

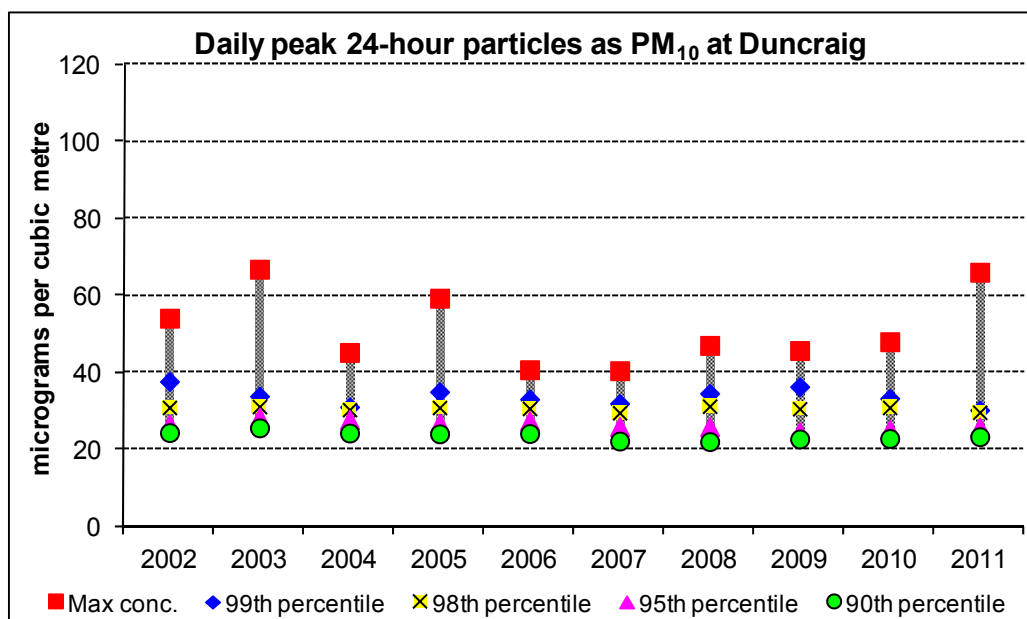


*Figure A1-28 - 24-hour sulfur dioxide at Wattleup*

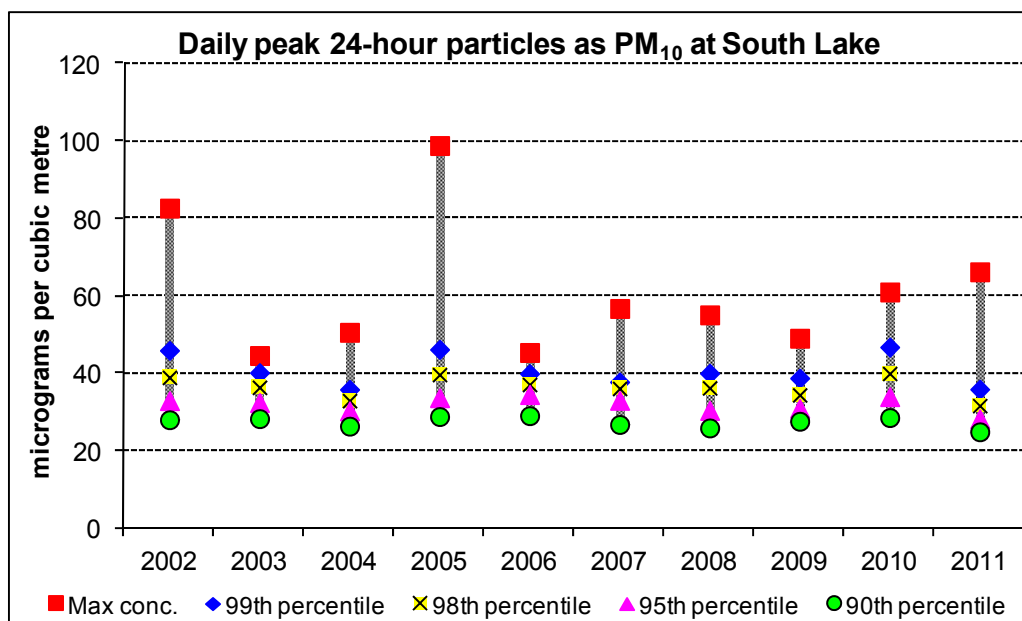
## Particles as PM<sub>10</sub>



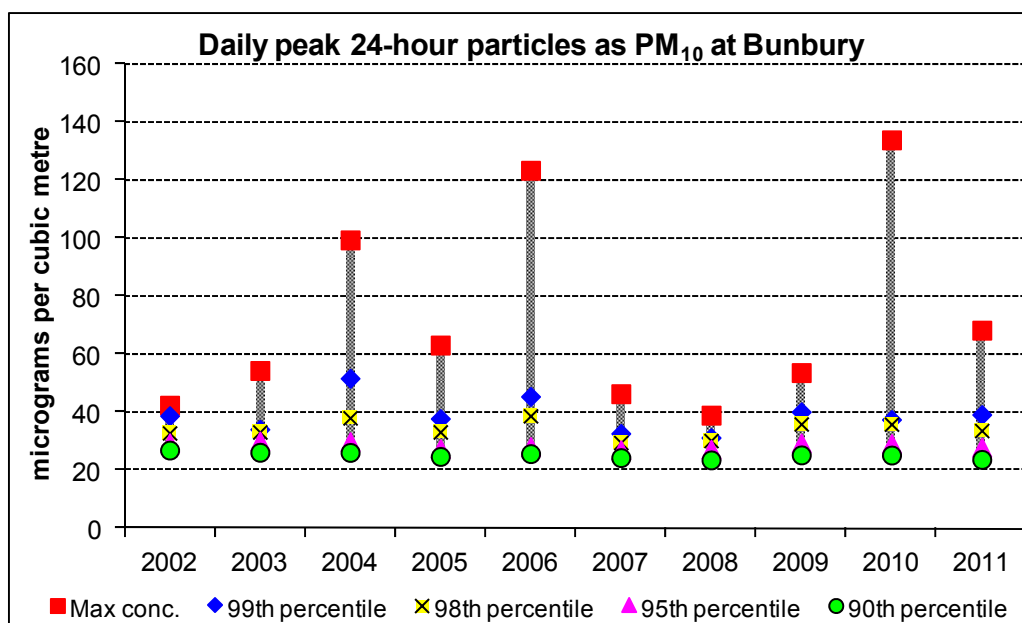
*Figure A1-29 - 24-hour PM<sub>10</sub> at Caversham*



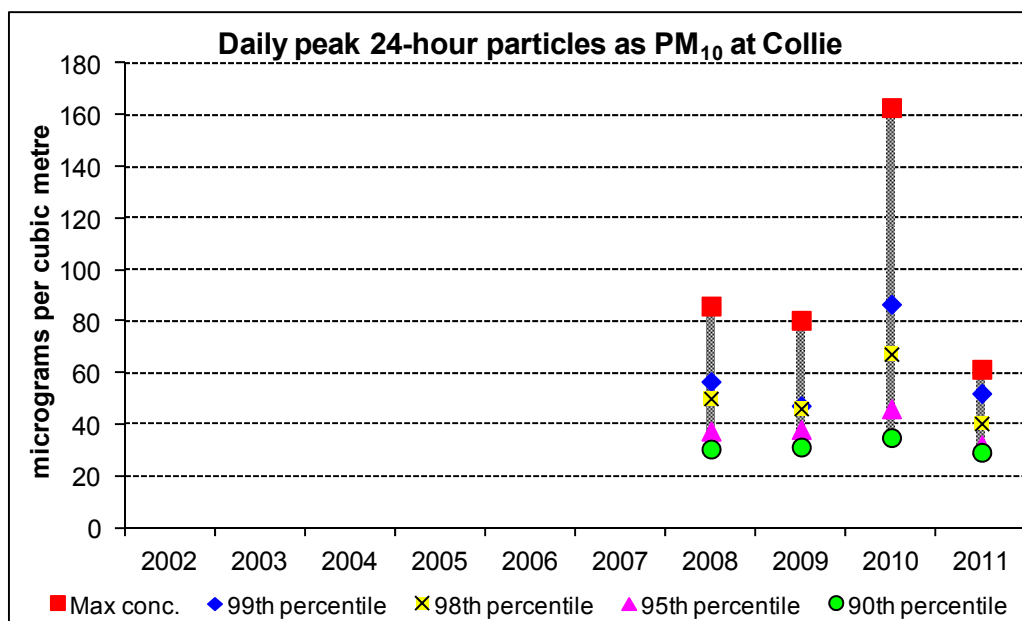
*Figure A1-30 - 24-hour PM<sub>10</sub> at Duncraig*



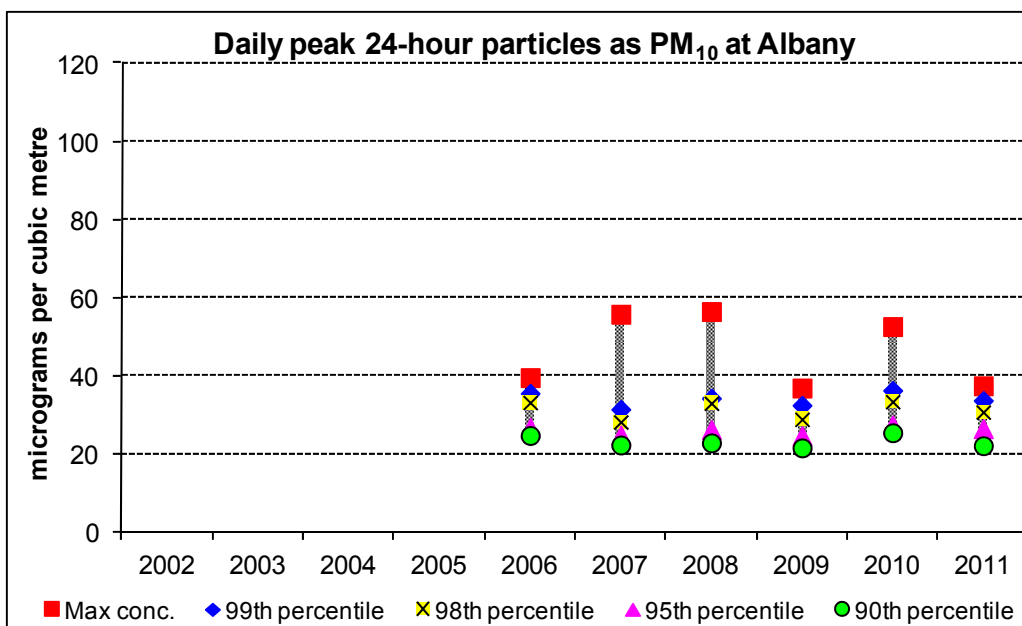
*Figure A1-31 - 24-hour PM<sub>10</sub> at South Lake*



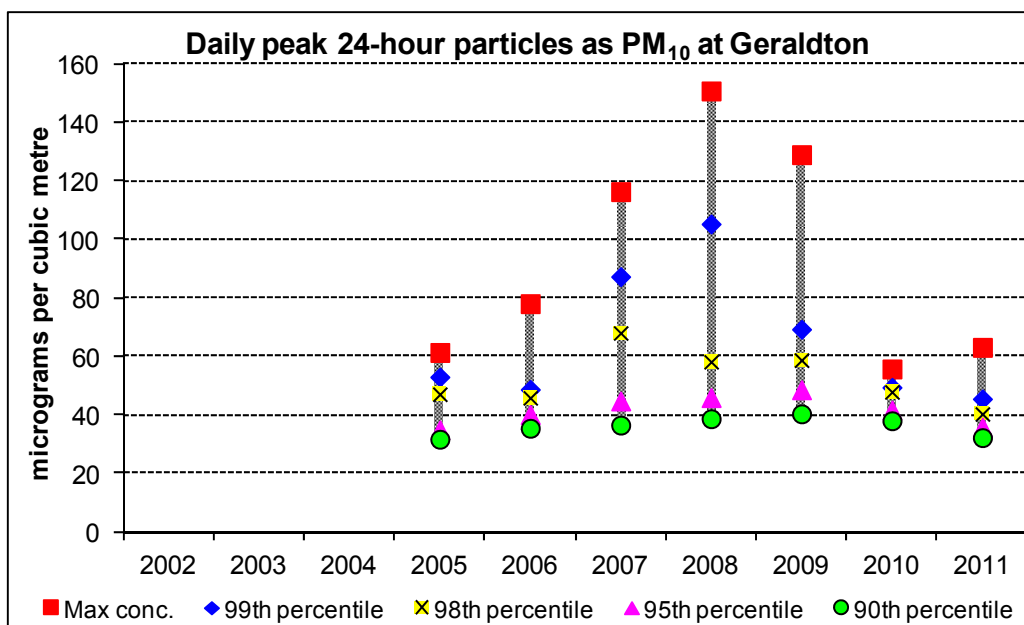
*Figure A1-32 - 24-hour PM<sub>10</sub> at Bunbury*



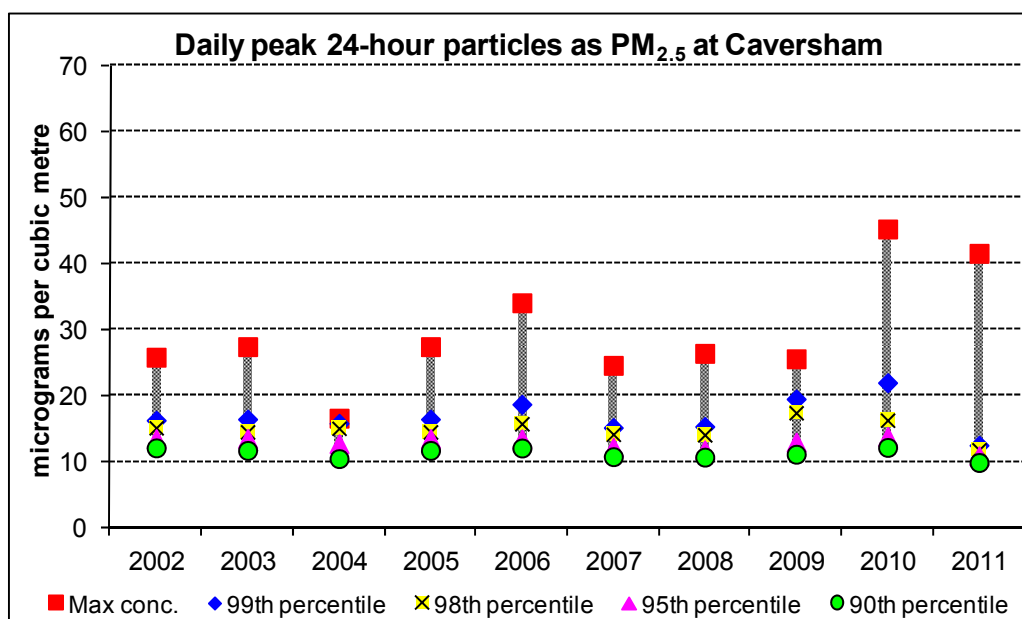
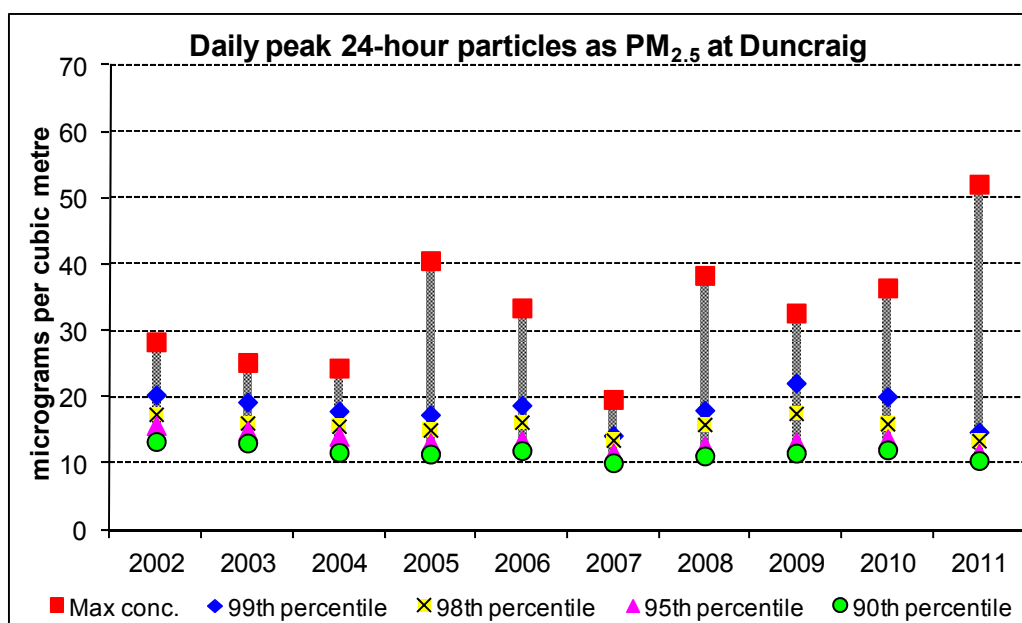
*Figure A1-33 - 24-hour PM<sub>10</sub> at Collie*

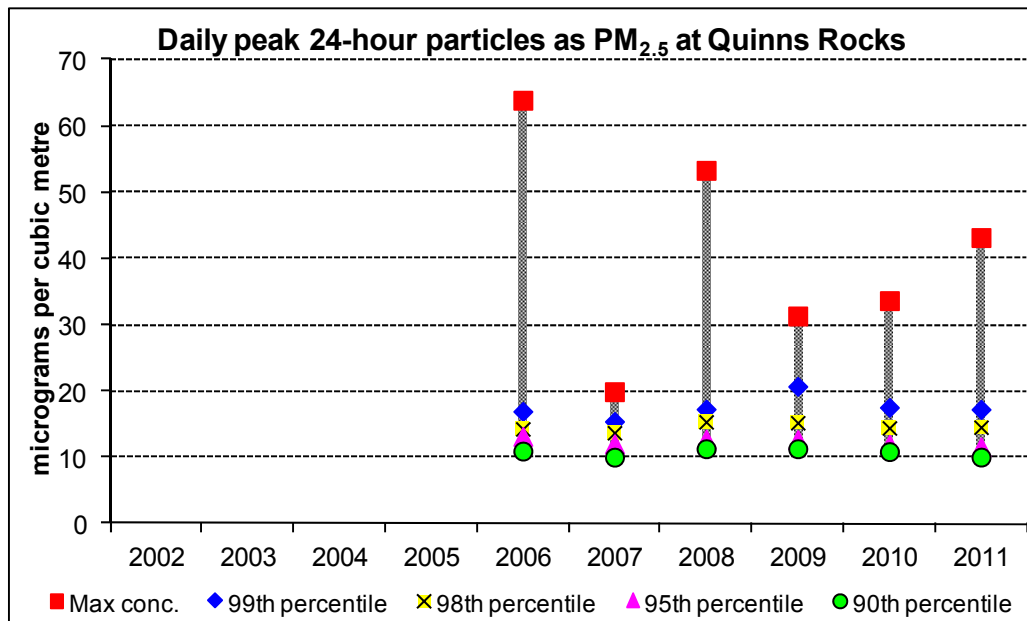
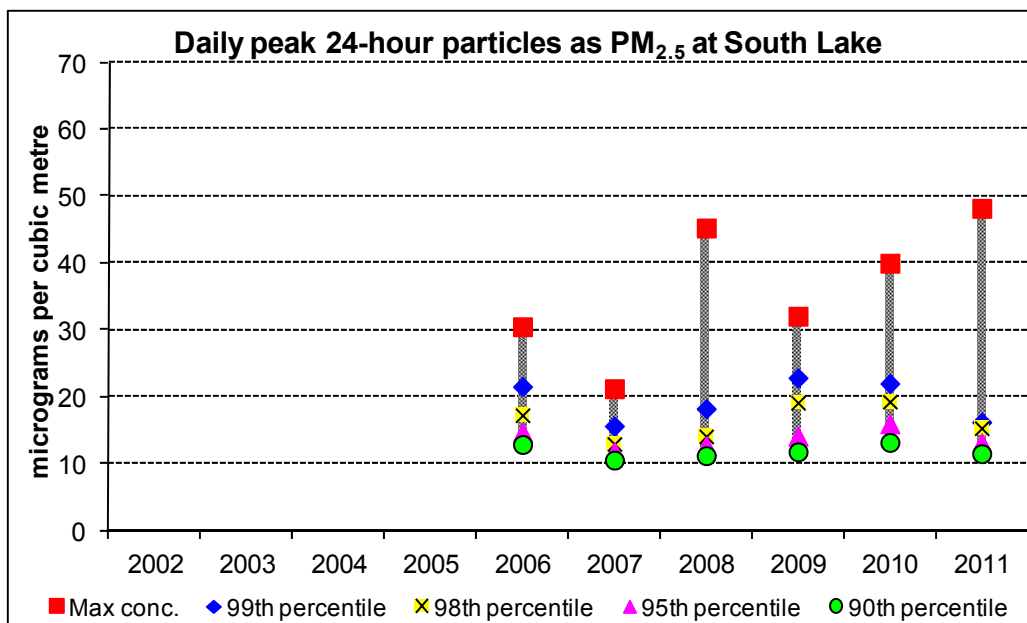


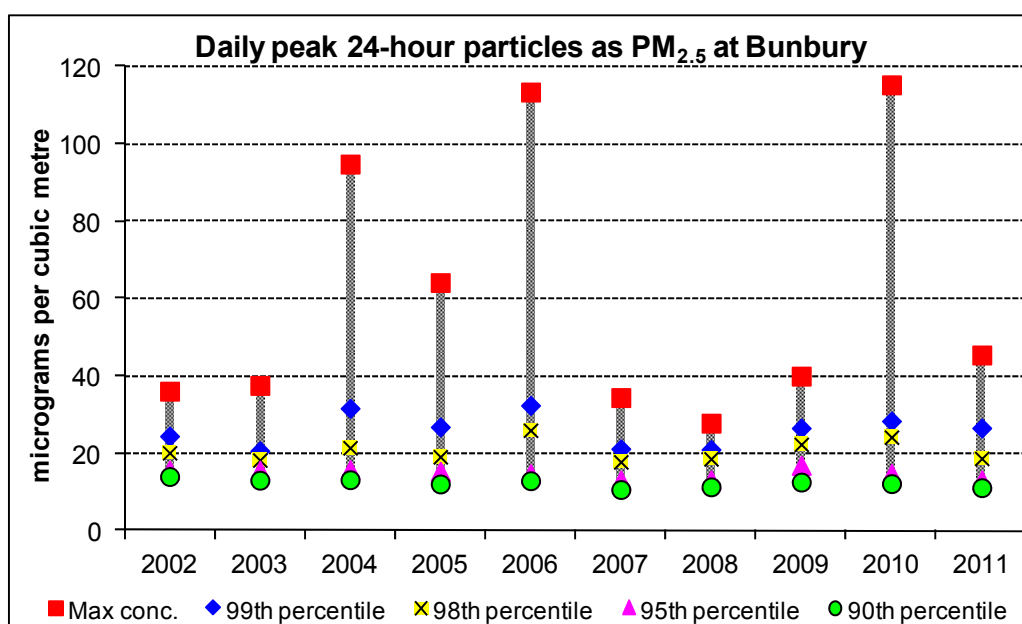
*Figure A1-34 - 24-hour PM<sub>10</sub> at Albany*



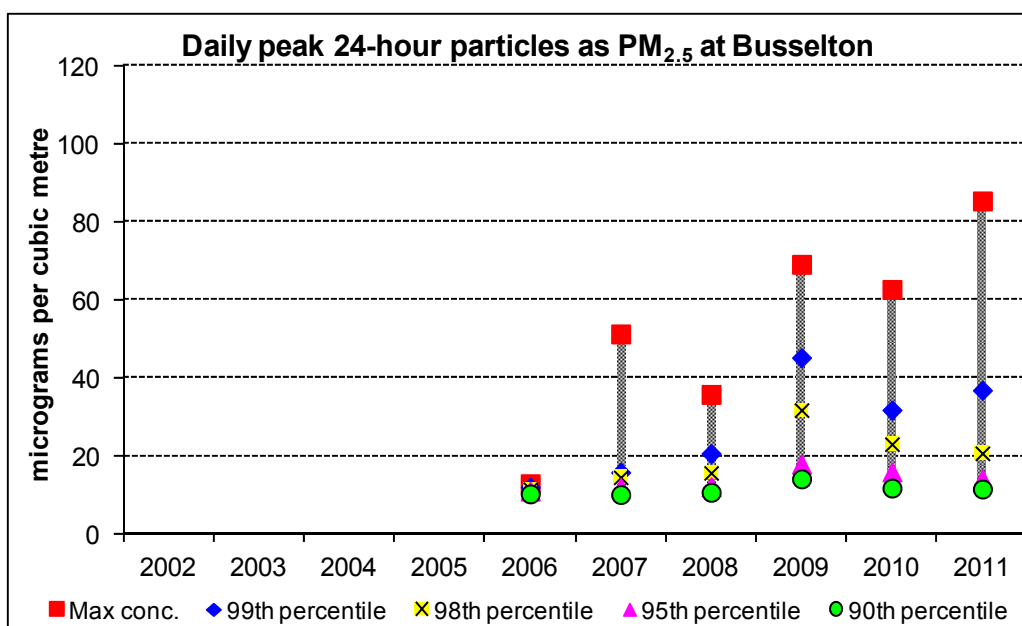
**Figure A1-35 - 24-hour PM<sub>10</sub> at Geraldton**

Particles as PM<sub>2.5</sub>*Figure A1-36 - 24-hour PM<sub>2.5</sub> at Caversham**Figure A1-37 - 24-hour PM<sub>2.5</sub> at Duncraig*

*Figure A1-38 - 24-hour PM<sub>2.5</sub> at Quinns Rocks**Figure A1-39 - 24-hour PM<sub>2.5</sub> at South Lake*



*Figure A1-40 - 24-hour PM<sub>2.5</sub> at Bunbury*



*Figure A1-41 - 24-hour PM<sub>2.5</sub> at Busselton*