Government of **Western Australia**
Department of **Environment Regulation**

WRITTEN TO COMPLY WITH THE
NATIONAL ENVIRONMENT PROTECTION MEASURE
(AMBIENT AIR QUALITY)

2012 WESTERN AUSTRALIA AIR MONITORING REPORT

REPORT

DER2013014

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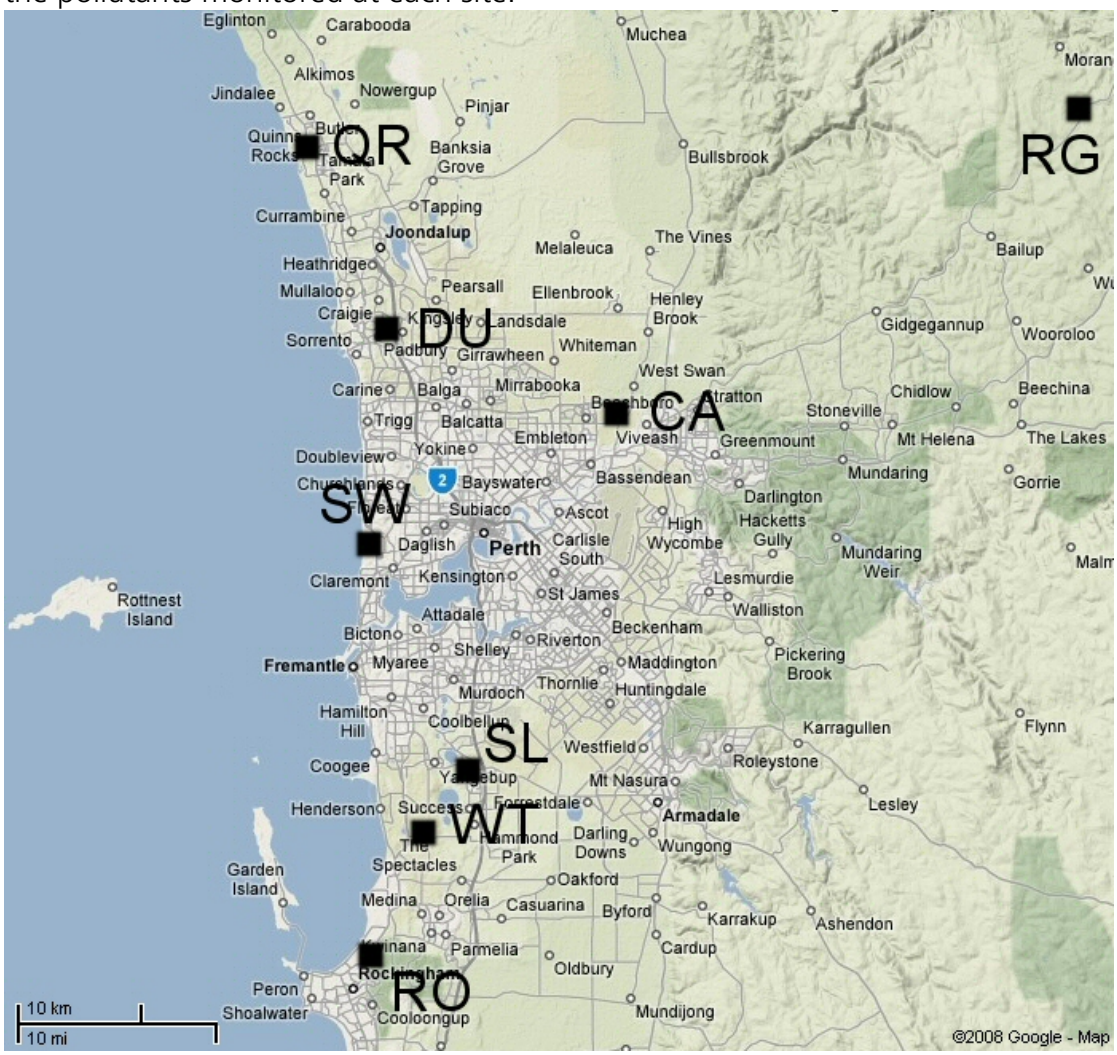
SECTION A – MONITORING SUMMARY

Current monitoring stations

The Department of Environment Regulation (DER) 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.



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

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

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

Figure A3 - DER air quality monitoring station operating in Geraldton

Figure A4 - DER air quality monitoring station operating in Albany

Table A1. Air quality parameters measured at DER monitoring stations.

Monitoring Site	CO	O_3	NO_2	SO_2	PM_{10} TEOM	$PM_{2.5}$ TEOM
AL Albany					07/06 to present	
BN Bunbury	03/99 to 04/02				06/99 to present	04/97 to present
BS Busselton						11/06 to present
CA Caversham	08/93 to present	11/89 to present	09/90 to present		01/04 to present	03/94 to present
CO Collie					02/08 to present	
DU Duncraig	08/95 to present		08/95 to present		06/96 to present	01/95 to present
GE Geraldton					09/05 to present	
QR Quinns Rock		11/92 to present	11/92 to present			07/06 to present
RO Rockingham		12/95 to present	12/95 to present	07/88 to present		
RG Rolling Green		01/93 to present	01/93 to present			
SL 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
SW Swanbourne	01/93 to 05/95	01/93 to present	03/93 to present			06/94 to 07/95
WT Wattleup				01/88 to present		

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

DER has periodically 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 airquality@der.wa.gov.au, or telephone 6467 5000.

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

Pollutant	Standard	Method
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_{10}	AS 3580.9.8 2008 – Methods for sampling and analysis of ambient air – Determination of suspended particulate matter – PM_{10} continuous direct mass method using a tapered element oscillating microbalance analyser	Tapered element oscillating microbalance
Particles as $PM_{2.5}$		Tapered element oscillating microbalance

Table A3. Monitoring in Western Australia.

Site:	CO	O_3	NO_2	SO_2	PM_{10}	$PM_{2.5}$
AL – Albany					M	
BN – Bunbury					M	DER
BS – Busselton						DER
CA – Caversham	DER	T	T		P	DER
CO – Collie					DER	
DU - Duncraig	T		DER		T	DER
GE – Geraldton					M	
QR - Quinns Rock		DER	DER			DER
RG - Rolling Green		DER	DER			
RO - Rockingham		DER	DER	DER		
SL - South Lake	P	T	P	T	P	DER
SW - Swanbourne		T	P		DER	
WT - Wattleup				DER		

Key to symbols:
P – performance monitoring station
P[(1)] – 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
DER – station will be maintained by DER 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 exceedances 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 exceedances 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[a]	CO	O_3	NO_2	SO_2	Pb	PM_{10}
Perth & Rockingham	1,740,000				B&C	A	
Mandurah[b]	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[c]	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.scew.gov.au/sites/www.scew.gov.au/files/resources/9947318f-af8c-0b24-d928-04e4d3a4b25c/files/aaqprctp04screeningprocedures200705final.pdf
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
Perth Region										
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.
Southwest Region										
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
Midwest Region										
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_3-rich air with the NO_x-rich plumes from Kwinana industry (potentially giving elevated NO_2 concentrations).

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

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

Nitrogen dioxide

For purposes of scientific understanding, NO_2 is being monitored at all stations where O_3 is monitored. Caversham, Swanbourne and South Lake were therefore chosen as performance monitoring stations for NO_2 as these provide a good spatial distribution.

Caversham, Swanbourne and South Lake are also trend stations.

As part of its wider network DER will continue to measure NO_2 at Quinns Rocks, Rolling Green and Duncraig for the foreseeable future.

Sulfur dioxide

DER 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 $\mu g/m^3$ annual NEPM standard. In 2001, the average lead level in Perth was 0.022 $\mu g/m^3$, 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_{10}

Duncraig is an upper bound performance monitoring station site for PM_{10} 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_{10} 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 $PM_{2.5}$

To make assessments against the advisory standard, four $PM_{2.5}$ 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 Regulation internal quality standards.

Exceedance Summary

In 2012 there were a number of exceedances of the NEPM PM_{10} and O_3 standards. The NEPM goals were not met at Collie for PM_{10} and at Caversham and Quinns Rocks for O_3 averaged over four hours.

All other sites met the NEPM goal.

Table A7. Air NEPM exceedances recorded during 2012

Site	Pollutant	Concentration	Date / Time	Reason
Bunbury	$PM_{2.5}$ – 24 hour	27.8 µg/m³	13/02/2012	Smoke Haze
Bunbury	PM_{10} – 24 hour	53.5 µg/m³	14/02/2012	Smoke Haze
Bunbury	$PM_{2.5}$ – 24 hour	40.2 µg/m³	14/02/2012	Smoke Haze
Bunbury	$PM_{2.5}$ – 24 hour	25.2 µg/m³	15/02/2012	Smoke Haze
Bunbury	PM_{10} – 24 hour	52.7 µg/m³	16/02/2012	Smoke Haze
Bunbury	$PM_{2.5}$ – 24 hour	43.0 µg/m³	16/02/2012	Smoke Haze
Bunbury	$PM_{2.5}$ – 24 hour	25.4 µg/m³	22/02/2012	Smoke Haze
Bunbury	$PM_{2.5}$ – 24 hour	25.4 µg/m³	25/05/2012	Smoke Haze
Bunbury	$PM_{2.5}$ – 24 hour	29.5 µg/m³	26/05/2012	Smoke Haze
Busselton	$PM_{2.5}$ – 24 hour	49.1 µg/m³	14/02/2012	Smoke Haze
Busselton	$PM_{2.5}$ – 24 hour	61.2 µg/m³	16/02/2012	Smoke Haze
Busselton	$PM_{2.5}$ – 24 hour	25.8 µg/m³	21/02/2012	Smoke Haze
Busselton	$PM_{2.5}$ – 24 hour	80.0 µg/m³	22/02/2012	Smoke Haze
Busselton	$PM_{2.5}$ – 24 hour	29.5 µg/m³	26/05/2012	Smoke Haze

Site	Pollutant	Concentration	Date / Time	Reason
Caversham	O_3 – 4 hour	0.083 ppm	14/02/2012	Smoke Haze
Caversham	PM_{10} – 24 hour	68.7 µg/m^3	14/02/2012	Smoke Haze
Caversham	$PM_{2.5}$ – 24 hour	45.9 µg/m^3	14/02/2012	Smoke Haze
Caversham	PM_{10} – 24 hour	61.4 µg/m^3	15/02/2012	Smoke Haze
Caversham	$PM_{2.5}$ – 24 hour	39.6 µg/m^3	15/02/2012	Smoke Haze
Caversham	PM_{10} – 24 hour	58.7 µg/m^3	16/02/2012	Smoke Haze
Caversham	$PM_{2.5}$ – 24 hour	39.0 µg/m^3	16/02/2012	Smoke Haze
Caversham	O_3 – 4 hour	0.086 ppm	22/02/2012	Smoke induced
Caversham	PM_{10} – 24 hour	65.5 µg/m^3	21/09/2012	Crustal
Collie	PM_{10} – 24 hour	56.3 µg/m^3	12/02/2012	Smoke Haze
Collie	PM_{10} – 24 hour	56.9 µg/m^3	14/02/2012	Smoke Haze
Collie	PM_{10} – 24 hour	66.6 µg/m^3	15/02/2012	Smoke Haze
Collie	PM_{10} – 24 hour	91.7 µg/m^3	17/02/2012	Smoke Haze
Collie	PM_{10} – 24 hour	51.4 µg/m^3	26/05/2012	Indeterminate
Collie	PM_{10} – 24 hour	54.2 µg/m^3	29/05/2012	Indeterminate
Duncraig	PM_{10} – 24 hour	89.5 µg/m^3	14/02/2012	Smoke Haze
Duncraig	$PM_{2.5}$ – 24 hour	77.3 µg/m^3	14/02/2012	Smoke Haze
Duncraig	$PM_{2.5}$ – 24 hour	35.2 µg/m^3	15/02/2012	Smoke Haze
Duncraig	PM_{10} – 24 hour	54.8 µg/m^3	16/02/2012	Smoke Haze
Duncraig	$PM_{2.5}$ – 24 hour	43.8 µg/m^3	16/02/2012	Smoke Haze
Geraldton	PM_{10} – 24 hour	61.5 µg/m^3	29/01/2012	Crustal
Geraldton	PM_{10} – 24 hour	54.5 µg/m^3	07/03/2012	Indeterminate
Geraldton	PM_{10} – 24 hour	61.2 µg/m^3	11/10/2012	Indeterminate
Quinns Rocks	O_3 – 1 hour	0.130 ppm	28/01/2012	Coastal Event
Quinns Rocks	O_3 – 4 hour	0.108 ppm	28/01/2012	Coastal Event
Quinns Rocks	$PM_{2.5}$ – 24 hour	74.5 µg/m^3	14/02/2012	Smoke Haze
Quinns Rocks	$PM_{2.5}$ – 24 hour	31.1 µg/m^3	15/02/2012	Smoke Haze
Quinns Rocks	$PM_{2.5}$ – 24 hour	45.9 µg/m^3	16/02/2012	Smoke Haze
Quinns Rocks	$PM_{2.5}$ – 24 hour	25.2 µg/m^3	22/02/2012	Smoke Haze
Quinns Rocks	O_3 – 4 hour	0.086 ppm	31/12/2012	Coastal Event
Rolling Green	O_3 – 1 hour	0.103 ppm	15/02/2012	Smoke induced
Rolling Green	O_3 – 4 hour	0.081 ppm	15/02/2012	Smoke induced
South Lake	PM_{10} – 24 hour	81.5 µg/m^3	14/02/2012	Smoke Haze
South Lake	$PM_{2.5}$ – 24 hour	71.6 µg/m^3	14/02/2012	Smoke Haze
South Lake	$PM_{2.5}$ – 24 hour	36.8 µg/m^3	15/02/2012	Smoke Haze
South Lake	PM_{10} – 24 hour	58.8 µg/m^3	16/02/2012	Smoke Haze
South Lake	$PM_{2.5}$ – 24 hour	48.0 µg/m^3	16/02/2012	Smoke Haze
South Lake	$PM_{2.5}$ – 24 hour	26.4 µg/m^3	22/02/2012	Smoke Haze
Swanbourne	O_3 – 1 hour	0.128 ppm	28/01/2012	Coastal Event
Swanbourne	O_3 – 4 hour	0.108 ppm	28/01/2012	Coastal Event

Key:

Crustal	A small proportion of $PM_{2.5}$ within PM_{10}.
Indeterminate	The cause was unknown due to a lack of confirming data or observations.
Smoke Haze	A high proportion of $PM_{2.5}$ within PM_{10}.
Coastal Event	High concentrations of ozone on the coast due to recirculation of Perth emissions on the sea breeze.

In February 2012 lightning strikes in the south west started major fires resulting in wide spread smoke plumes which impacted the Perth region. A sample of satellite images is shown in Attachment 2

SECTION B – ASSESSMENT OF COMPLIANCE WITH STANDARDS AND GOALS

Table B1. 2012 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 exceedances (days)	Performance against the standards and goal
	Q1	Q2	Q3	Q4	Annual		
Perth Region							
Caversham (North East Metro)	99.5	99	93.4	100	98	0	met
Duncraig (North Metro)	99.6	100	99.8	98.7	99.5	0	met
South Lake (South East Metro)	98.9	98	99.5	99.3	98.9	0	met

Performance against the standards and goal: “met”, “not met”, “not demonstrated”

Table B2. 2012 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 exceedances (days)	Performance against the standards and goal	
	Q1	Q2	Q3	Q4	Annual			1-hour	1-year
Perth Region									
Caversham (North East Metro)	99.5	98.9	89.7	99.9	97	0.006	0	met	met
Duncraig (North Metro)	98.5	99.1	98	91.7	96.8	0.007	0	met	met
Quinns Rocks (Outer North Coast)	95.5	94.2	99.5	99.9	97.3	0.003	0	met	met
Rockingham (South Coast)	99.5	91.3	95.1	99.8	96.4	0.005	0	met	met
Rolling Green (Outer East Rural)	87.3	85	98.7	96.4	91.9	0.003	0	met	met
South Lake (South East Metro)	98.8	97.6	99.1	99.2	98.7	0.007	0	met	met
Swanbourne (Inner West Coast)	95.3	99	99.7	99.6	98.4	0.005	0	met	met

Performance against the standards and goal: “met”, “not met”, “not demonstrated”

Table B3. 2012 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 Exceedances (days)		Performance against the standards and goal	
	Q1	Q2	Q3	Q4	Annual	1-hour	4-hour	1-hour	4-hour
Perth Region									
Caversham (North East Metro)	99.5	98.2	92.4	99.8	97.5	0	2	met	not met
Quinns Rocks (Outer North Coast)	95.6	94.2	100	92.9	95.7	1	2	met	not met
Rockingham (South Coast)	99.2	97.8	99.2	99.7	99	0	0	met	met
Rolling Green (Outer East Rural)	87.2	84.9	98.7	96.4	91.8	1	1	met	met
South Lake (South East Metro)	98.8	95.4	99.5	99.2	98.2	0	0	met	met
Swanbourne (Inner West Coast)	95.4	99	99.9	98.5	98.2	1	1	met	met

Performance against the standards and goal: “met”, “not met”, “not demonstrated”

Table B4. 2012 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	Number of Exceedances (days)		Performance against the standards and goal		
	Q1	Q2	Q3	Q4	Annual	(ppm)	1-hour	24-hour	1-hour	24-hour	1-year
Perth Region											
Rockingham (South Coast)	95.5	92.9	94.5	94.6	94.4	0.001	0	0	met	met	met
South Lake (South East Metro)	94.5	93.3	94.6	93.5	94	0.001	0	0	met	met	met
Wattleup (South Metro)	95.5	93.9	93.9	95.7	94.7	0.001	0	0	met	met	met

Performance against the standards and goal: “met”, “not met”, “not demonstrated”

Table B5. 2012 compliance summary for particles as PM_{10}

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

Regional Performance Monitoring Station	Data availability rates (% of days)					Number of exceedances (Days)	Performance against the standards and goal
	Q1	Q2	Q3	Q4	Annual		
Perth Region							
Caversham (North East Metro)	99.5	98.8	93.2	99.8	97.8	4	met
Duncraig (North Metro)	99.5	99.8	99.8	98.5	99.4	2	met
South Lake (South East Metro)	98.9	98.2	99.7	99.4	99.1	2	met
Southwest Region							
Albany	99.9	99.6	99.5	99	99.5	0	met
Bunbury	99.7	98.8	99.8	99.9	99.5	2	met
Collie	99.8	99.6	98.8	99.3	99.4	6	not met
Midwest Region							
Geraldton	99.5	99.7	99.9	99.5	99.6	3	met

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

Table B6. 2012 compliance summary for particles as $PM_{2.5}$

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

Regional Performance Monitoring Station	Data availability rates (% of days)					Number of exceedances (Days)	Performance against the standards and goal
	Q1	Q2	Q3	Q4	Annual		
Perth Region							
Caversham (North East Metro)	97.7	96.6	93.3	99.8	96.9	3	n/a
Duncraig (North Metro)	98.6	99.8	97.4	94.3	97.5	3	n/a
Quinns Rocks (Outer North Coast)	95.5	92.5	98.2	99.8	96.5	4	n/a
South Lake (South East Metro)	98.8	98.1	99.6	99.3	99	4	n/a
Southwest Region							
Bunbury	99.8	98.8	99.8	100	99.6	7	n/a
Busselton	99.5	99.8	99.8	99.5	99.6	5	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 2012. The NEPM goal of no more than 1 exceedance at each site was met. Table C1 contains the summary statistics for daily peak eight-hour CO in Western Australia.

Table C1. 2012 summary statistics for daily peak eight-hour carbon monoxide

AAQ NEPM Standard
9.0 ppm (8-hour average)

Regional Performance Monitoring Station	Data Recovery Rates (%)	Highest (ppm)	Highest (date)	Highest (time)	2nd Highest (ppm)	2nd Highest (date)	2nd Highest (time)
Perth Region							
Caversham (North East Metro)	98	0.9	15/02/2012	0300	0.8	16/02/2012	1000
Duncraig (North Metro)	99.5	2.4	13/07/2012	0600	2.2	14/07/2012	0600
South Lake (South East Metro)	98.9	2.2	13/07/2012	0700	1.7	30/06/2012	0300

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 2012. The NEPM goal of no more than 1 exceedance at each site was met. Table C2 contains the summary statistics for daily peak 1-hour NO_2 in Western Australia.

Table C2. 2012 summary statistics for daily peak one-hour nitrogen dioxide

AAQ NEPM Standard
0.12 ppm (one-hour average)

Regional Performance Monitoring Station	Data Recovery Rates (%)	Highest (ppm)	Highest (date)	Highest (time)	2nd Highest (ppm)	2nd Highest (date)	2nd Highest (time)
Perth Region							
Caversham (North East Metro)	97.0	0.037	09/03/2012	2200	0.035	26/07/2012	2000
Duncraig (North Metro)	96.8	0.047	27/01/2012	1900	0.042	26/04/2012	1900
Quinns Rocks (Outer North Coast)	97.3	0.041	26/04/2012	2300	0.036	07/02/2012	1700
Rockingham (South Coast)	96.4	0.053	12/03/2012	0900	0.033	25/04/2012	2000
Rolling Green (Outer East Rural)	91.9	0.029	20/01/2012	2000	0.023	21/01/2012	0300
South Lake (South East Metro)	98.7	0.046	29/12/2012	1400	0.043	28/01/2012	1700
Swanbourne (Inner West Coast)	98.4	0.045	26/04/2012	2000	0.039	27/04/2012	1800

Photochemical smog as ozone

The NEPM standard for ozone of 0.10 ppm averaged over one hour was exceeded at Quinns Rocks, Rolling Green and Swanbourne in 2012. The NEPM goal of no more than one exceedance at each site was met. Table C3 contains the summary statistics for daily peak one-hour O_3 in Western Australia.

Table C3. 2012 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 (ppm)	Highest (date)	Highest (time)	2nd Highest (ppm)	2nd Highest (date)	2nd Highest (time)
Perth Region							
Caversham (North East Metro)	97.5	0.098	22/02/2012	1400	0.092	14/02/2012	1500
Quinns Rocks (Outer North Coast)	95.7	0.130	28/01/2012	1500	0.095	31/12/2012	1500
Rockingham (South Coast)	99.0	0.095	28/01/2012	1400	0.079	22/02/2012	1400
Rolling Green (Outer East Rural)	91.8	0.103	15/02/2012	1600	0.095	14/02/2012	1700
South Lake (South East Metro)	98.2	0.085	22/02/2012	1400	0.081	28/01/2012	1300
Swanbourne (Inner West Coast)	98.2	0.128	28/01/2012	1400	0.088	17/03/2012	2000

The NEPM standard for ozone of 0.08 ppm averaged over four hours was exceeded at Caversham, Quinns Rocks, Rolling Green and Swanbourne. The NEPM goal of no more than one exceedance at each site was not met at Caversham and Quinns Rocks with two exceedances at each site. Table C4 contains the summary statistics for daily peak four-hour O_3 in Western Australia.

Table C4. 2012 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 (ppm)	Highest (date)	Highest (time)	2nd Highest (ppm)	2nd Highest (date)	2nd Highest (time)
Perth Region							
Caversham (North East Metro)	97.5	0.086	22/02/2012	1600	0.083	14/02/2012	1600
Quinns Rocks (Outer North Coast)	95.7	0.108	28/01/2012	1600	0.086	31/12/2012	1600
Rockingham (South Coast)	99.0	0.079	28/01/2012	1500	0.071	31/12/2012	1400
Rolling Green (Outer East Rural)	91.8	0.081	15/02/2012	1800	0.079	14/02/2012	1800
South Lake (South East Metro)	98.2	0.080	22/02/2012	1400	0.072	28/01/2012	1500
Swanbourne (Inner West Coast)	98.2	0.108	28/01/2012	1500	0.072	31/12/2012	1500

Sulfur dioxide

The NEPM standard for sulfur dioxide of 0.20 ppm averaged over one hour was not exceeded at any site during 2012. The NEPM goal of no more than one exceedance at each site was met. Table C5 contains the summary statistics for daily peak one-hour SO_2 in Western Australia.

Table C5. 2012 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)	Highest (time)	2nd Highest (ppm)	2nd Highest (date)	2nd Highest (time)
Perth Region							
Rockingham (South Coast)	94.4	0.040	30/05/2012	1000	0.034	31/07/2012	0200
South Lake (South East Metro)	94	0.039	15/02/2012	1600	0.030	28/01/2012	1700
Wattleup (South Metro)	94.7	0.043	13/02/2012	1800	0.043	29/08/2012	1300

The NEPM standard for sulfur dioxide of 0.08 ppm averaged over 24 hours was not exceeded at any site during 2012. The NEPM goal of no more than 1 exceedance at each site was met. Table C6 contains the summary statistics for daily peak 24-hour SO_2 in Western Australia.

Table C6. 2012 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)	Highest (time)	2nd Highest (ppm)	2nd Highest (date)	2nd Highest (time)
Perth Region							
Rockingham (South Coast)	94.4	0.006	31/07/2012	2400	0.006	30/07/2012	2400
South Lake (South East Metro)	94	0.006	15/02/2012	2400	0.005	21/12/2012	2400
Wattleup (South Metro)	94.7	0.008	13/02/2012	2400	0.006	14/02/2012	2400

The NEPM advisory standard for sulfur dioxide of 0.02 ppm averaged over one year was not exceeded at any site during 2012. Table C7 contains the summary statistics for annual SO_2 in Western Australia.

Table C7. 2012 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)
Perth Region		
Rockingham (South Coast)	94.4	0.001
South Lake (South East Metro)	94.0	0.001
Wattleup (South Metro)	94.7	0.001

Particles as PM_{10}

The NEPM standard for particles as PM_{10} of 50 µg/m^3 averaged over 24 hours was exceeded twice at Bunbury, Duncraig and South Lake, three times at Geraldton, 4 times at Caversham and 6 times at Collie during 2012. The NEPM goal of no more than five exceedances was not met at Collie. Table C8 contains the summary statistics for daily peak 24-hour PM_{10} in Western Australia.

Table C8. 2012 summary statistics for 24-hour particles as PM_{10}

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

Regional Performance Monitoring Station	Data Recovery Rates (%)	Highest (µg/m^3)	Highest (date)	Highest (time)	6th Highest (µg/m^3)	6th Highest (date)	6th Highest (time)
Perth Region							
Caversham [1] (North East Metro)	97.8	68.7	14/02/2012	2400	40.3	22/02/2012	2400
Duncraig [1] (North Metro)	99.4	89.5	14/02/2012	2400	29.9	23/02/2012	2400
South Lake [1] (South East Metro)	99.1	81.5	14/02/2012	2400	34.0	07/03/2012	2400
Southwest Region							
Albany [1]	99.5	37.0	27/01/2012	2400	33.3	23/05/2012	2400
Bunbury [1]	99.5	53.5	14/02/2012	2400	38.8	25/05/2012	2400
Collie [1]	99.4	91.7	17/02/2012	2400	51.4	26/05/2012	2400
Midwest Region							
Geraldton [1]	99.6	61.5	29/01/2012	2400	45.7	26/12/2012	2400

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

Particles as $PM_{2.5}$

The NEPM advisory standard for particles as $PM_{2.5}$ of 25 micrograms per cubic metre averaged over 24 hours was exceeded three times at Caversham and Duncraig, four times at Quinns Rocks and South Lake, five times at Busselton and seven times at and Bunbury during 2012. Table C9 contains the summary statistics for daily peak 24-hour $PM_{2.5}$ in Western Australia.

Table C9. 2012 summary statistics for 24-hour particles as $PM_{2.5}$

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

Regional Performance Monitoring Station	Data Recovery Rates (%)	Highest (µg/m^3)	Highest (date)	Highest (time)	6th Highest (µg/m^3)	6th Highest (date)	6th Highest (time)
Perth Region							
Caversham [1] (North East Metro)	96.9	45.9	14/02/2012	2400	16.5	13/02/2012	2400
Duncraig [1] (North Metro)	97.5	77.3	14/02/2012	2400	17.9	13/02/2012	2400
Quinns Rocks [1] (Outer North Coast)	96.5	74.5	14/02/2012	2400	17.4	23/02/2012	2400
South Lake [1] (South East Metro)	99	71.6	14/02/2012	2400	20.3	17/02/2012	2400
Southwest Region							
Bunbury [1]	99.6	43.0	16/02/2012	2400	25.4	25/05/2012	2400
Busselton [1]	99.6	78.0	22/02/2012	2400	24.7	13/02/2012	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 $PM_{2.5}$ of 8 micrograms per cubic metre averaged over one year was exceeded at Duncraig, South Lake, Bunbury and Busselton during 2012. Table C10 contains the summary statistics for annual $PM_{2.5}$ in Western Australia.

Table C10. 2012 summary statistics for annual particles as $PM_{2.5}$

AAQ NEPM Advisory Standard
8 µg/m^3 (annual average)

Regional Performance Monitoring Station	Data Recovery Rates (%)	annual average (µg/m^3)
Perth Region		
Caversham [1] (North East Metro)	96.9	7.8
Duncraig [1] (North Metro)	97.5	8.2
Quinns Rocks [1] (Outer North Coast)	96.5	7.9
South Lake [1] (South East Metro)	99	8.9
Southwest Region		
Bunbury [1]	99.6	8.6
Busselton [1]	99.6	8.6

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 2012

Table D1. 2012 percentiles of daily peak 8-hour carbon monoxide concentrations

AAQ NEPM Standard
9.0 ppm (8-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)	98	0.9	0.7	0.6	0.5	0.4	0.3	0.1
Duncraig (North Metro)	99.5	2.4	1.9	1.5	1.1	0.9	0.5	0.3
South Lake (South East Metro)	98.9	2.2	1.6	1.4	1.0	0.8	0.4	0.2

Table D2. 2012 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)	97	0.037	0.033	0.032	0.029	0.025	0.021	0.015
Duncraig (North Metro)	96.8	0.047	0.037	0.033	0.030	0.027	0.024	0.018
Quinns Rocks (Outer North Coast)	97.3	0.041	0.032	0.031	0.027	0.024	0.016	0.010
Rockingham (South Coast)	96.4	0.053	0.030	0.030	0.027	0.024	0.020	0.013
Rolling Green (Outer East Rural)	91.9	0.029	0.019	0.017	0.016	0.014	0.011	0.007
South Lake (South East Metro)	98.7	0.046	0.038	0.035	0.031	0.028	0.024	0.018
Swanbourne (Inner West Coast)	98.4	0.045	0.033	0.032	0.030	0.027	0.020	0.014

Table D3. 2012 percentiles of daily peak 1-hour ozone concentrations

AAQ NEPM Standard
0.10 ppm (1-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)	97.5	0.098	0.078	0.064	0.052	0.047	0.035	0.030
Quinns Rocks (Outer North Coast)	95.7	0.130	0.073	0.069	0.058	0.048	0.037	0.033
Rockingham (South Coast)	99	0.095	0.073	0.064	0.053	0.044	0.035	0.032
Rolling Green (Outer East Rural)	91.8	0.103	0.074	0.066	0.055	0.045	0.037	0.033
South Lake (South East Metro)	98.2	0.085	0.065	0.062	0.051	0.041	0.033	0.030
Swanbourne (Inner West Coast)	98.2	0.128	0.074	0.067	0.056	0.047	0.036	0.032

Table D4. 2012 percentiles 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)
Perth Region								
Caversham (North East Metro)	97.5	0.086	0.070	0.056	0.047	0.041	0.033	0.029
Quinns Rocks (Outer North Coast)	95.7	0.108	0.065	0.061	0.051	0.043	0.035	0.032
Rockingham (South Coast)	99	0.079	0.065	0.060	0.048	0.040	0.034	0.030
Rolling Green (Outer East Rural)	91.8	0.081	0.064	0.058	0.049	0.042	0.035	0.032
South Lake (South East Metro)	98.2	0.080	0.060	0.054	0.046	0.037	0.031	0.028
Swanbourne (Inner West Coast)	98.2	0.108	0.064	0.061	0.051	0.042	0.035	0.031

Table D5. 2012 percentiles of daily peak 1-hour sulfur dioxide concentrations

AAQ NEPM Standard
0.20 ppm (1-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								
Rockingham (South Coast)	94.4	0.040	0.020	0.018	0.011	0.008	0.004	0.002
South Lake (South East Metro)	94	0.039	0.027	0.019	0.014	0.010	0.005	0.003
Wattleup (South Metro)	94.7	0.043	0.039	0.034	0.025	0.017	0.009	0.003

Table D6. 2012 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)
Perth Region								
Rockingham (South Coast)	94.4	0.006	0.005	0.003	0.002	0.002	0.001	0.001
South Lake (South East Metro)	94	0.006	0.004	0.003	0.003	0.002	0.002	0.001
Wattleup (South Metro)	94.7	0.008	0.005	0.004	0.003	0.002	0.001	0.001

Table D7. 2012 percentiles of daily peak 24-hour particles as PM_{10} concentrations

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

Regional Performance Monitoring Station	Data availability rates (%)	Max conc. (µg/m^3)	99th percentile (µg/m^3)	98th percentile (µg/m^3)	95th percentile (µg/m^3)	90th percentile (µg/m^3)	75th percentile (µg/m^3)	50th percentile (µg/m^3)
Perth Region								
Caversham (North East Metro)	97.8	68.7	49.2	36.7	27.2	24.4	19.4	15.4
Duncraig (North Metro)	99.4	89.5	35.5	28.3	26.1	23.0	18.8	15.0
South Lake (South East Metro)	99.1	81.5	36.6	30.3	28.5	24.1	19.1	15.7
Southwest Region								
Albany	99.5	37.0	34.6	31.1	27.4	23.6	18.7	13.4
Bunbury	99.5	53.5	40.0	32.9	26.5	24.1	20.4	16.9
Collie	99.4	91.7	54.9	46.9	35.1	30.1	24.3	18.3
Midwest Region								
Geraldton	99.6	61.5	47.0	45.3	40.2	33.8	25.9	18.8

Table D8. 2012 percentiles of daily peak 24-hour particles as $PM_{2.5}$ concentrations

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

Regional Performance Monitoring Station	Data availability rates (%)	Max conc. (µg/m^3)	99th percentile (µg/m^3)	98th percentile (µg/m^3)	95th percentile (µg/m^3)	90th percentile (µg/m^3)	75th percentile (µg/m^3)	50th percentile (µg/m^3)
Perth Region								
Caversham (North East Metro)	96.9	45.9	19.2	15.9	12.3	10.6	8.8	7.1
Duncraig (North Metro)	97.5	77.3	22.0	14.4	12.7	11.0	8.8	7.3
Quinns Rocks (Outer North Coast)	96.5	74.5	22.7	14.3	11.9	10.6	8.7	7.2
South Lake (South East Metro)	99	71.6	25.0	19.3	14.6	13.2	10.0	7.9
Southwest Region								
Bunbury	99.6	43.0	26.3	21.0	14.9	12.8	9.5	7.7
Busselton	99.6	78.0	27.1	21.4	13.4	11.8	9.6	7.7

Maxima and percentiles by site 2003 to 2012

Table D9. Daily peak 8-hour carbon monoxide at Caversham (2003-2012)
Trend station/region: Caversham AAQ NEPM Standard
9.0 ppm (8-hour average)

Year	Data Recovery (%)	No. of exceedances (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
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
2012	98.0	0	0.9	0.7	0.6	0.5	0.4

Table D10. Daily peak 8-hour carbon monoxide at Duncraig (2003-2012)
Trend station/region: Duncraig AAQ NEPM Standard
9.0 ppm (8-hour average)

Year	Data Recovery (%)	No. of exceedances (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
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
2012	99.5	0	2.4	1.9	1.5	1.1	0.9

Table D11. Daily peak 8-hour carbon monoxide at South Lake (2003-2012)

Trend station/region: South Lake — AAQ NEPM Standard 9.0 ppm (8-hour average)

Year	Data Recovery (%)	No. of exceedances (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
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
2012	98.9	0	2.2	1.6	1.4	1.0	0.8

Table D12. Daily peak 1-hour nitrogen dioxide at Caversham (2003-2012)

Trend station/region: Caversham — AAQ NEPM Standard 0.12 ppm (1-hour average)

Year	Data Recovery (%)	No. of exceedances (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
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
2012	97.0	0	0.037	0.033	0.032	0.029	0.025

Table D13. Daily peak 1-hour nitrogen dioxide at Duncraig (2003-2012)

Trend station/region: Duncraig — AAQ NEPM Standard 0.12 ppm (1-hour average)

Year	Data Recovery (%)	No. of exceedances (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
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
2012	96.8	0	0.047	0.037	0.033	0.030	0.027

Table D14. Daily peak 1-hour nitrogen dioxide at Quinns Rocks (2003-2012)
Trend station/region: Quinns Rocks AAQ NEPM Standard
0.12 ppm (1-hour average)

Year	Data Recovery (%)	No. of exceedances (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
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
2012	97.3	0	0.041	0.032	0.031	0.027	0.024

Table D15. Daily peak 1-hour nitrogen dioxide at Rockingham (2003-2012)
Trend station/region: Rockingham AAQ NEPM Standard
0.12 ppm (1-hour average)

Year	Data Recovery (%)	No. of exceedances (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
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
2012	96.4	0	0.053	0.030	0.030	0.027	0.024

Table D16. Daily peak 1-hour nitrogen dioxide at Rolling Green (2003-2012)
Trend station/region: Rolling Green AAQ NEPM Standard
0.12 ppm (1-hour average)

Year	Data Recovery (%)	No. of exceedances (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
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
2012	91.9	0	0.029	0.019	0.017	0.016	0.014

Table D17. Daily peak 1-hour nitrogen dioxide at South Lake (2003-2012)
Trend station/region: South Lake AAQ NEPM Standard 0.12 ppm (1-hour average)

Year	Data Recovery (%)	No. of exceedances (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
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
2012	98.7	0	0.046	0.038	0.035	0.031	0.028

Table D18. Daily peak 1-hour nitrogen dioxide at Swanbourne (2003-2012)
Trend station/region: Swanbourne AAQ NEPM Standard 0.12 ppm (1-hour average)

Year	Data Recovery (%)	No. of exceedances (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
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
2012	98.4	0	0.045	0.033	0.032	0.030	0.027

Table D19. Daily peak 1-hour ozone at Caversham (2003-2012)
Trend station/region: Caversham AAQ NEPM Standard 0.10 ppm (1-hour average)

Year	Data Recovery (%)	No. of exceedances (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
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
2012	97.5	0	0.098	0.078	0.064	0.052	0.047

Table D20. Daily peak 1-hour ozone at Quinns Rocks (2003-2012)

Trend station/region: Quinns Rocks — AAQ NEPM Standard 0.10 ppm (1-hour average)

Year	Data Recovery (%)	No. of exceedances (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
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
2012	95.7	1	0.130	0.073	0.069	0.058	0.048

Table D21. Daily peak 1-hour ozone at Rockingham (2003-2012)

Trend station/region: Rockingham — AAQ NEPM Standard 0.10 ppm (1-hour average)

Year	Data Recovery (%)	No. of exceedances (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
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
2012	99.0	0	0.095	0.073	0.064	0.053	0.044

Table D22. Daily peak 1-hour ozone at Rolling Green (2003-2012)

Trend station/region: Rolling Green — AAQ NEPM Standard 0.10 ppm (1-hour average)

Year	Data Recovery (%)	No. of exceedances (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
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
2012	91.8	1	0.103	0.074	0.066	0.055	0.045

Table D23. Daily peak 1-hour ozone at South Lake (2003-2012)

Trend station/region: South Lake — AAQ NEPM Standard 0.10 ppm (1-hour average)

Year	Data Recovery (%)	No. of exceedances (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
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
2012	98.2	0	0.085	0.065	0.062	0.051	0.041

Table D24. Daily peak 1-hour ozone at Swanbourne (2003-2012)

Trend station/region: Swanbourne — AAQ NEPM Standard 0.10 ppm (1-hour average)

Year	Data Recovery (%)	No. of exceedances (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
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
2012	98.2	1	0.128	0.074	0.067	0.056	0.047

Table D25. Daily peak 4-hour ozone at Caversham (2003-2012)

Trend station/region: Caversham — AAQ NEPM Standard 0.08 ppm (4-hour average)

Year	Data Recovery (%)	No. of exceedances (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
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
2012	97.5	2	0.086	0.070	0.056	0.047	0.041

Table D26. Daily peak 4-hour ozone at Quinns Rocks (2003-2012)

Trend station/region: Quinns Rocks — AAQ NEPM Standard 0.08 ppm (4-hour average)

Year	Data Recovery (%)	No. of exceedances (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
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
2012	95.7	2	0.108	0.065	0.061	0.051	0.043

Table D27. Daily peak 4-hour ozone at Rockingham (2003-2012)

Trend station/region: Rockingham — AAQ NEPM Standard 0.08 ppm (4-hour average)

Year	Data Recovery (%)	No. of exceedances (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
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
2012	99.0	0	0.079	0.065	0.060	0.048	0.040

Table D28. Daily peak 4-hour ozone at Rolling Green (2003-2012)

Trend station/region: Rolling Green — AAQ NEPM Standard 0.08 ppm (4-hour average)

Year	Data Recovery (%)	No. of exceedances (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
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
2012	91.8	1	0.081	0.064	0.058	0.049	0.042

Table D29. Daily peak 4-hour ozone at South Lake (2003-2012)

Trend station/region: South Lake — AAQ NEPM Standard 0.08 ppm (4-hour average)

Year	Data Recovery (%)	No. of exceedances (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
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
2012	98.2	0	0.080	0.060	0.054	0.046	0.037

Table D30. Daily peak 4-hour ozone at Swanbourne (2003-2012)

Trend station/region: Swanbourne — AAQ NEPM Standard 0.10 ppm (1-hour average)

Year	Data Recovery (%)	No. of exceedances (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
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
2012	98.2	1	0.108	0.064	0.061	0.051	0.042

Table D31. Daily peak 1-hour sulfur dioxide at Rockingham (2003-2012)

Trend station/region: Rockingham — AAQ NEPM Standard 0.20 ppm (1-hour average)

Year	Data Recovery (%)	No. of exceedances (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
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
2012	94.4	0	0.040	0.020	0.018	0.011	0.008

Table D32. Daily peak 1-hour sulfur dioxide at South Lake (2003-2012)
Trend station/region: South Lake AAQ NEPM Standard
0.20 ppm (1-hour average)

Year	Data Recovery (%)	No. of exceedances (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
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
2012	94.0	0	0.039	0.027	0.019	0.014	0.010

Table D33. Daily peak 1-hour sulfur dioxide at Wattleup (2003-2012)
Trend station/region: Wattleup AAQ NEPM Standard
0.20 ppm (1-hour average)

Year	Data Recovery (%)	No. of exceedances (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
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
2012	94.7	0	0.043	0.039	0.034	0.025	0.017

Table D34. Daily peak 24-hour sulfur dioxide at Rockingham (2003-2012)
Trend station/region: Rockingham AAQ NEPM Standard
0.08 ppm (24-hour average)

Year	Data Recovery (%)	No. of exceedances (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
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
2012	94.4	0	0.006	0.005	0.003	0.002	0.002

Table D35. Daily peak 24-hour sulfur dioxide at South Lake (2003-2012)
Trend station/region: South Lake AAQ NEPM Standard
0.08 ppm (24-hour average)

Year	Data Recovery (%)	No. of exceedances (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
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
2012	94.0	0	0.006	0.004	0.003	0.003	0.002

Table D36. Daily peak 24-hour sulfur dioxide at Wattleup (2003-2012)
Trend station/region: Wattleup AAQ NEPM Standard
0.08 ppm (24-hour average)

Year	Data Recovery (%)	No. of exceedances (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)
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
2012	94.7	0	0.008	0.005	0.004	0.003	0.002

Table D37. Daily peak 24-hour particles as PM_{10} at Caversham (2003-2012)
Trend station/region: Caversham AAQ NEPM Standard
50 $\mu g/m^3$ (24-hour average)

Year	Data Recovery (%)	No. of exceedances (days)	Max conc. ($\mu g/m^3$)	99th percentile ($\mu g/m^3$)	98th percentile ($\mu g/m^3$)	95th percentile ($\mu g/m^3$)	90th percentile ($\mu g/m^3$)
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
2012	97.8	4	68.7	49.2	36.7	27.2	24.4

Table D38. Daily peak 24-hour particles as PM_{10} at Duncraig (2003-2012)
Trend station/region: Duncraig AAQ NEPM Standard 50 µg/m^3 (24-hour average)

Year	Data Recovery (%)	No. of exceedances (days)	Max conc. (µg/m^3)	99th percentile (µg/m^3)	98th percentile (µg/m^3)	95th percentile (µg/m^3)	90th percentile (µg/m^3)
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
2012	99.4	2	89.5	35.5	28.3	26.1	23.0

Table D39. Daily peak 24-hour particles as PM_{10} at South Lake (2003-2012)
Trend station/region: South Lake AAQ NEPM Standard 50 µg/m^3 (24-hour average)

Year	Data Recovery (%)	No. of exceedances (days)	Max conc. (µg/m^3)	99th percentile (µg/m^3)	98th percentile (µg/m^3)	95th percentile (µg/m^3)	90th percentile (µg/m^3)
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
2012	99.1	2	81.5	36.6	30.3	28.5	24.1

Table D40. Daily peak 24-hour particles as PM_{10} at Bunbury (2003-2012)
Trend station/region: Bunbury AAQ NEPM Standard 50 µg/m^3 (24-hour average)

Year	Data Recovery (%)	No. of exceedances (days)	Max conc. (µg/m^3)	99th percentile (µg/m^3)	98th percentile (µg/m^3)	95th percentile (µg/m^3)	90th percentile (µg/m^3)
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
2012	99.5	2	53.5	40.0	32.9	26.5	24.1

Table D41. Daily peak 24-hour particles as PM_{10} at Albany (2003-2012)
Trend station/region: Albany AAQ NEPM Standard 50 µg/m^3 (24-hour average)

Year	Data Recovery (%)	No. of exceedances (days)	Max conc. (µg/m^3)	99th percentile (µg/m^3)	98th percentile (µg/m^3)	95th percentile (µg/m^3)	90th percentile (µg/m^3)
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
2012	99.5	0	37.0	34.6	31.1	27.4	23.6

Table D42. Daily peak 24-hour particles as PM_{10} at Geraldton (2003-2012)
Trend station/region: Geraldton AAQ NEPM Standard 50 µg/m^3 (24-hour average)

Year	Data Recovery (%)	No. of exceedances (days)	Max conc. (µg/m^3)	99th percentile (µg/m^3)	98th percentile (µg/m^3)	95th percentile (µg/m^3)	90th percentile (µg/m^3)
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
2012	99.6	3	61.5	47.0	45.3	40.2	33.8

Table D43. Daily peak 24-hour particles as PM_{10} at Collie (2003-2012)
Trend station/region: Collie AAQ NEPM Standard 50 µg/m^3 (24-hour average)

Year	Data Recovery (%)	No. of exceedances (days)	Max conc. (µg/m^3)	99th percentile (µg/m^3)	98th percentile (µg/m^3)	95th percentile (µg/m^3)	90th percentile (µg/m^3)
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
2012	99.4	6	91.7	54.9	46.9	35.1	30.1

Table D44. Daily peak 24-hour particles as $PM_{2.5}$ at Caversham (2003-2012)

Trend station/region: Caversham — AAQ NEPM Advisory Standard 25 µg/m^3 (24-hour average)

Year	Data Recovery (%)	No. of exceedances (days)	Max conc. (µg/m^3)	99th percentile (µg/m^3)	98th percentile (µg/m^3)	95th percentile (µg/m^3)	90th percentile (µg/m^3)
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
2012	96.9	3	45.9	19.2	15.9	12.3	10.6

Table D45. Daily peak 24-hour particles as $PM_{2.5}$ at Duncraig (2003-2012)

Trend station/region: Duncraig — AAQ NEPM Advisory Standard 25 µg/m^3 (24-hour average)

Year	Data Recovery (%)	No. of exceedances (days)	Max conc. (µg/m^3)	99th percentile (µg/m^3)	98th percentile (µg/m^3)	95th percentile (µg/m^3)	90th percentile (µg/m^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
2012	97.5	3	77.3	22.0	14.4	12.7	11.0

Table D46. Daily peak 24-hour particles as $PM_{2.5}$ at Quinns Rocks (2003-2012)

Trend station/region: Quinns Rocks — AAQ NEPM Advisory Standard 25 µg/m^3 (24-hour average)

Year	Data Recovery (%)	No. of exceedances (days)	Max conc. (µg/m^3)	99th percentile (µg/m^3)	98th percentile (µg/m^3)	95th percentile (µg/m^3)	90th percentile (µg/m^3)
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
2012	96.5	4	74.5	22.7	14.3	11.9	10.6

Table D47. Daily peak 24-hour particles as $PM_{2.5}$ at South Lake (2003-2012)

Trend station/region: South Lake — AAQ NEPM Advisory Standard 25 µg/m^3 (24-hour average)

Year	Data Recovery (%)	No. of exceedances (days)	Max conc. (µg/m^3)	99th percentile (µg/m^3)	98th percentile (µg/m^3)	95th percentile (µg/m^3)	90th percentile (µg/m^3)
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
2012	99.0	4	71.6	25.0	19.3	14.6	13.2

Table D48. Daily peak 24-hour particles as $PM_{2.5}$ at Bunbury (2003-2012)

Trend station/region: Bunbury — AAQ NEPM Advisory Standard 25 µg/m^3 (24-hour average)

Year	Data Recovery (%)	No. of exceedances (days)	Max conc. (µg/m^3)	99th percentile (µg/m^3)	98th percentile (µg/m^3)	95th percentile (µg/m^3)	90th percentile (µg/m^3)
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
2012	99.6	7	43.0	26.3	21.0	14.9	12.8

Table D49. Daily peak 24-hour particles as $PM_{2.5}$ at Busselton (2003-2012)

Trend station/region: Busselton — AAQ NEPM Advisory Standard 25 µg/m^3 (24-hour average)

Year	Data Recovery (%)	No. of exceedances (days)	Max conc. (µg/m^3)	99th percentile (µg/m^3)	98th percentile (µg/m^3)	95th percentile (µg/m^3)	90th percentile (µg/m^3)
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
2012	99.6	5	78.0	27.1	21.4	13.4	11.8

Maxima by pollutant 2003-2012

Table D50. Annual daily peak 8-hour carbon monoxide concentrations (ppm) for 2003-2012

AAQ NEPM Standard
9.0 ppm (8-hour average)

Regional Performance Monitoring Station	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Perth Region										
Caversham (North East Metro)	1.1	1.3	1.3	1.8	0.9	0.8	1.0	1.6	1.5	0.9
Duncraig (North Metro)	4.1	4.5	3.3	3.4	2.0	3.1	2.6	2.3	1.9	2.4
South Lake (South East Metro)	3.1	3.5	2.9	2.5	1.7	2.0	1.8	2.2	1.7	2.2

Highlighted cells indicate NEPM exceedances.

Table D51. Annual daily peak 1-hour nitrogen dioxide concentrations (ppm) for 2003-2012

AAQ NEPM Standard
0.12 ppm (1-hour average)

Regional Performance Monitoring Station	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Perth Region										
Caversham (North East Metro)	0.043	0.046	0.048	0.084	0.044	0.036	0.044	0.054	0.035	0.037
Duncraig (North Metro)	0.057	0.043	0.051	0.056	0.053	0.038	0.042	0.038	0.035	0.047
Quinns Rocks (Outer North Coast)	0.035	0.041	0.041	0.065	0.035	0.037	0.034	0.040	0.031	0.041
Rockingham (South Coast)	0.051	0.055	0.045	0.054	0.040	0.031	0.031	0.036	0.034	0.053
Rolling Green (Outer East Rural)	0.032	0.025	0.029	0.026	0.020	0.023	0.035	0.030	0.023	0.029
South Lake (South East Metro)	0.048	0.043	0.052	0.045	0.057	0.044	0.048	0.058	0.041	0.046
Swanbourne (Inner West Coast)	0.048	0.042	0.039	0.043	0.038	0.035	0.037	0.038	0.032	0.045

Highlighted cells indicate NEPM exceedances.

Table D52. Annual daily peak 1-hour ozone concentrations (ppm) for 2003-2012

AAQ NEPM Standard
0.10 ppm (1-hour average)

Regional Performance Monitoring Station	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Perth Region										
Caversham (North East Metro)	0.083	0.079	0.094	0.080	0.085	0.083	0.104	0.082	0.077	0.098
Quinns Rocks (Outer North Coast)	0.086	0.079	0.095	0.085	0.081	0.083	0.070	0.091	0.083	0.130
Rockingham (South Coast)	0.064	0.102	0.081	0.072	0.084	0.077	0.078	0.067	0.065	0.095
Rolling Green (Outer East Rural)	0.087	0.101	0.079	0.093	0.095	0.087	0.103	0.088	0.073	0.103
South Lake (South East Metro)	0.071	0.076	0.080	0.066	0.067	0.082	0.065	0.070	0.076	0.085
Swanbourne (Inner West Coast)	0.082	0.077	0.076	0.075	0.077	0.076	0.068	0.066	0.085	0.128

Highlighted cells indicate NEPM exceedances.

Table D53. Annual daily peak 4-hour ozone concentrations (ppm) for 2003-2012

AAQ NEPM Standard
0.08 ppm (4-hour average)

Regional Performance Monitoring Station	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Perth Region										
Caversham (North East Metro)	0.069	0.067	0.069	0.072	0.073	0.076	0.092	0.072	0.063	0.086
Quinns Rocks (Outer North Coast)	0.071	0.068	0.070	0.074	0.075	0.073	0.062	0.065	0.075	0.108
Rockingham (South Coast)	0.059	0.079	0.075	0.067	0.079	0.072	0.066	0.064	0.061	0.079
Rolling Green (Outer East Rural)	0.075	0.077	0.068	0.079	0.080	0.075	0.083	0.080	0.061	0.081
South Lake (South East Metro)	0.063	0.064	0.070	0.063	0.059	0.067	0.057	0.061	0.064	0.080
Swanbourne (Inner West Coast)	0.066	0.067	0.066	0.069	0.067	0.070	0.063	0.055	0.073	0.108

Highlighted cells indicate NEPM exceedances.

Table D54. Annual daily peak 1-hour sulfur dioxide concentrations (ppm) for 2003-2012

AAQ NEPM Standard
0.20 ppm (1-hour average)

Regional Performance Monitoring Station	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Perth Region										
Rockingham (South Coast)	0.026	0.039	0.041	0.040	0.041	0.079	0.032	0.037	0.040	0.040
South Lake (South East Metro)	0.038	0.042	0.046	0.060	0.040	0.046	0.036	0.073	0.044	0.039
Wattleup (South Metro)	0.062	0.076	0.120	0.062	0.060	0.077	0.059	0.057	0.067	0.043

Highlighted cells indicate NEPM exceedances.

Table D55. Annual daily peak 24-hour sulfur dioxide concentrations (ppm) for 2003-2012

AAQ NEPM Standard
0.08 ppm (24-hour average)

Regional Performance Monitoring Station	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Perth Region										
Rockingham (South Coast)	0.005	0.006	0.009	0.007	0.012	0.007	0.008	0.007	0.008	0.006
South Lake (South East Metro)	0.006	0.005	0.007	0.009	0.006	0.005	0.006	0.009	0.006	0.006
Wattleup (South Metro)	0.006	0.009	0.014	0.009	0.010	0.011	0.008	0.010	0.008	0.008

Highlighted cells indicate NEPM exceedances.

Table D56. Annual daily peak 24-hour particles as PM_{10} concentrations ($\mu g/m^3$) for 2003-2012

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

Regional Performance Monitoring Station	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Perth Region										
Caversham (North East Metro)	-	58.0	76.8	42.6	58.8	39.1	45.7	63.4	76.1	68.7
Duncraig (North Metro)	66.7	45.1	59.2	40.6	40.3	46.9	45.5	47.9	65.9	89.5
South Lake (South East Metro)	44.5	50.5	98.8	45.3	56.7	55.0	49.0	61.0	66.2	81.5
Southwest Region										
Bunbury	54.5	99.5	63.3	123.5	46.5	39.1	53.8	134.0	68.4	53.5
Collie	-	-	-	-	-	85.9	80.4	163.0	61.5	91.7
Albany	-	-	-	39.4	55.7	56.3	36.7	52.5	37.3	37.0
Mid West Region										
Geraldton	-	-	61.3	78.0	116.3	150.7	128.9	55.6	63.0	61.5

Highlighted cells indicate NEPM exceedances.

Table D57. Annual daily peak 24-hour particles as $PM_{2.5}$ concentrations ($\mu g/m^3$) for 2003-2012

AAQ NEPM Advisory Standard
25 µg/m3 (24-hour average)

Regional Performance Monitoring Station	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Perth Region										
Caversham (North East Metro)	27.3	16.5	27.3	34.0	24.5	26.3	25.5	45.2	41.5	45.9
Duncraig (North Metro)	25.2	24.4	40.6	33.4	19.6	38.3	32.7	36.4	52.1	77.3
Quinns Rocks (Outer North Coast)	-	-	-	63.9	19.9	53.3	31.3	33.7	43.2	74.5
South Lake (South East Metro)	-	-	-	30.5	21.2	45.2	32.0	40.0	48.2	71.6
Southwest Region										
Bunbury	37.6	94.8	64.2	113.5	34.5	27.8	40.0	115.3	45.5	43.0
Busselton	-	-	-	12.7	51.1	35.6	69.0	62.5	85.2	78.0

Highlighted cells indicate NEPM exceedances.

Table D58. Annual averaged particles as $PM_{2.5}$ concentrations ($\mu g/m^3$) for 2003-2012

AAQ NEPM Advisory Standard
8 µg/m3 (annual average)

Regional Performance Monitoring Station	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Perth Region										
Caversham (North East Metro)	8.0	7.6	8.0	8.1	7.5	7.1	7.8	8.2	7.0	7.8
Duncraig (North Metro)	8.9	7.9	7.8	8.2	7.3	7.7	8.2	8.2	7.8	8.2
Quinns Rocks (Outer North Coast)	-	-	-	7.8	6.9	7.2	7.8	7.8	7.2	7.9
South Lake (South East Metro)	-	-	-	8.7	7.6	7.7	8.2	8.7	7.8	8.9
Southwest Region										
Bunbury	8.6	9.2	8.6	8.7	7.8	7.6	8.3	9.2	8.0	8.6
Busselton	-	-	-	6.9	7.4	7.3	9.0	8.5	8.5	8.6

Highlighted cells indicate NEPM exceedances.

ATTACHMENT 1 – Graphical trends

This attachment provides graphical representations of tables D8 to D44 of Section D. Each graph show the maximum, 99th percentile, 98th percentile, 95th percentile and 90th percentile of daily maximum concentration for all pollutants monitored by the Department of Environment Regulation 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

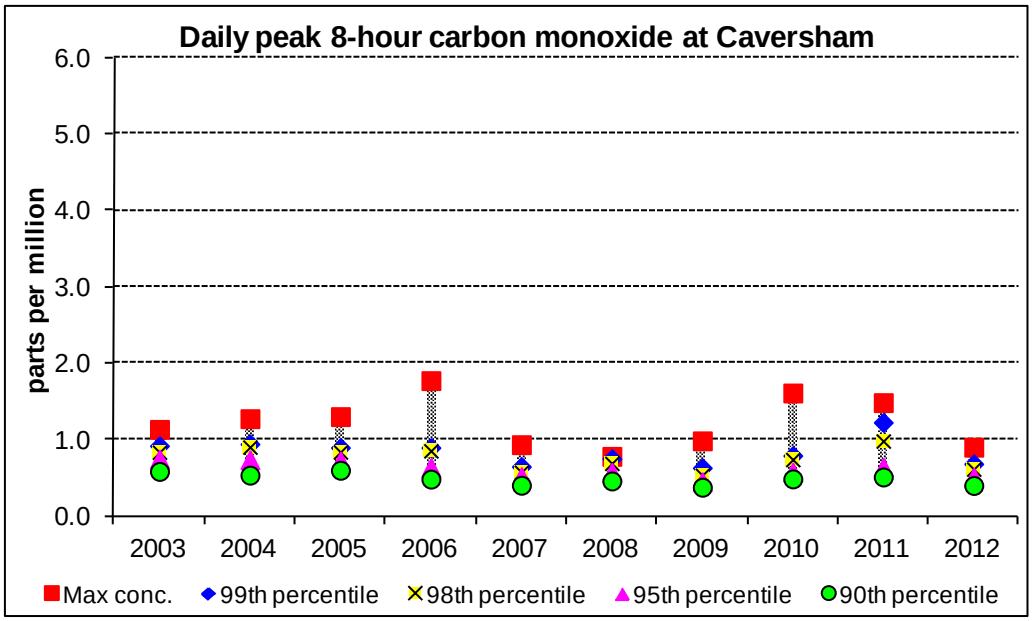


Figure A1-1 - 8-hour carbon monoxide at Caversham

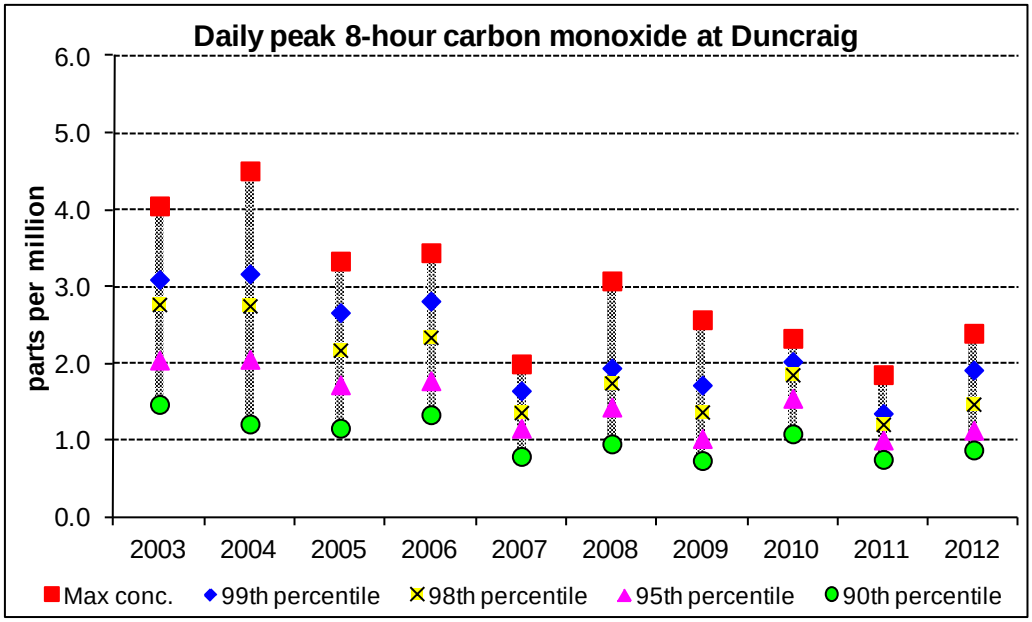


Figure A1-2 - 8-hour carbon monoxide at Duncraig

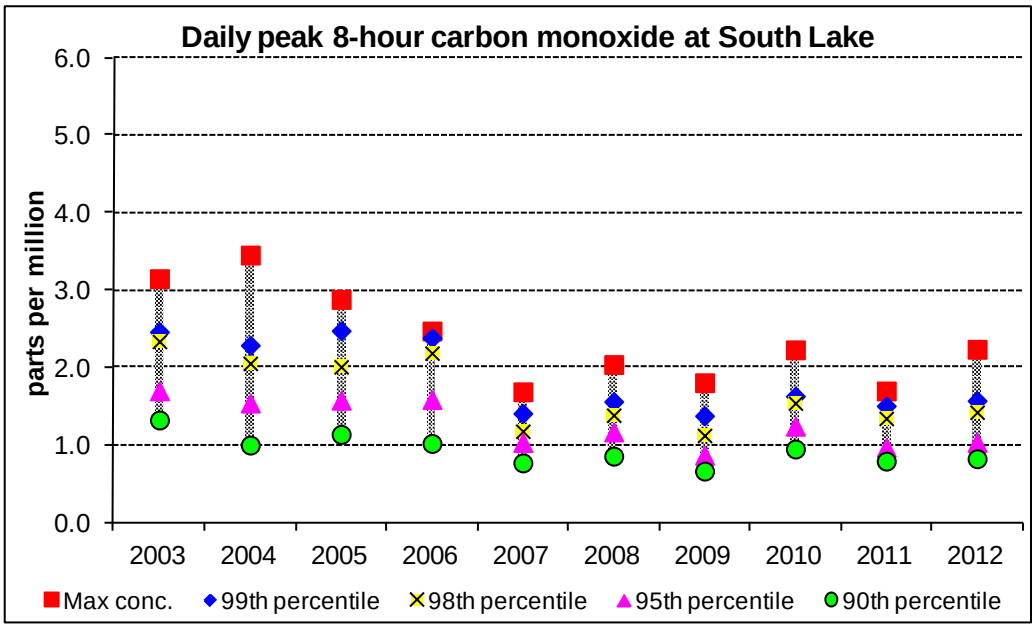


Figure A1-3 - 8-hour carbon monoxide at South Lake

Nitrogen dioxide

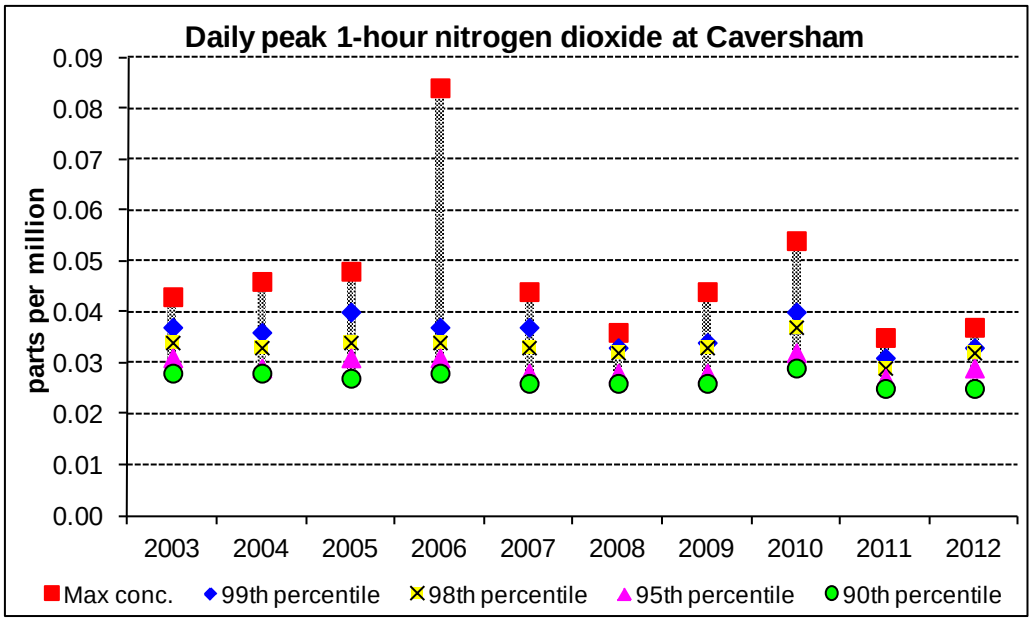


Figure A1-4 - 1-hour nitrogen dioxide at Caversham

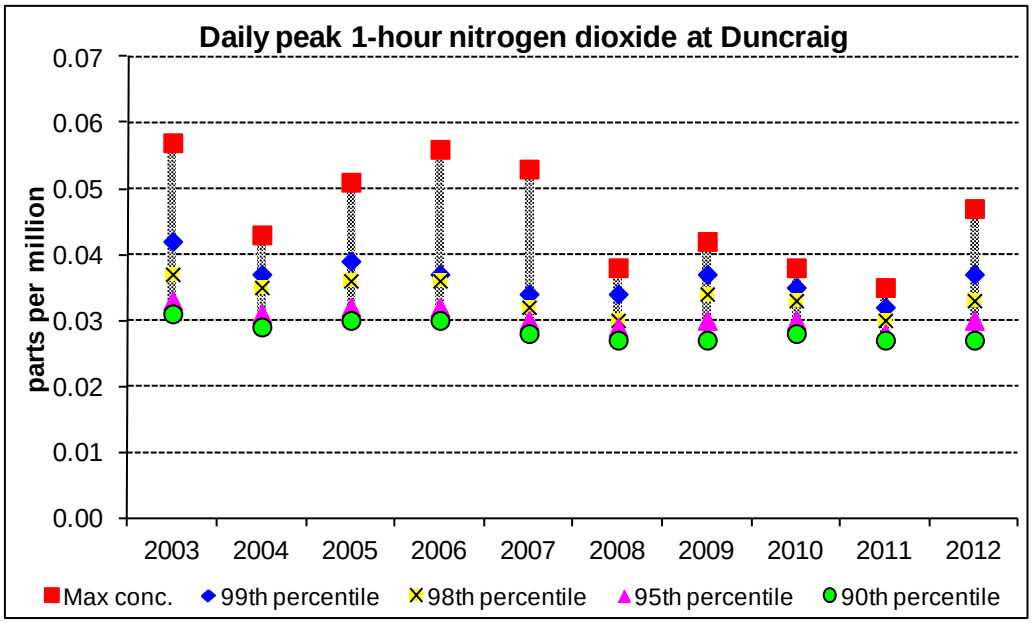


Figure A1-5 - 1-hour nitrogen dioxide at Duncraig

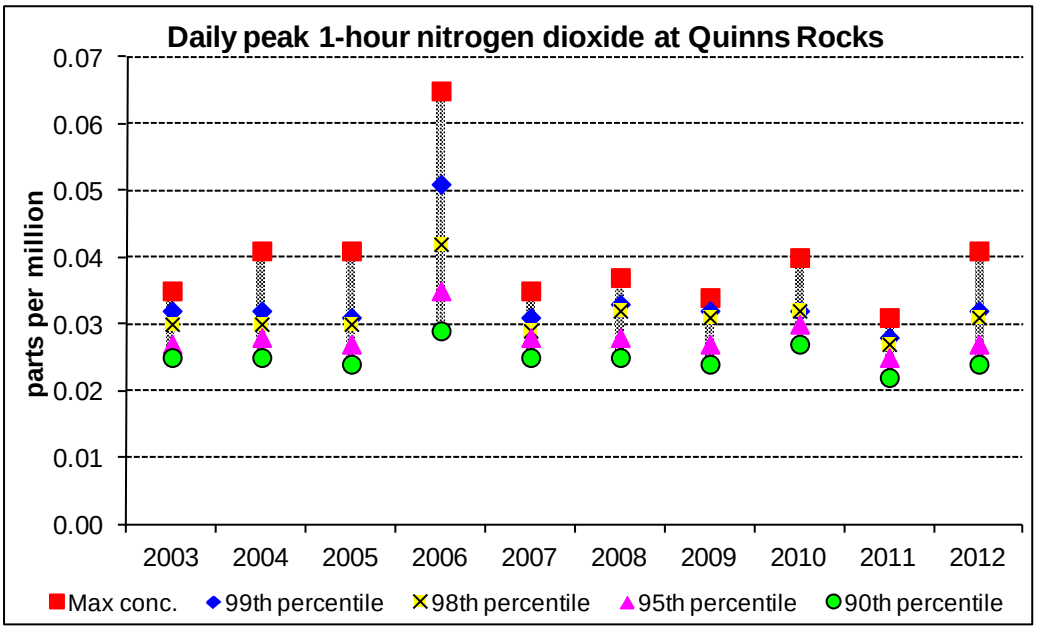


Figure A1-6 - 1-hour nitrogen dioxide at Quinns Rocks

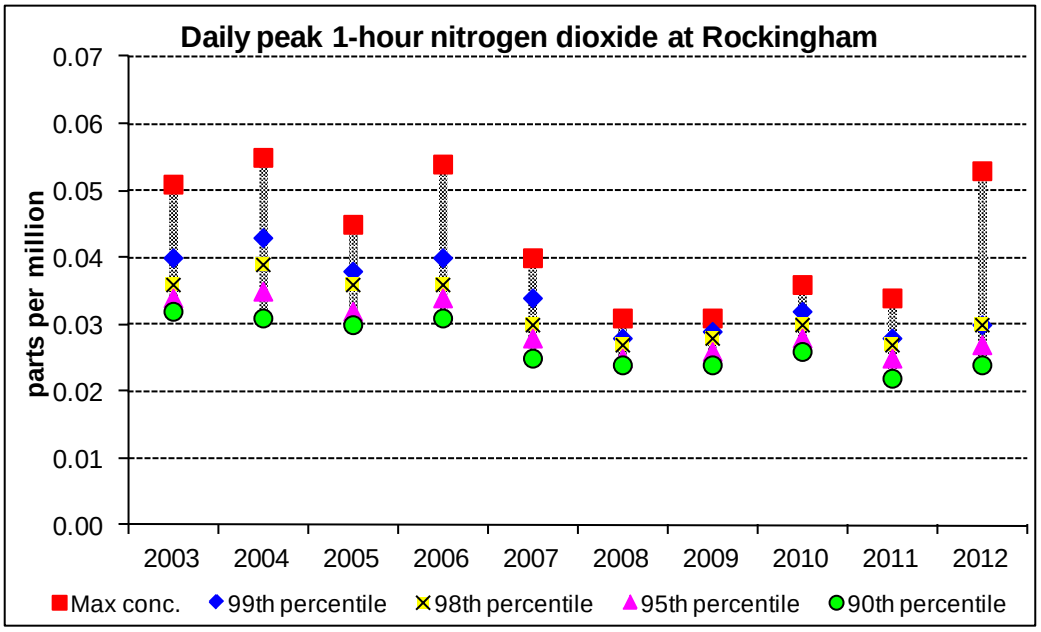


Figure A1-7 - 1-hour nitrogen dioxide at Rockingham

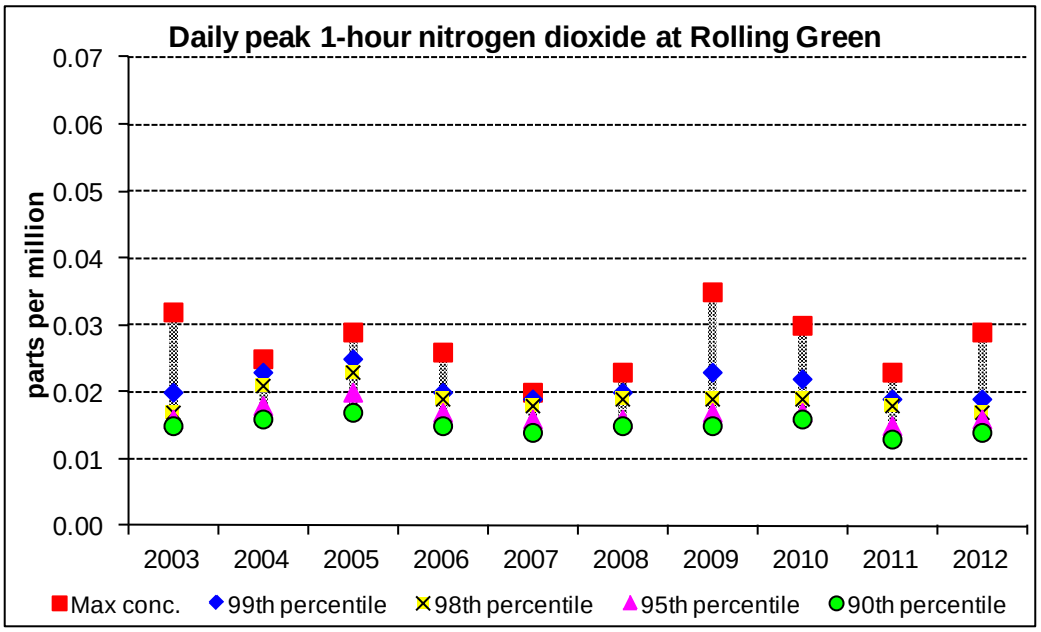


Figure A1-8 - 1-hour nitrogen dioxide at Rolling Green

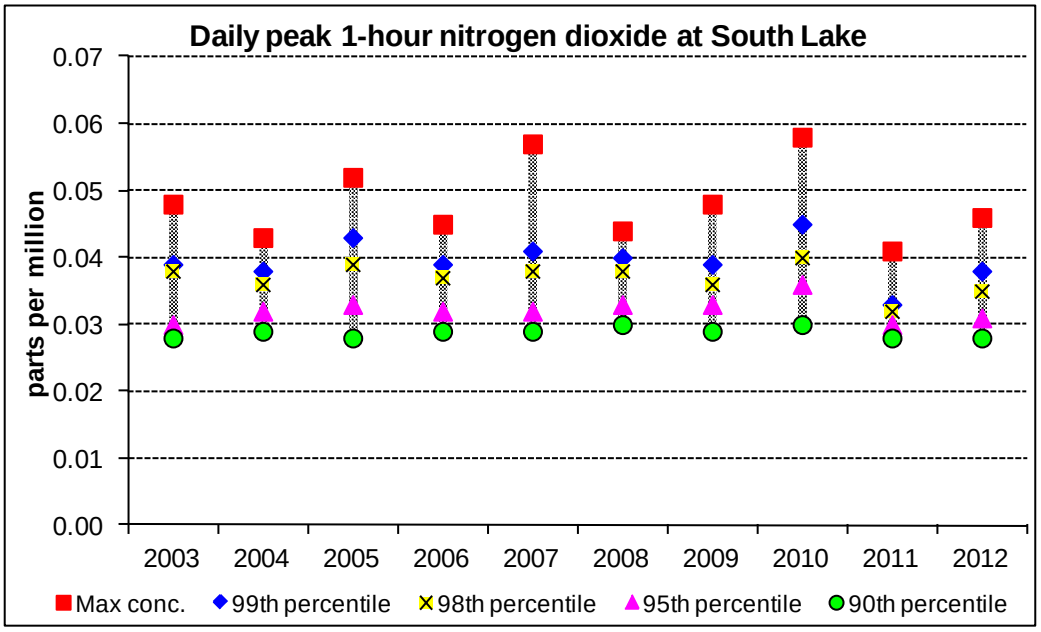


Figure A1-9 - 1-hour nitrogen dioxide at South Lake

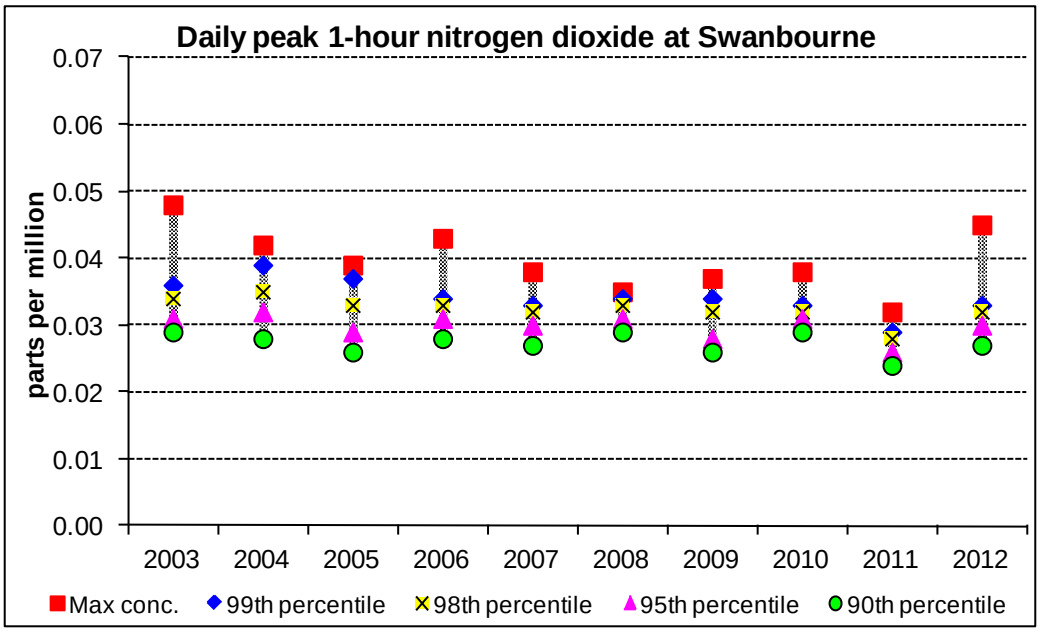


Figure A1-10 - 1-hour nitrogen dioxide at Swanbourne

Ozone

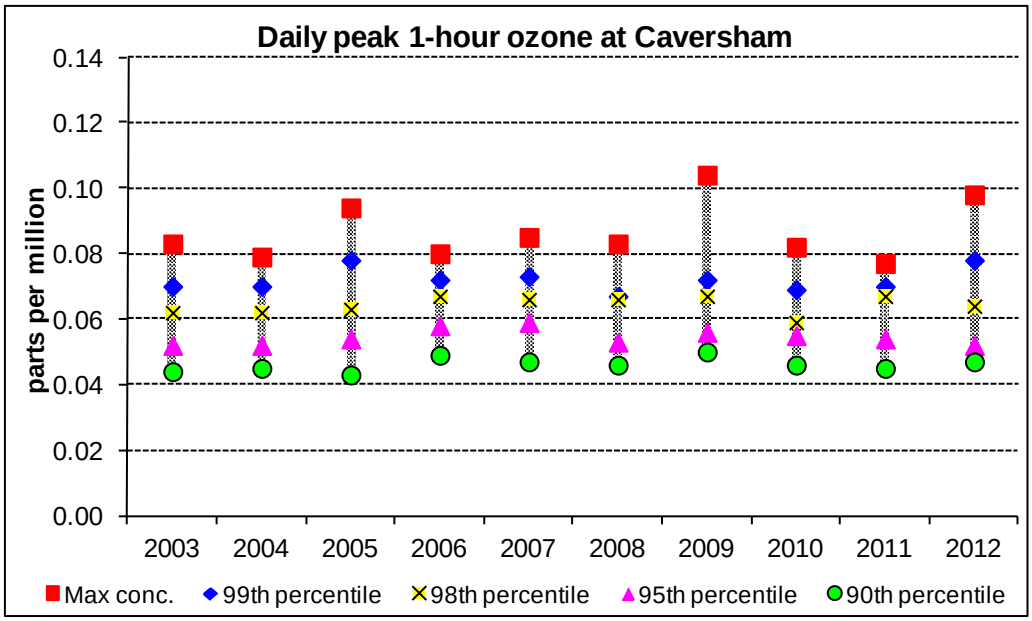


Figure A1-11 - 1-hour ozone at Caversham

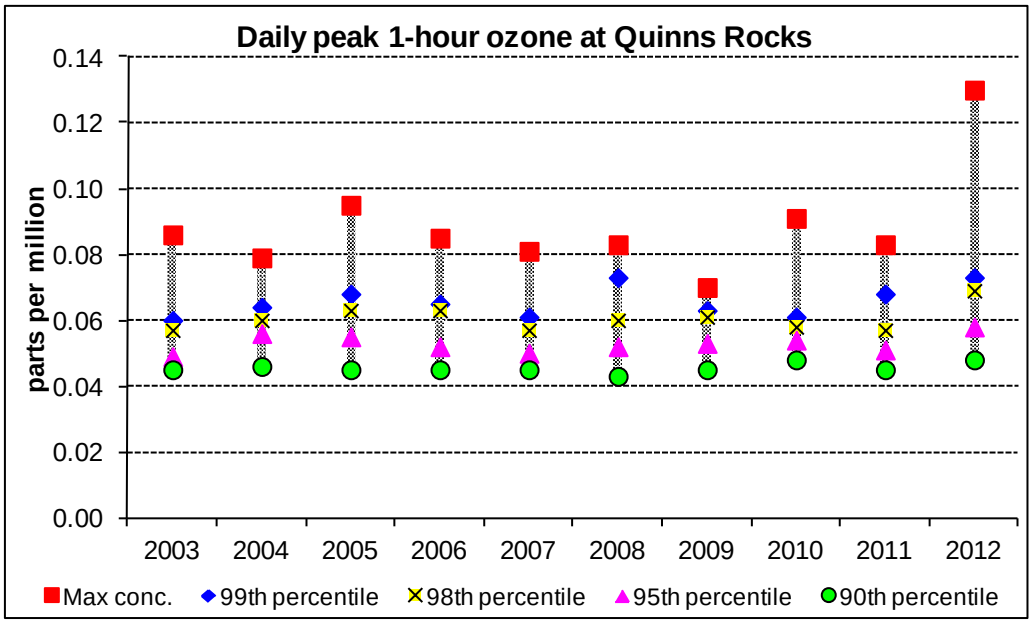


Figure A1-12 - 1-hour ozone at Quinns Rocks

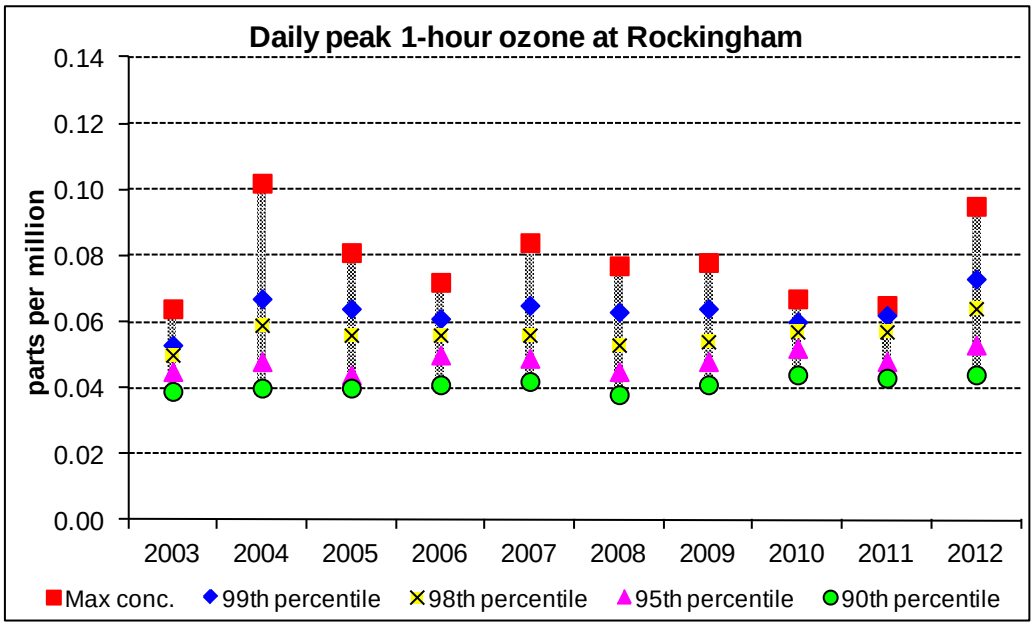


Figure A1-13 - 1-hour ozone at Rockingham

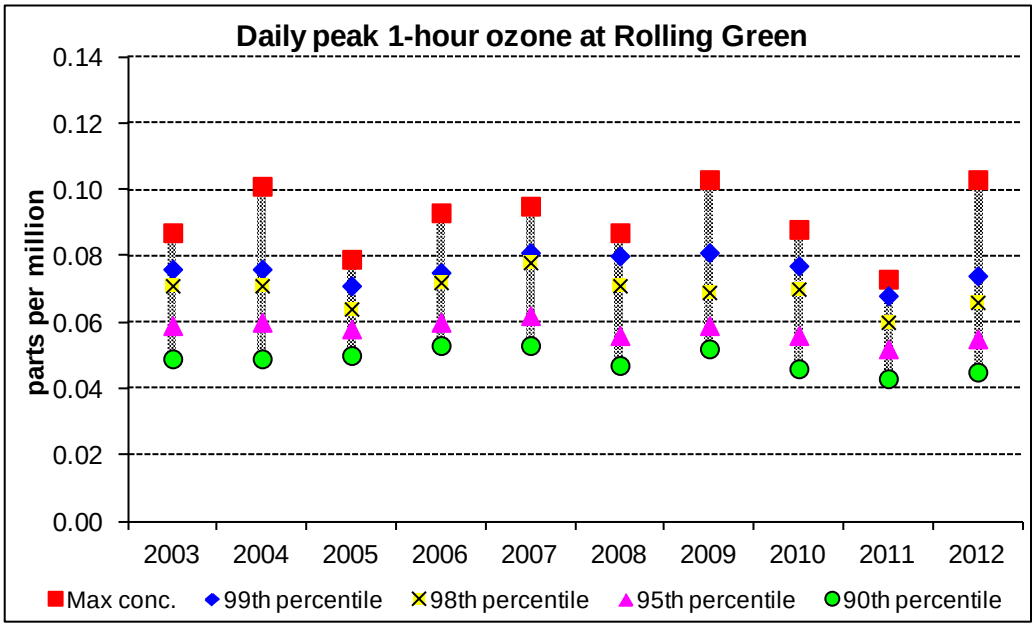


Figure A1-14 - 1-hour ozone at Rolling Green

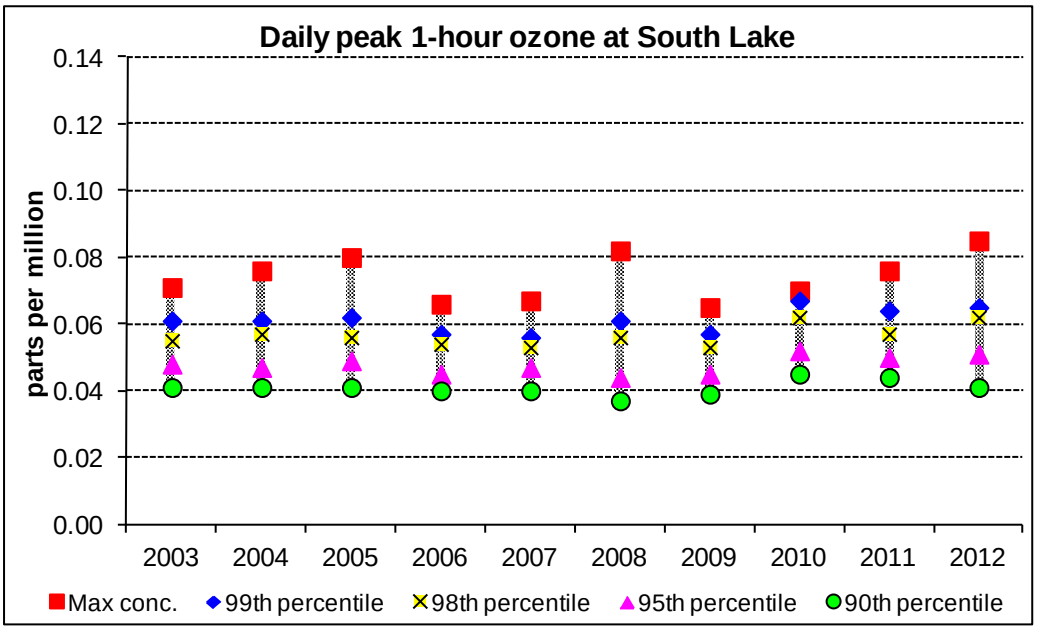


Figure A1-15 - 1-hour ozone at South Lake

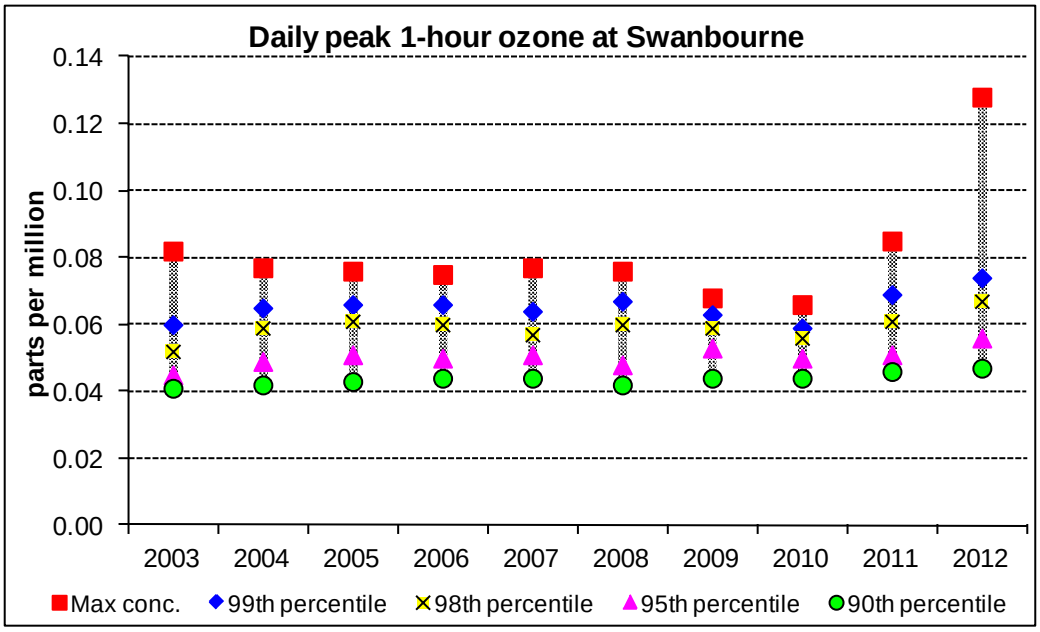


Figure A1-16 - 1-hour ozone at Swanbourne

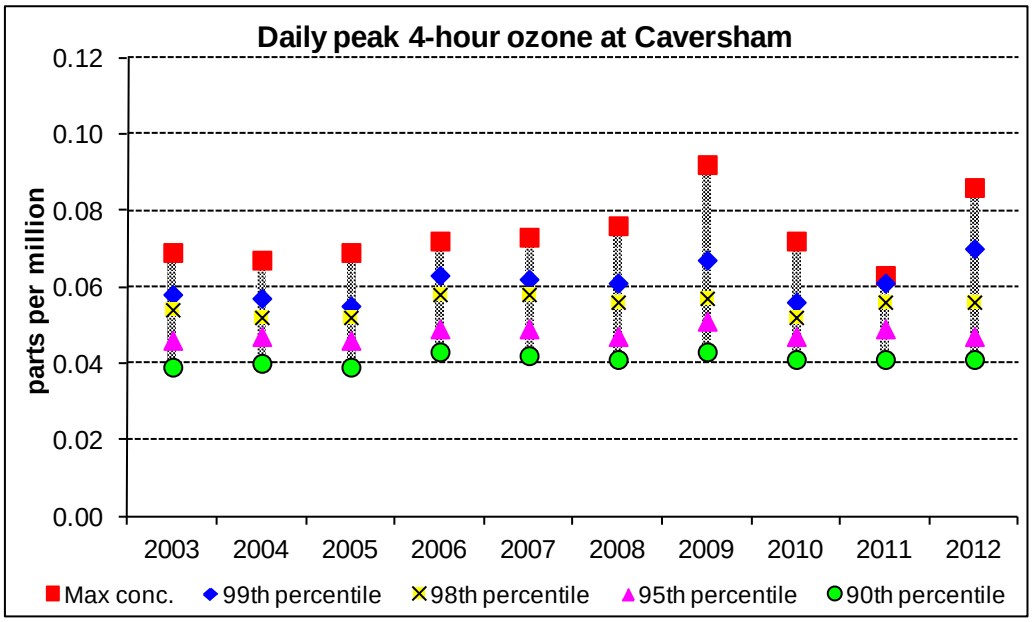


Figure A1-17 - 4-hour ozone at Caversham

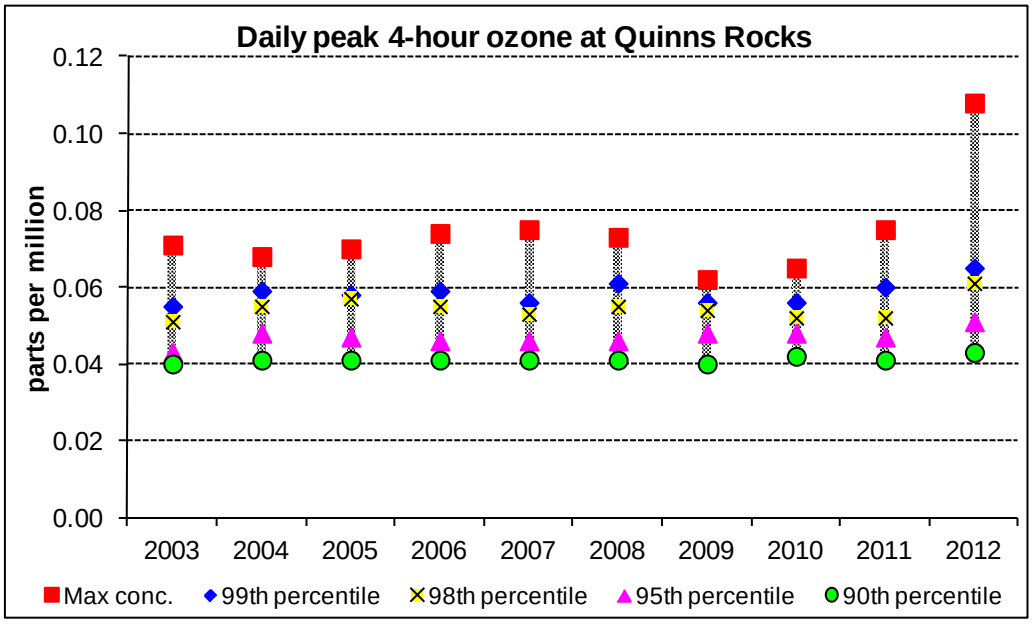


Figure A1-18 - 4-hour ozone at Quinns Rocks

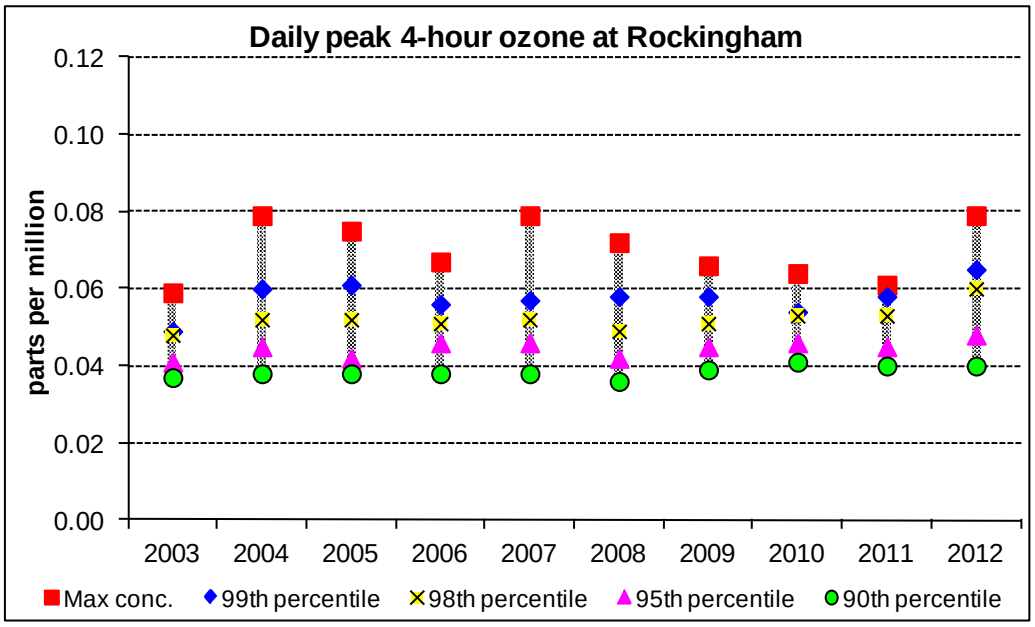


Figure A1-19 - 4-hour ozone at Rockingham

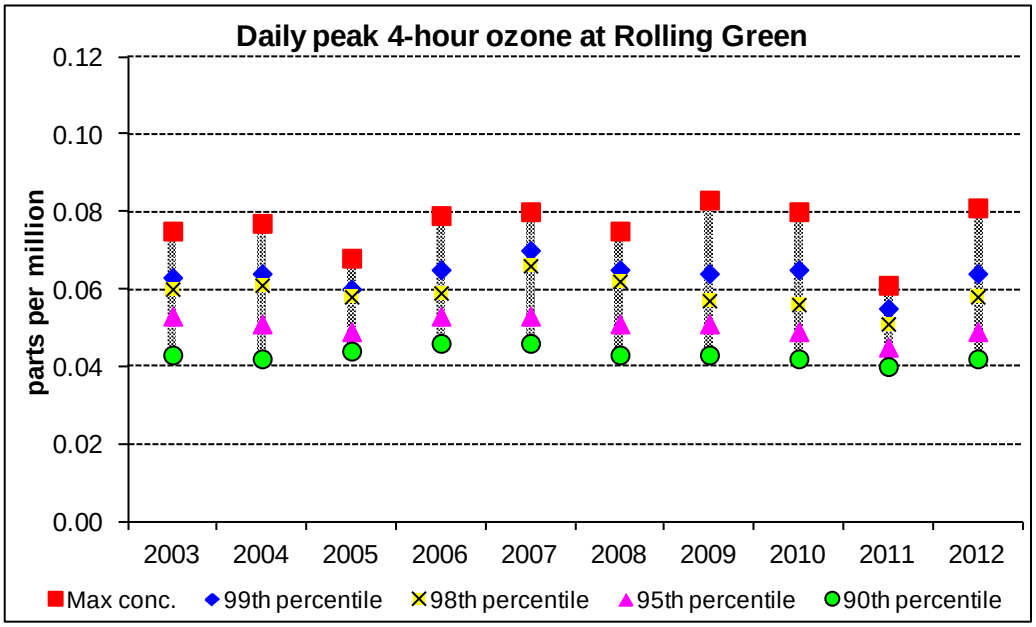


Figure A1-20 - 4-hour ozone at Rolling Green

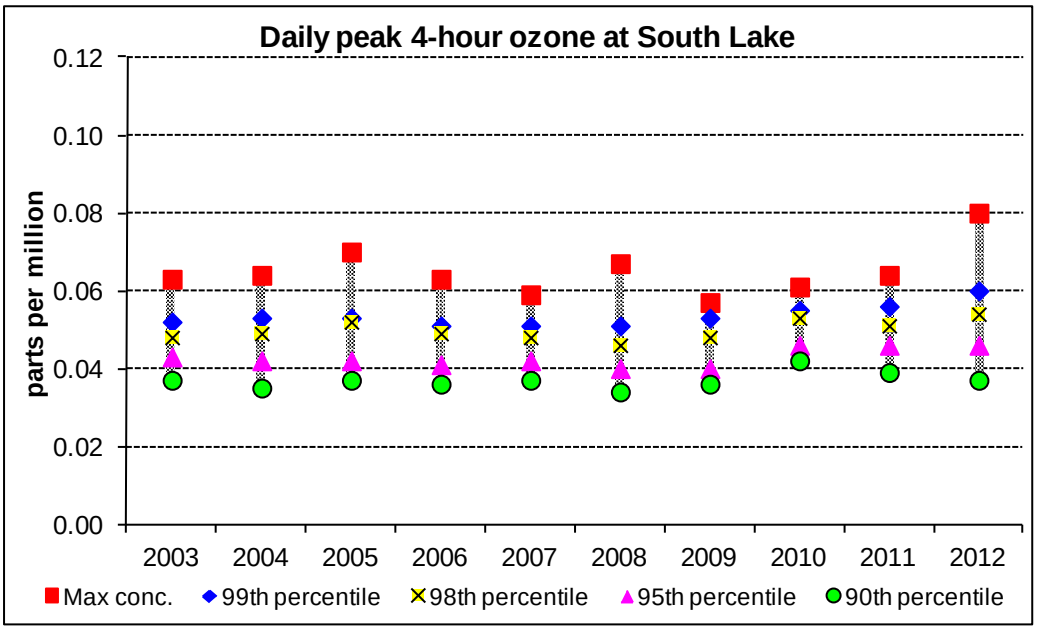


Figure A1-21 - 4-hour ozone at South Lake

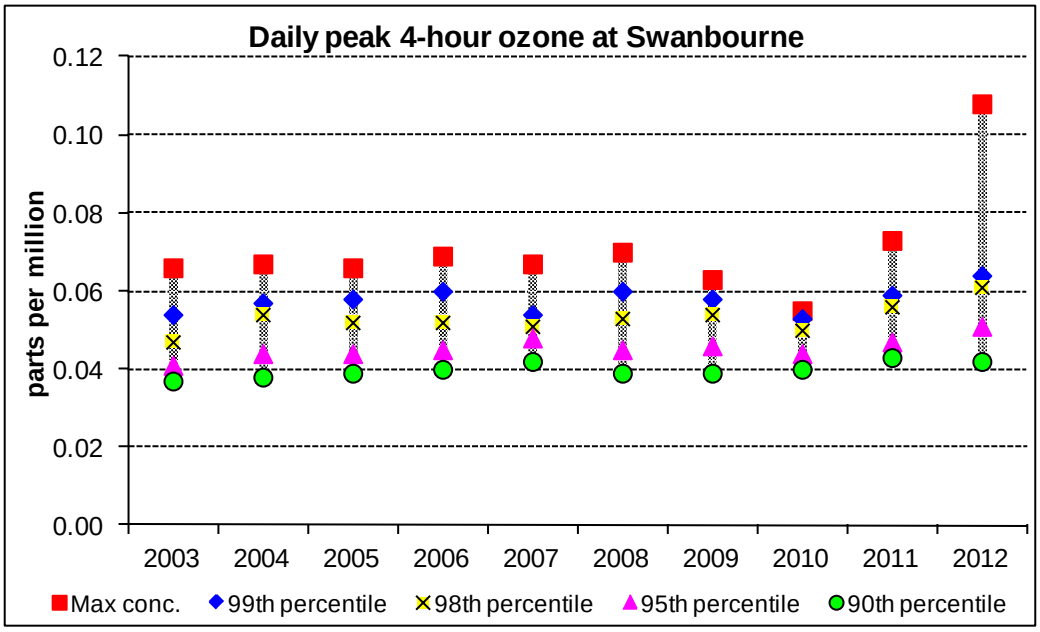


Figure A1-22 - 4-hour ozone at Swanbourne

Sulfur dioxide

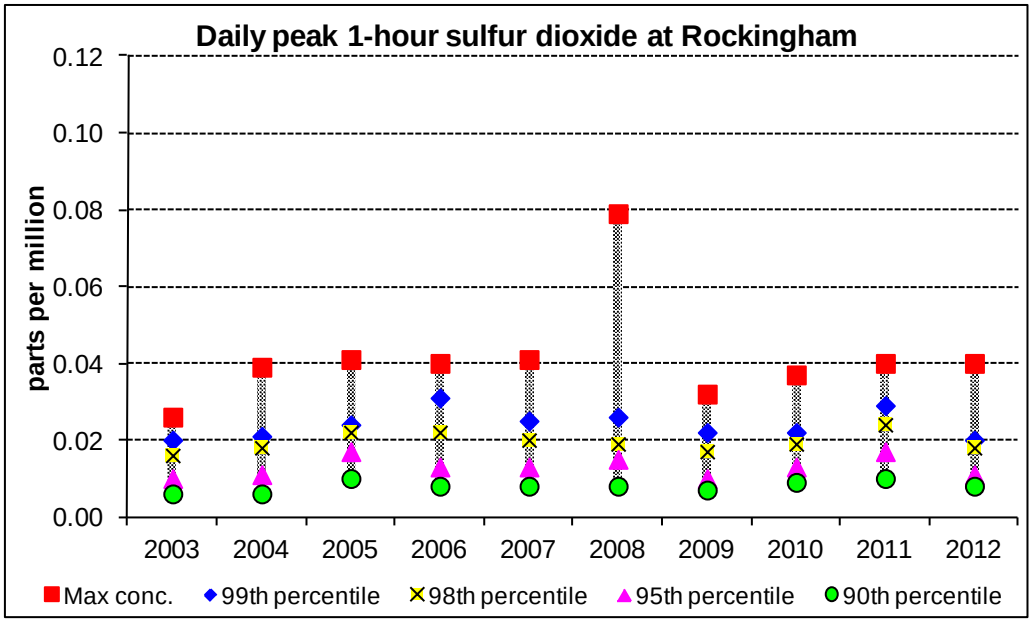


Figure A1-23 - 1-hour sulfur dioxide at Rockingham

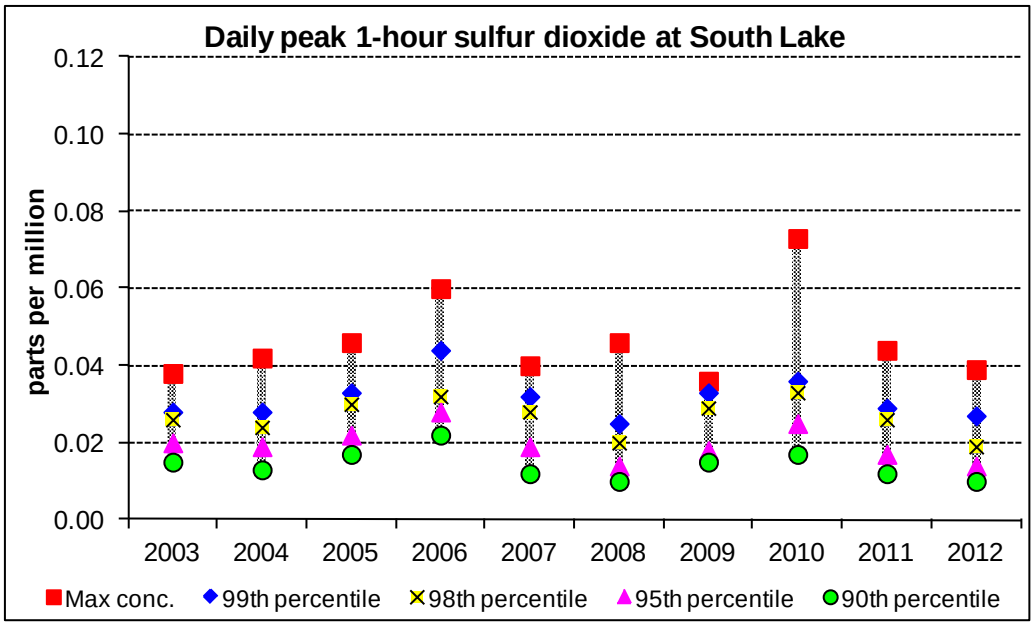


Figure A1-24 - 1-hour sulfur dioxide at South Lake

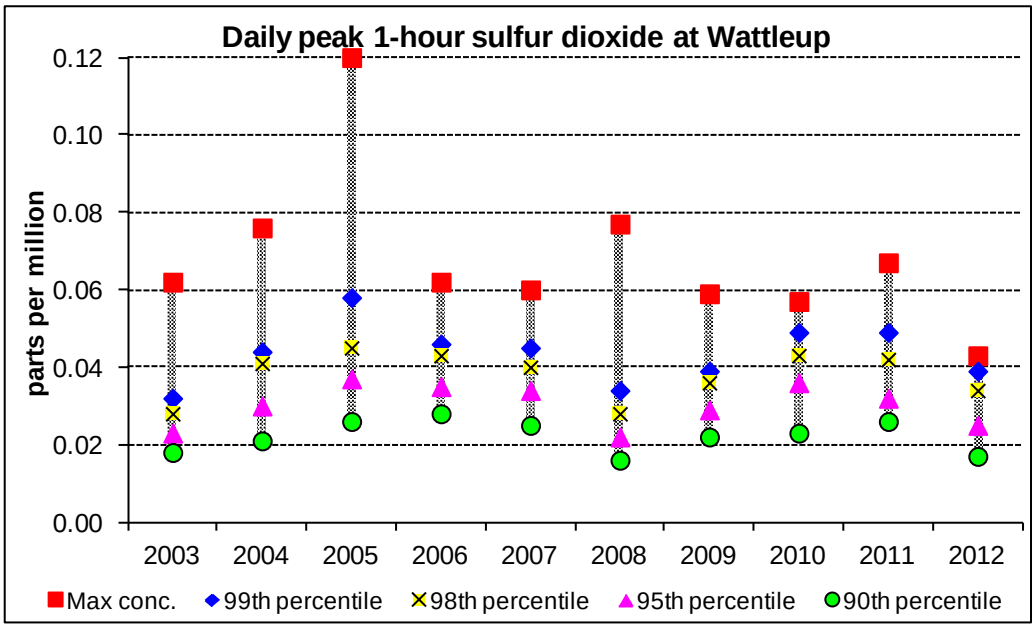


Figure A1-25 - 1-hour sulfur dioxide at Wattleup

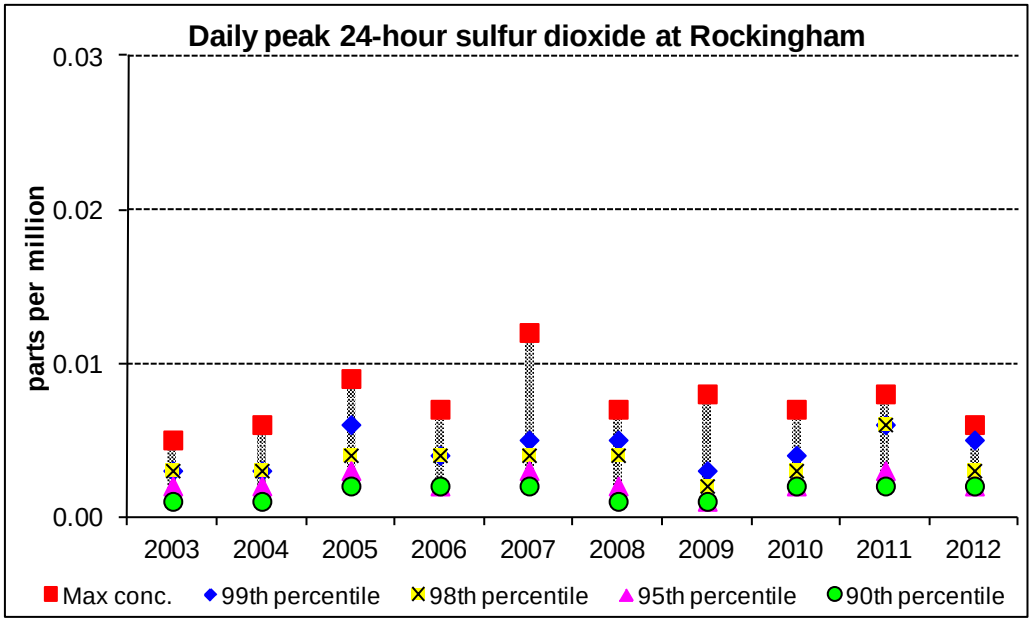


Figure A1-26 - 24-hour sulfur dioxide at Rockingham

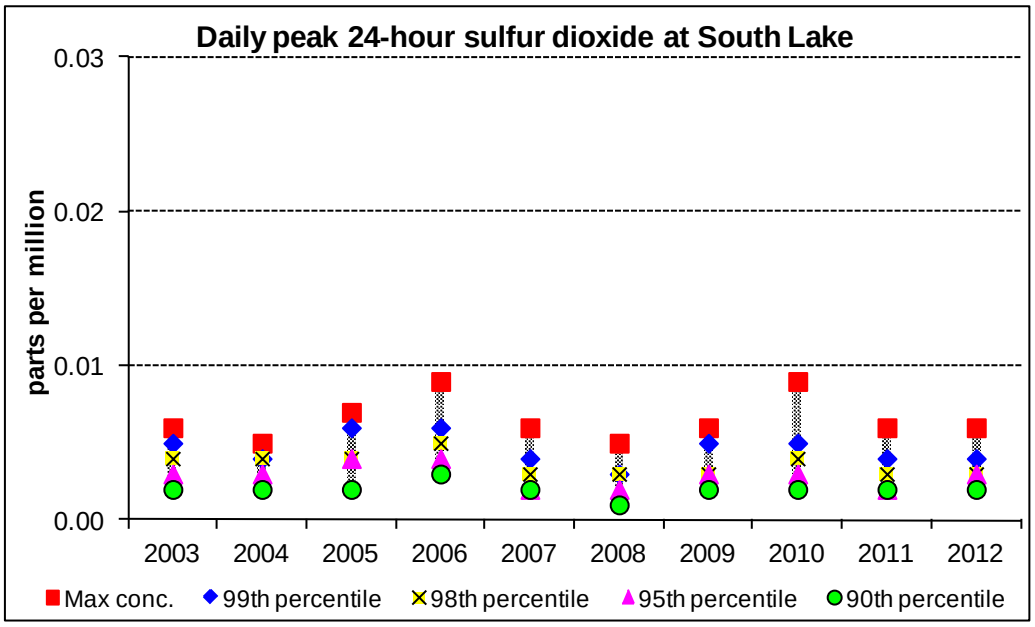


Figure A1-27 - 24-hour sulfur dioxide at South Lake

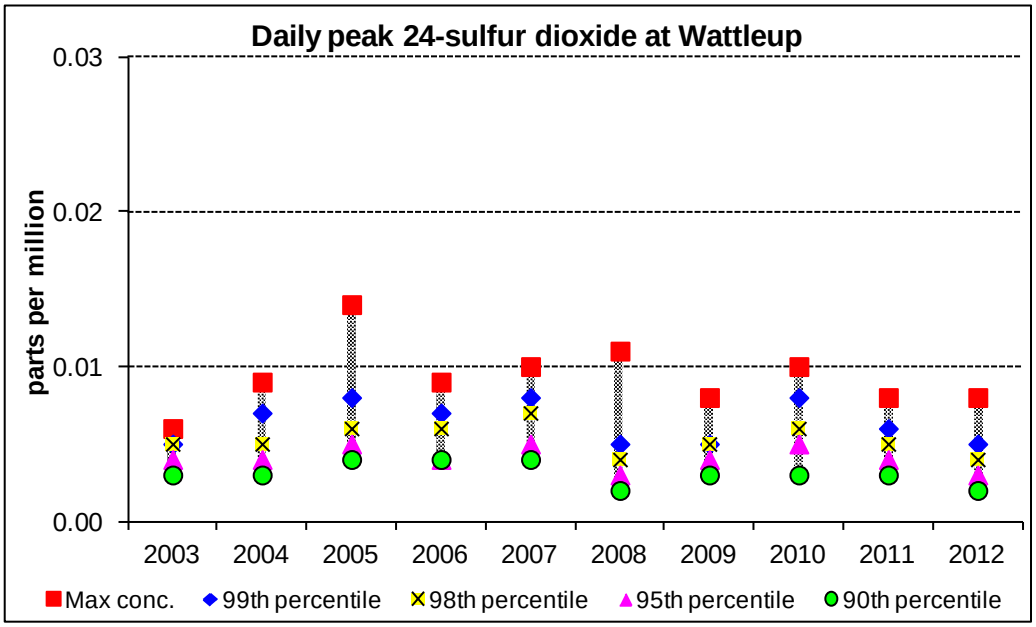


Figure A1-28 - 24-hour sulfur dioxide at Wattleup

Particles as PM_{10}

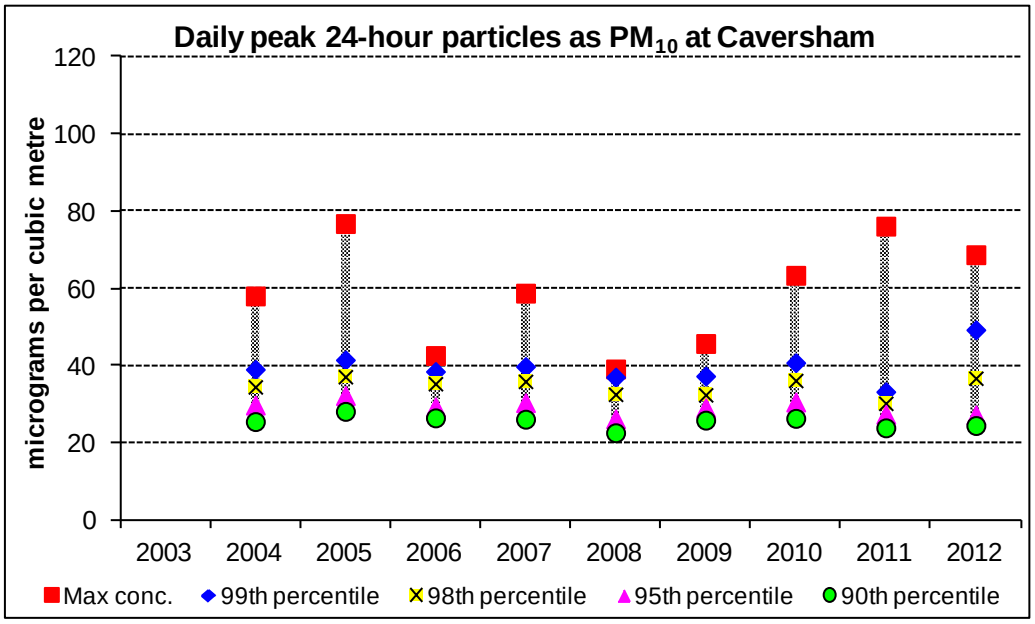


Figure A1-29 - 24-hour PM_{10} at Caversham

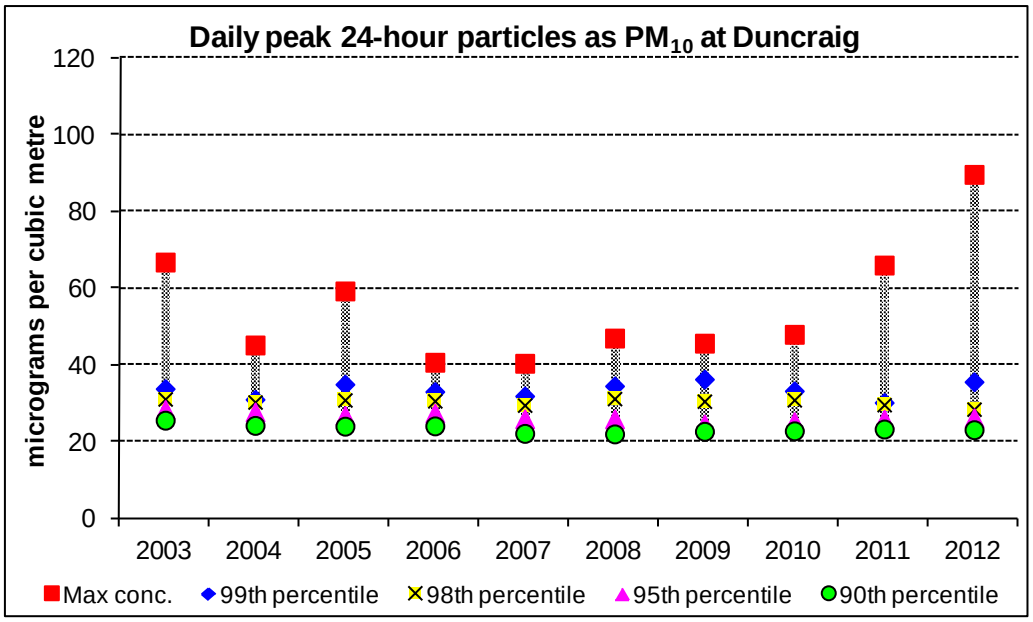


Figure A1-30 - 24-hour PM_{10} at Duncraig

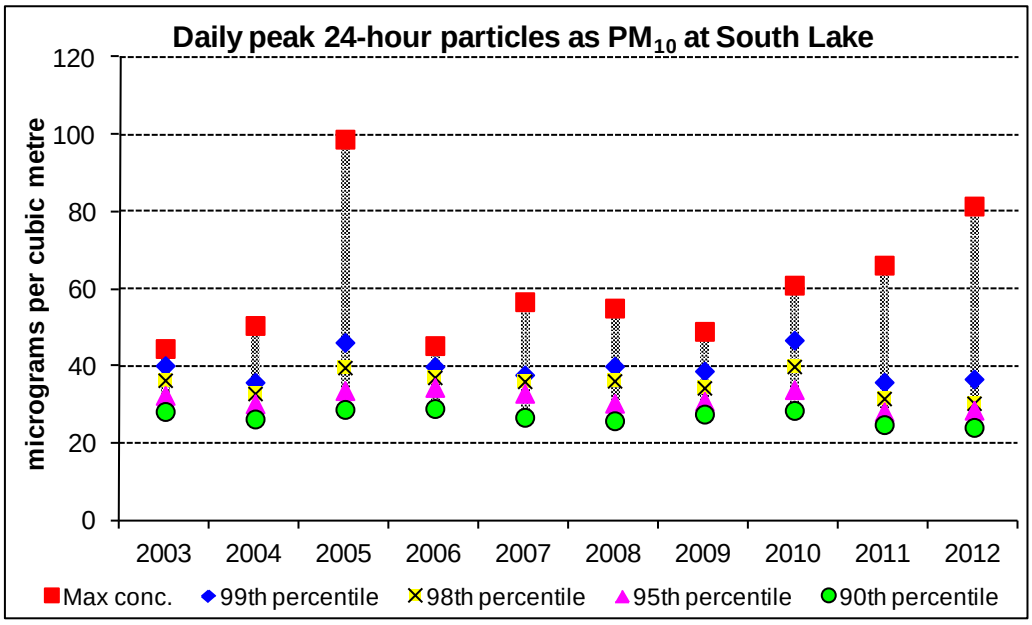


Figure A1-31 - 24-hour PM_{10} at South Lake

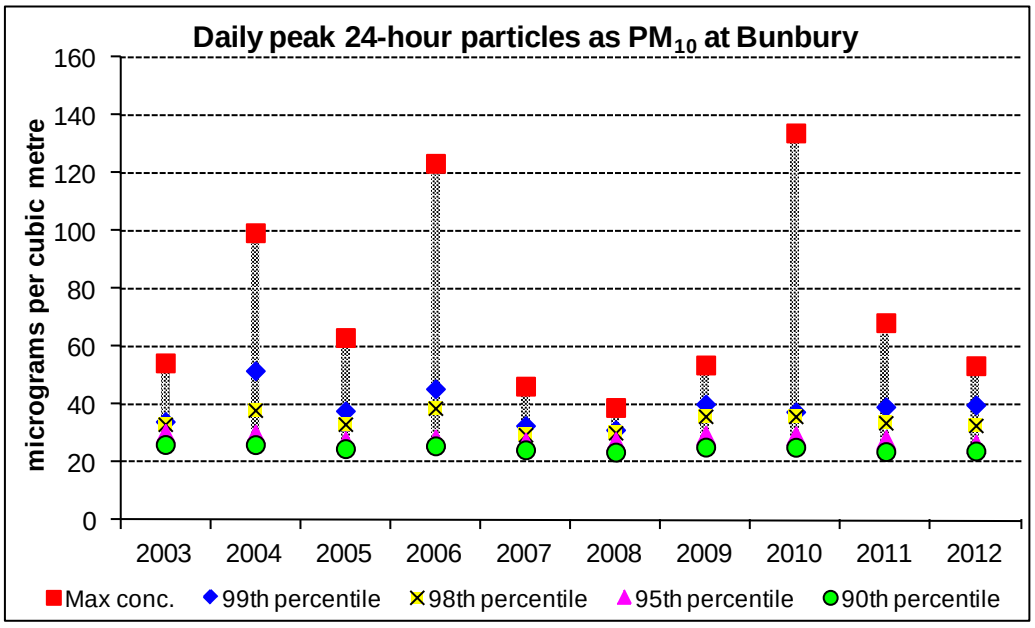


Figure A1-32 - 24-hour PM_{10} at Bunbury

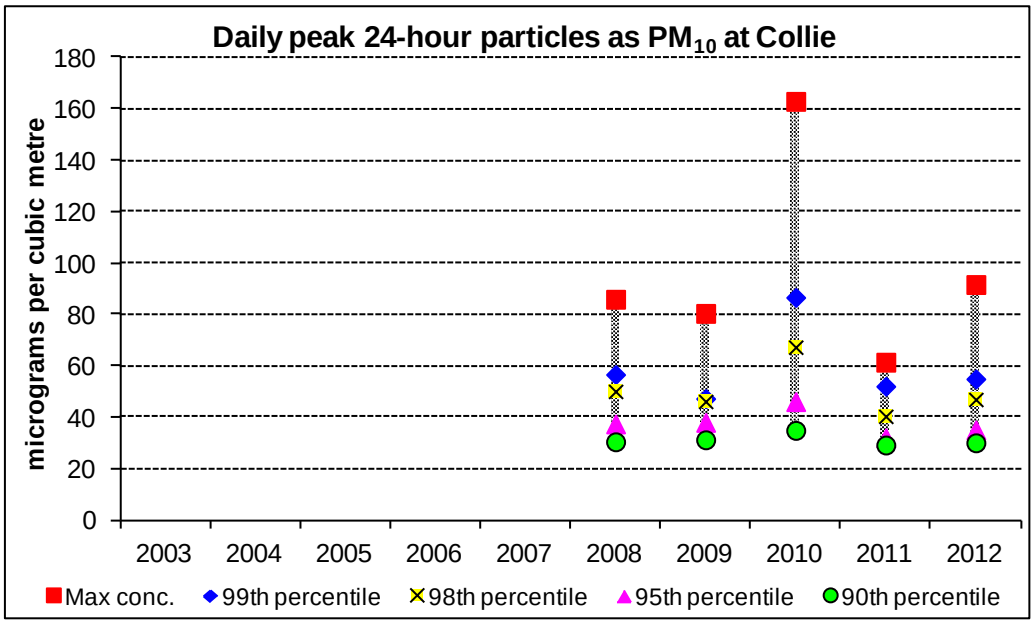


Figure A1-33 - 24-hour PM_{10} at Collie

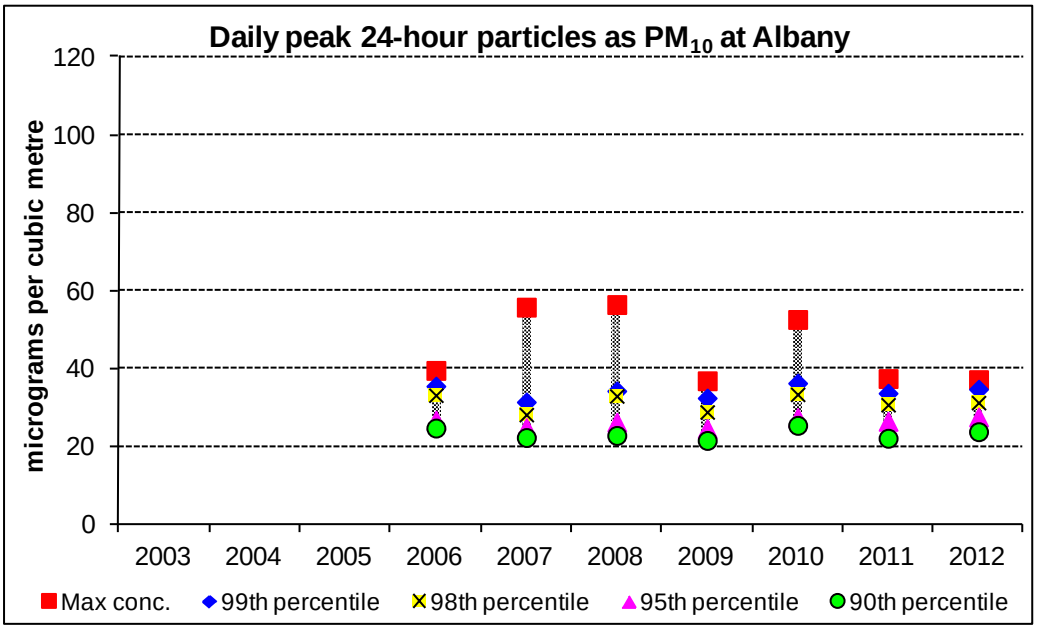


Figure A1-34 - 24-hour PM_{10} at Albany

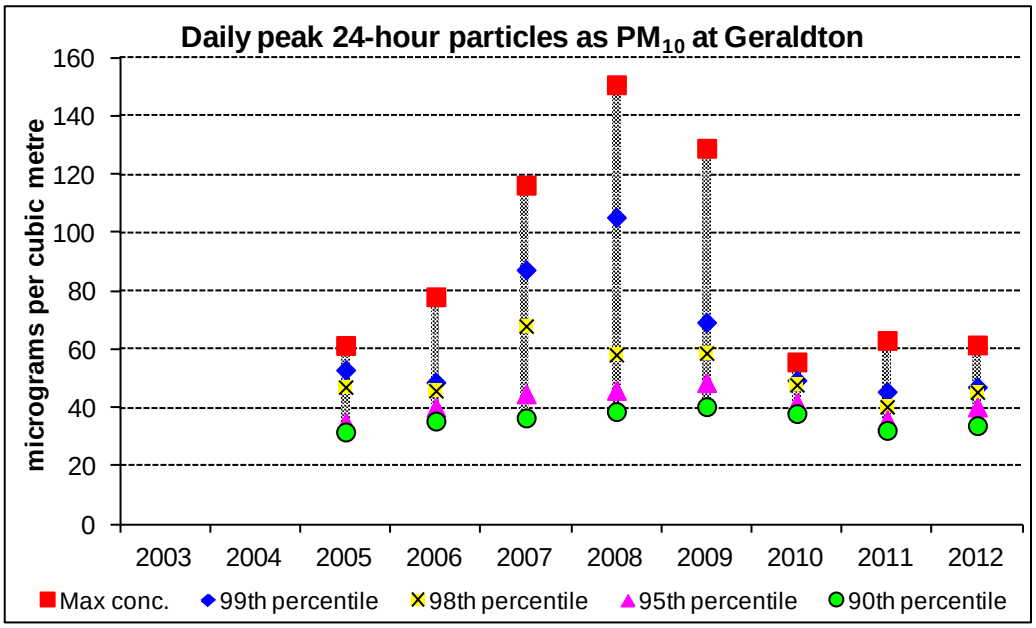


Figure A1-35 - 24-hour PM_{10} at Geraldton

Particles as $PM_{2.5}$

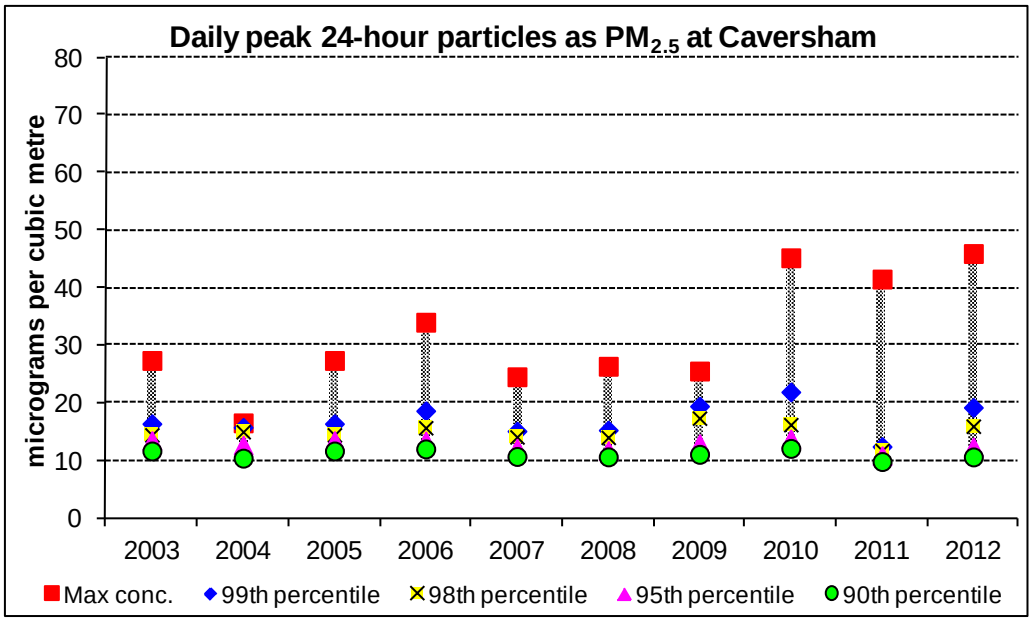


Figure A1-36 - 24-hour $PM_{2.5}$ at Caversham

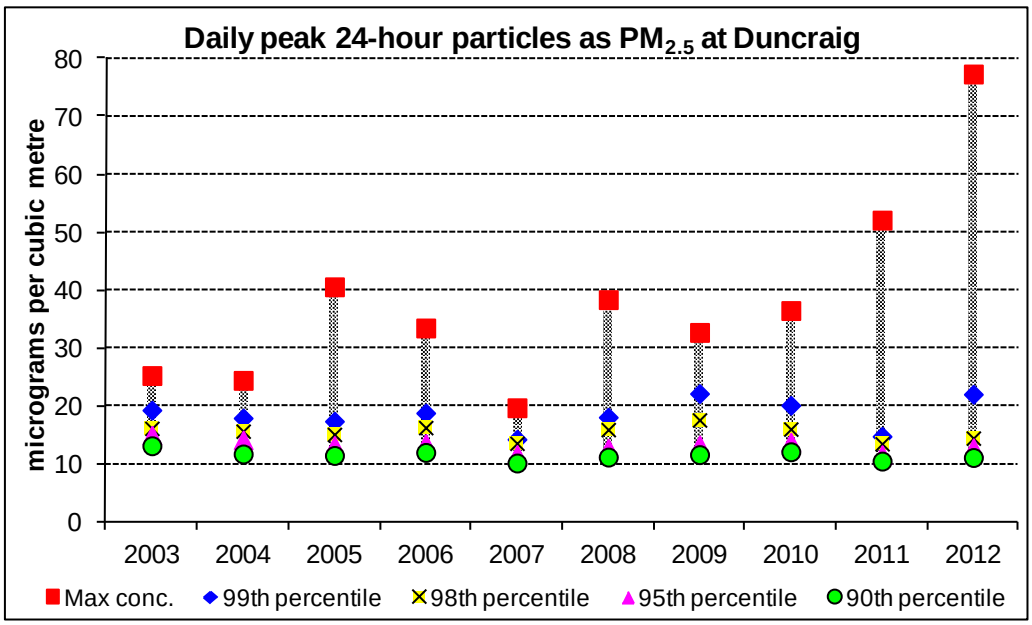


Figure A1-37 - 24-hour $PM_{2.5}$ at Duncraig

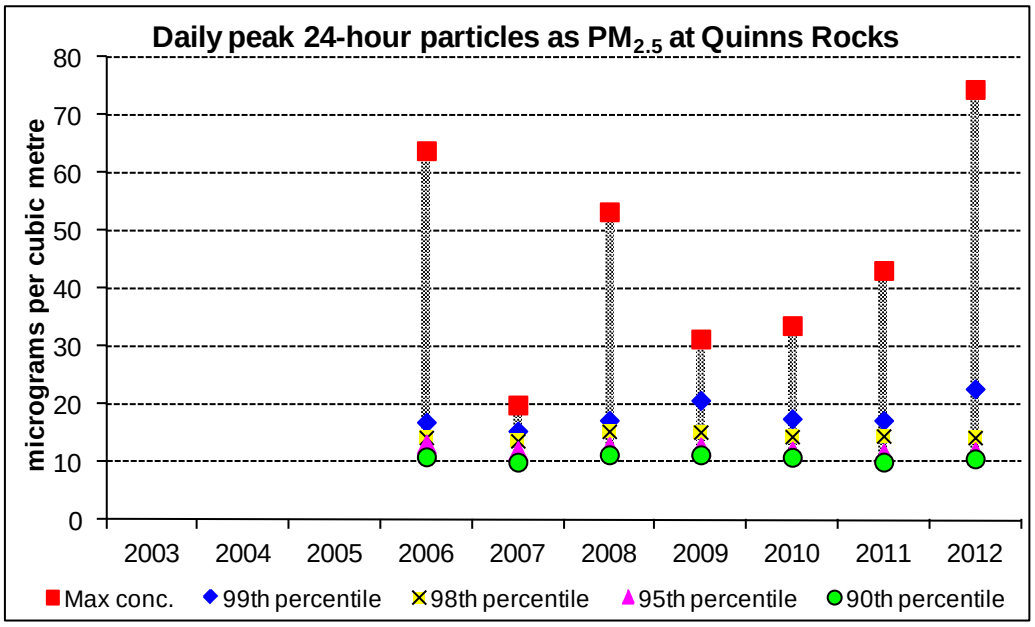


Figure A1-38 - 24-hour $PM_{2.5}$ at Quinns Rocks

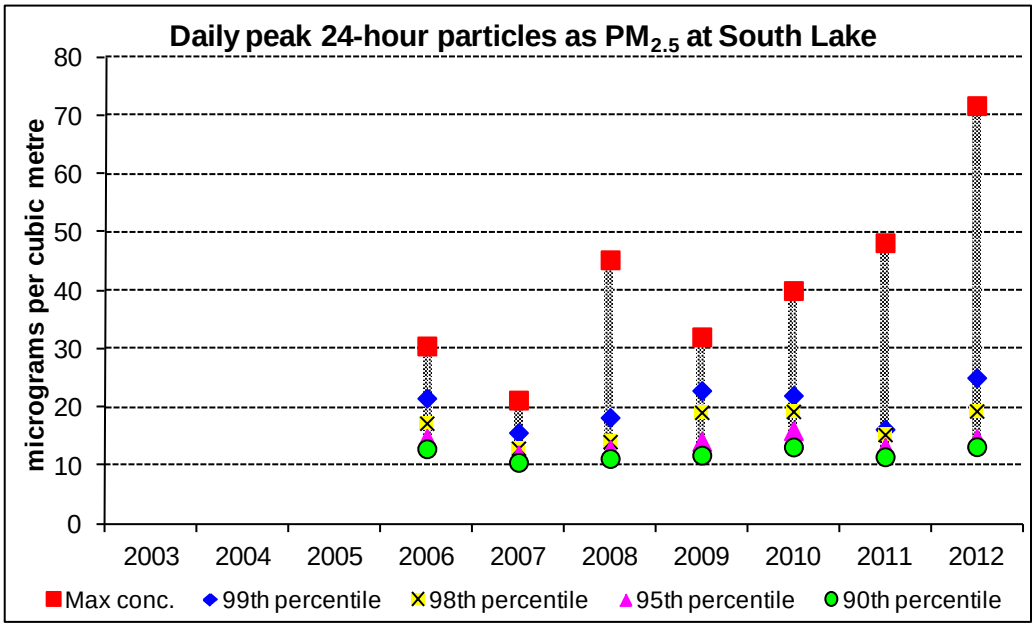


Figure A1-39 - 24-hour $PM_{2.5}$ at South Lake

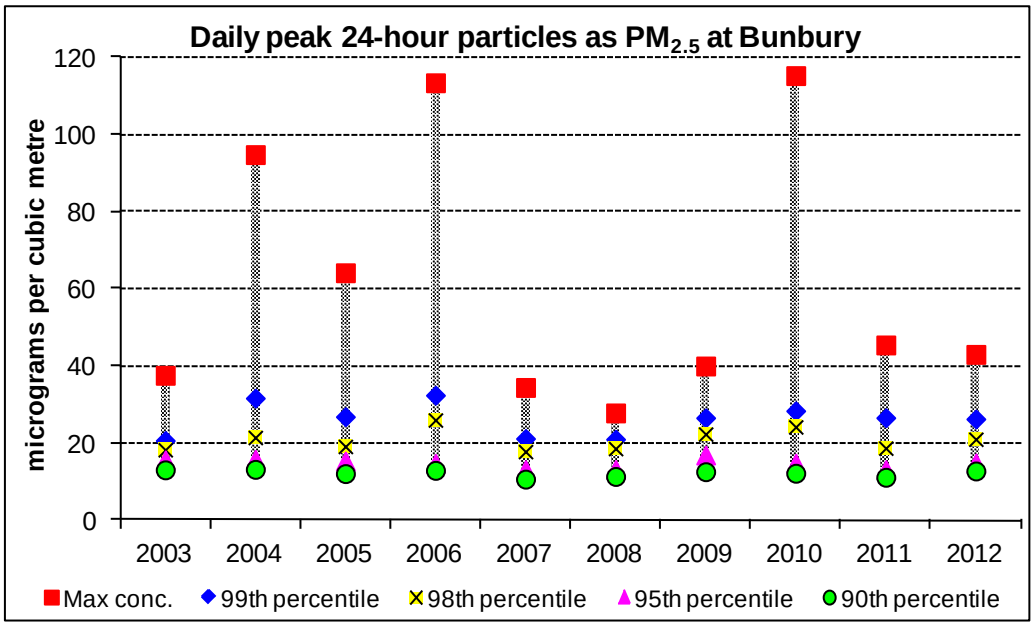


Figure A1-40 - 24-hour $PM_{2.5}$ at Bunbury

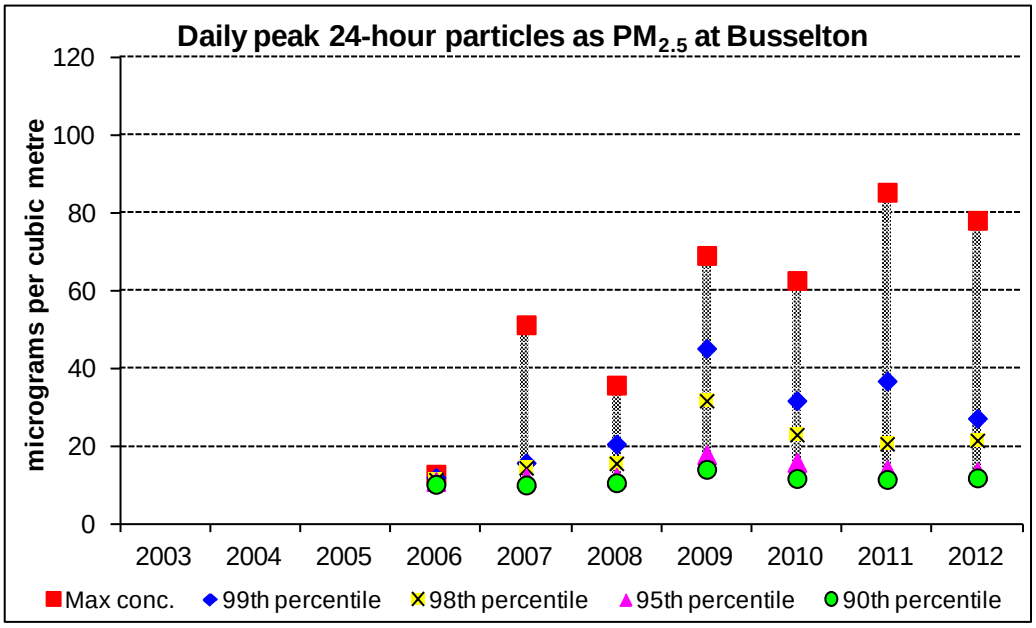
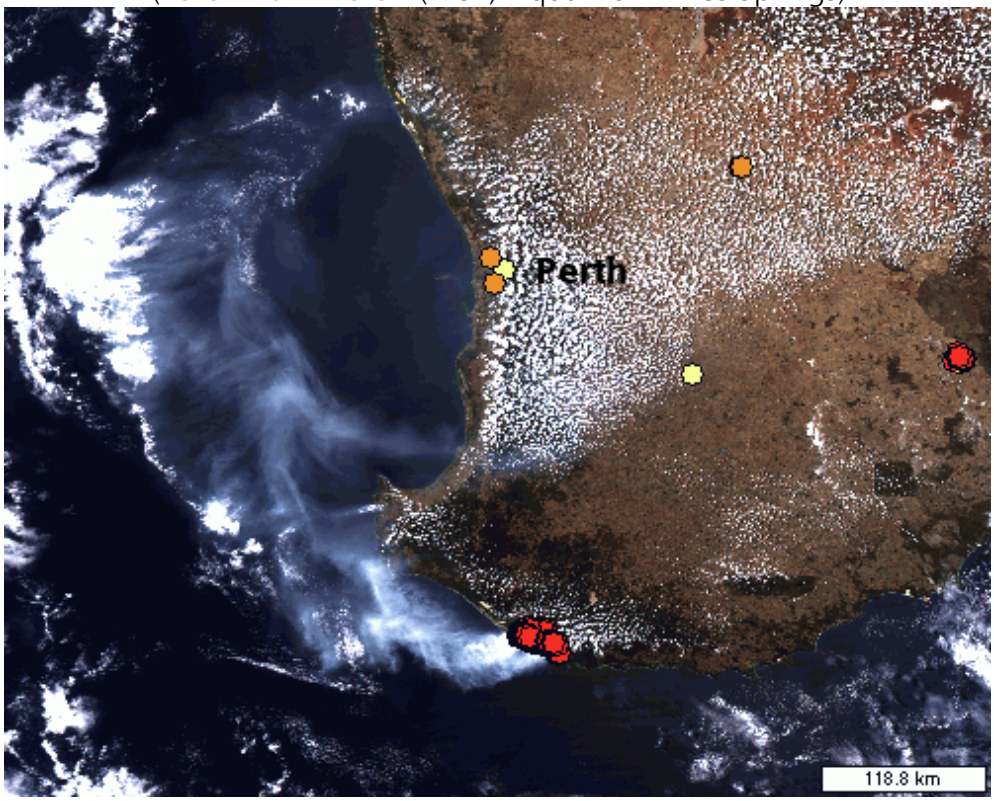


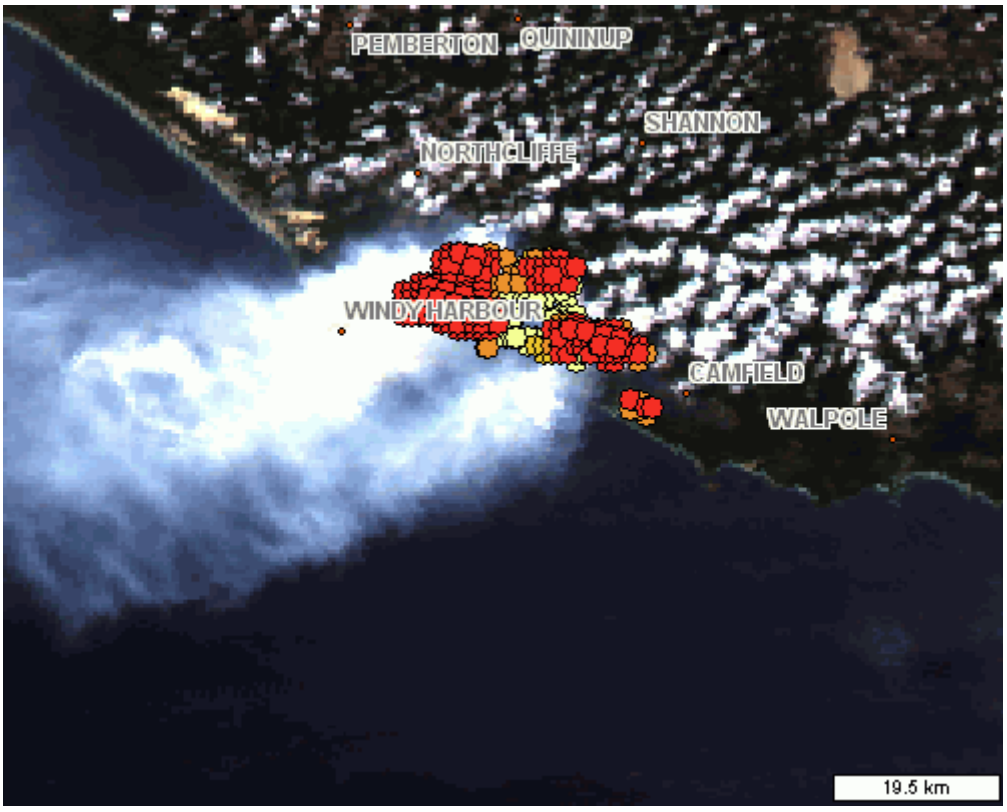
Figure A1-41 - 24-hour $PM_{2.5}$ at Busselton

ATTACHMENT 2 – Satellite imagery

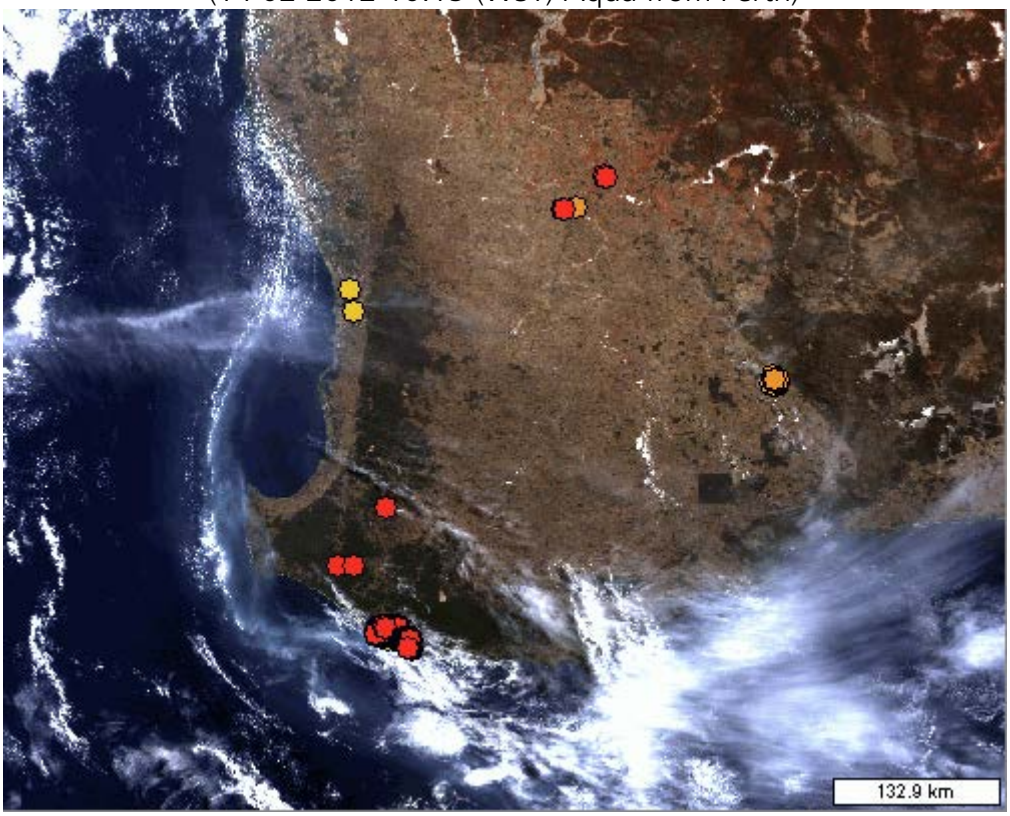
This attachment provides some satellite images of the extent of the fires in WA in February 2012.

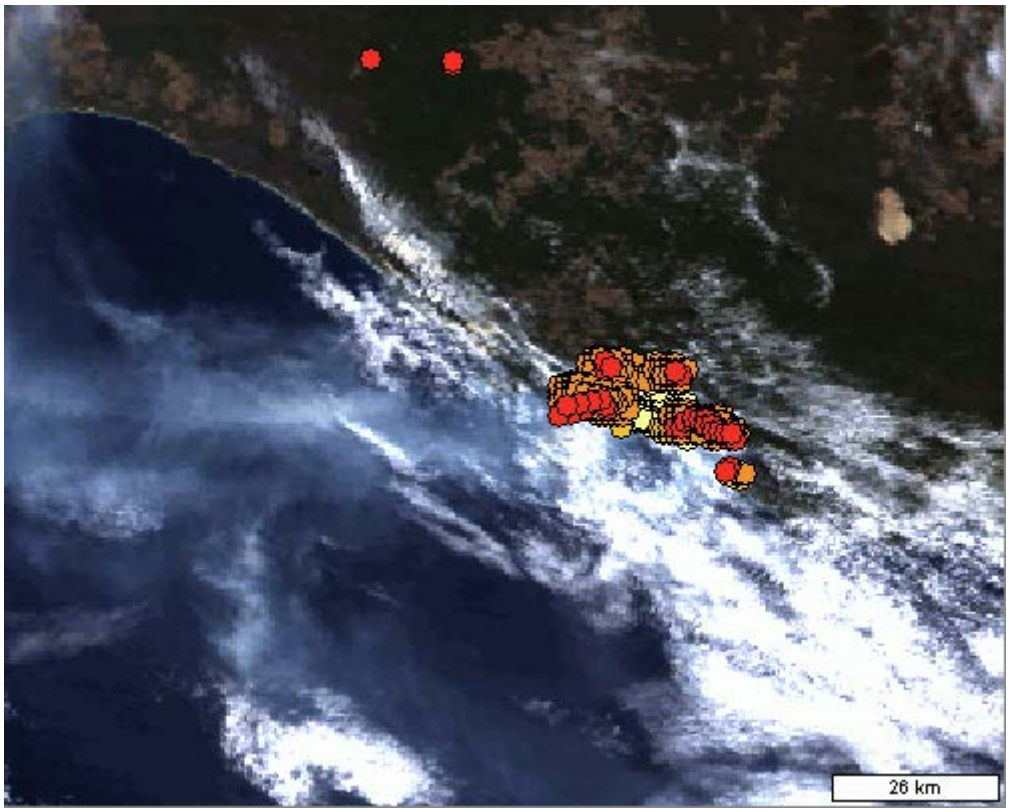
http://firewatch.dli.wa.gov.au/landgate_firewatch_public.asp
(13 02 2012 13:52 (WST) Aqua from Alice Springs)



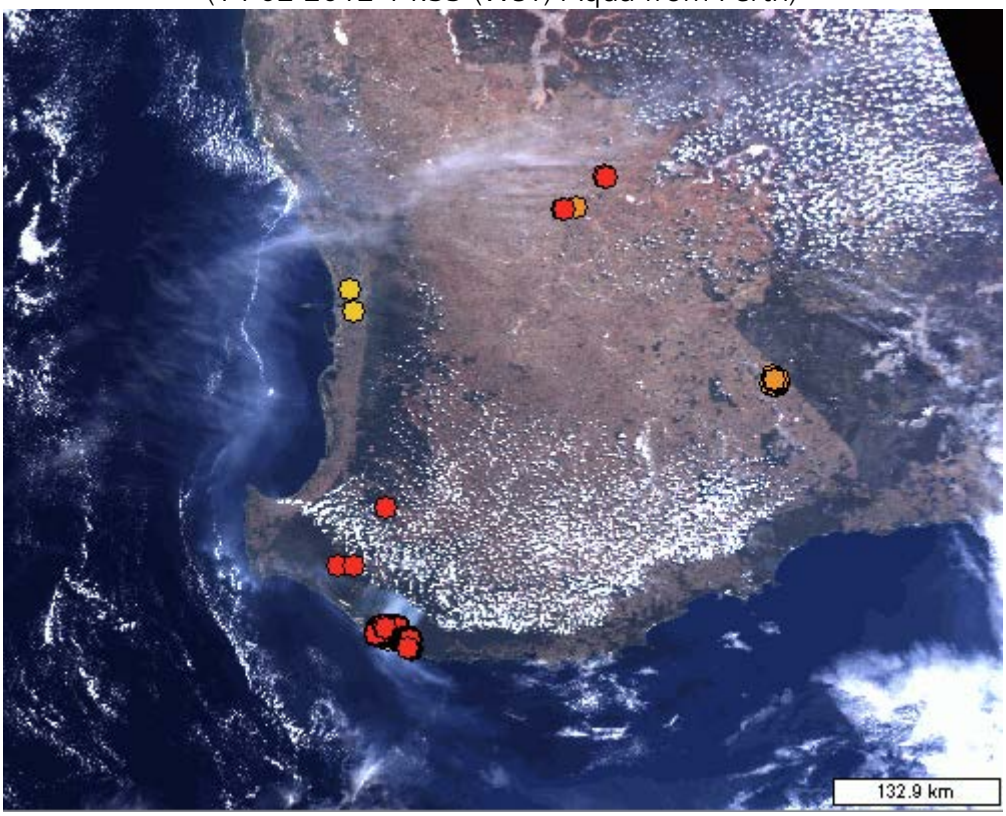


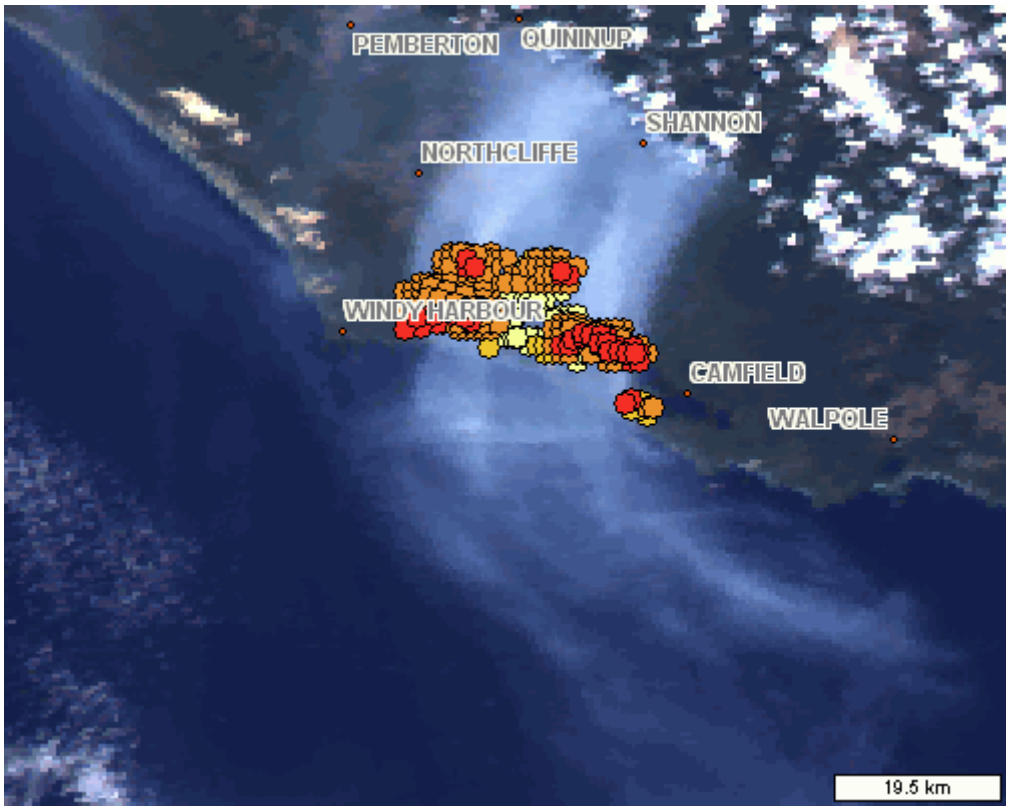
http://firewatch.dli.wa.gov.au/landgate_firewatch_public.asp
(14 02 2012 10:15 (WST) Aqua from Perth)



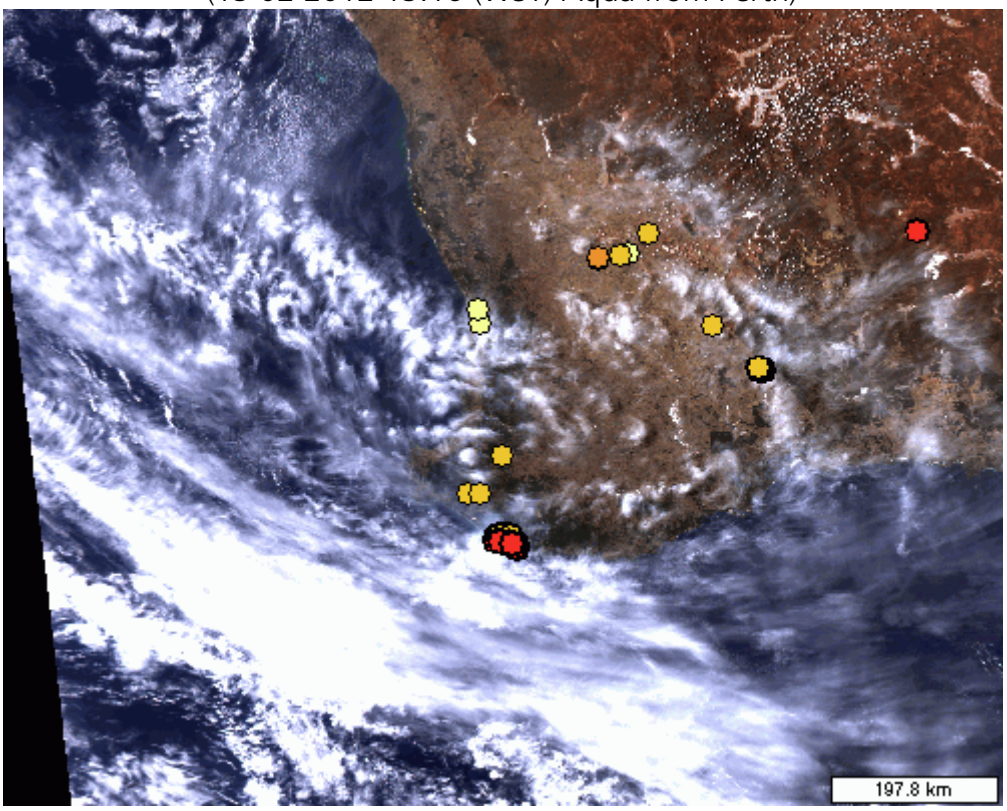


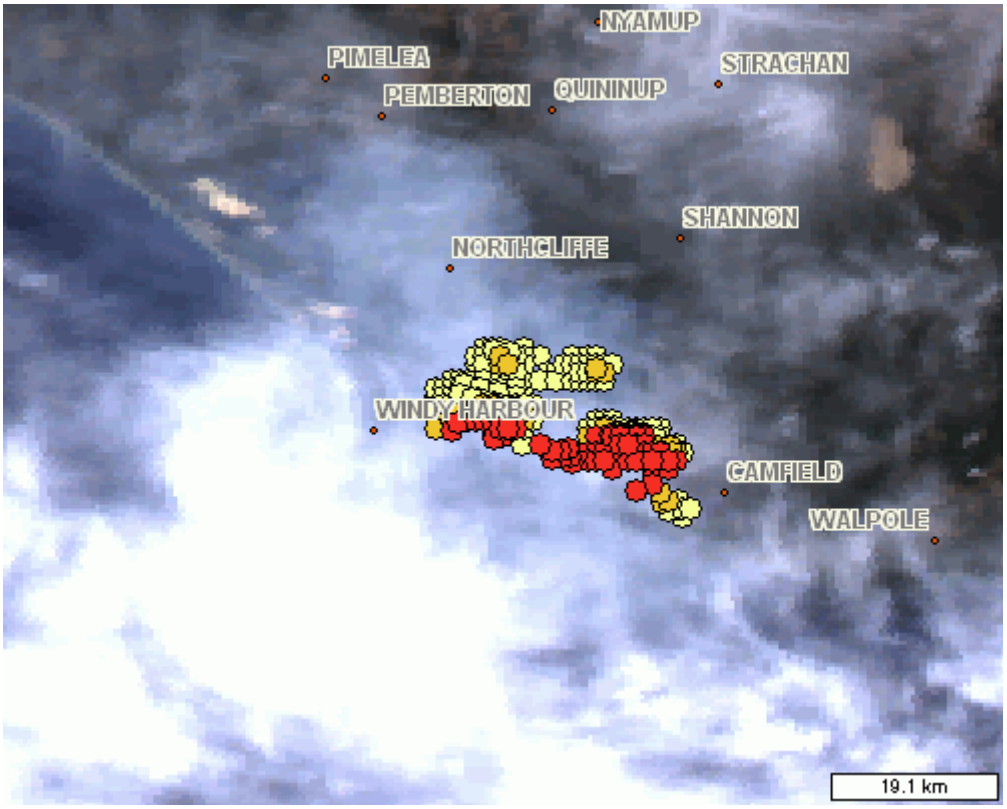
http://firewatch.dli.wa.gov.au/landgate_firewatch_public.asp
(14 02 2012 14:33 (WST) Aqua from Perth)



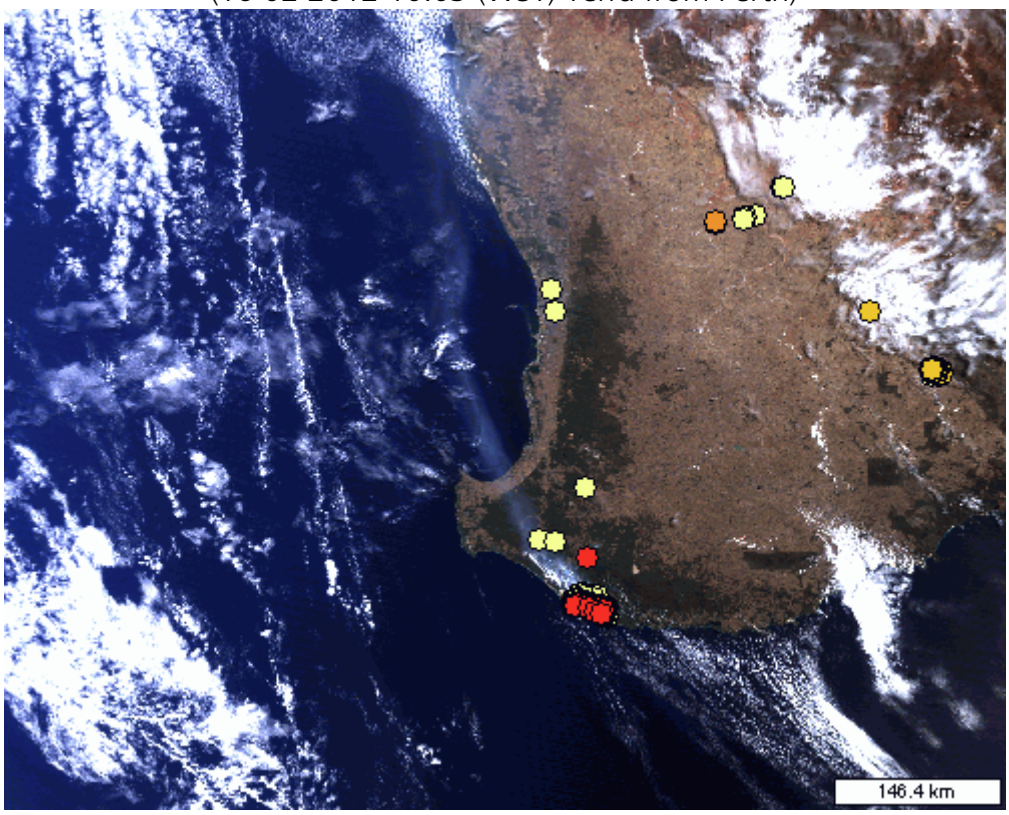


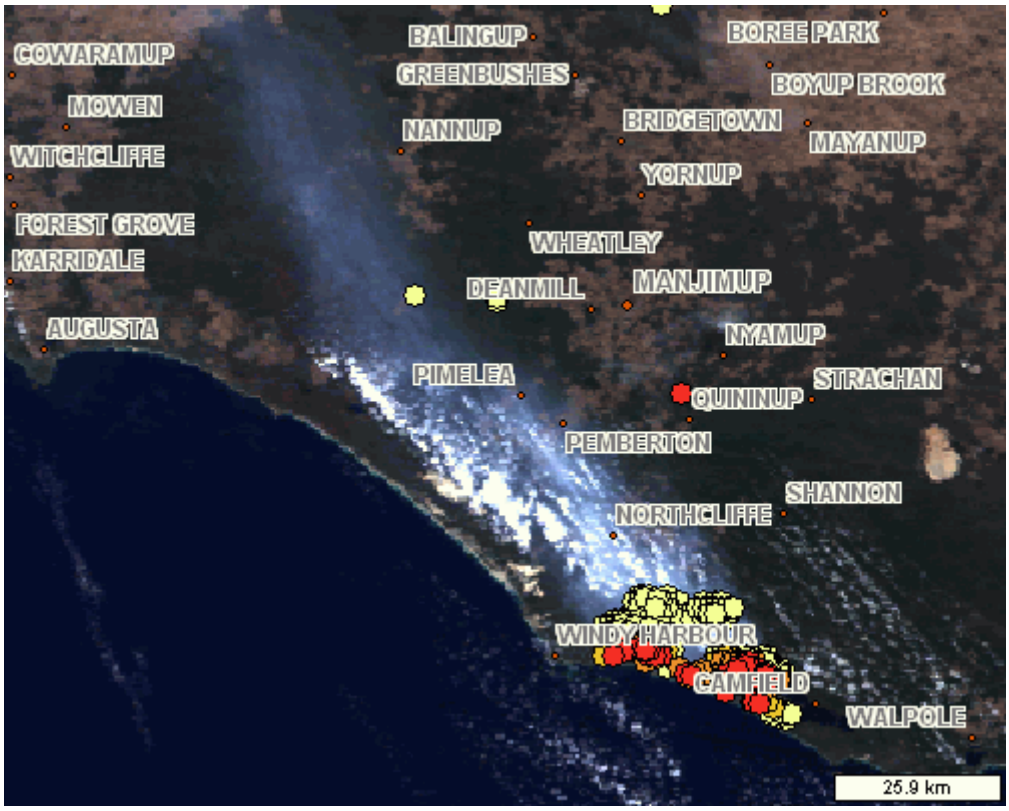
http://firewatch.dli.wa.gov.au/landgate_firewatch_public.asp
(15 02 2012 15:16 (WST) Aqua from Perth)





http://firewatch.dli.wa.gov.au/landgate_firewatch_public.asp
(16 02 2012 10:03 (WST) Terra from Perth)





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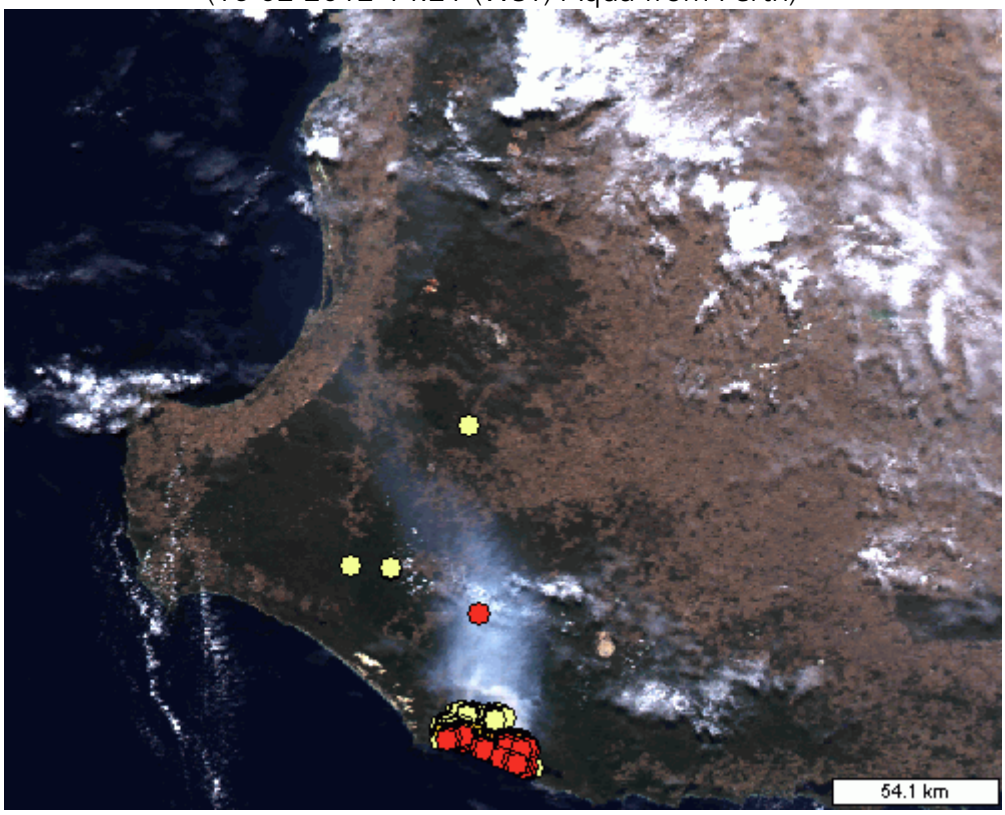
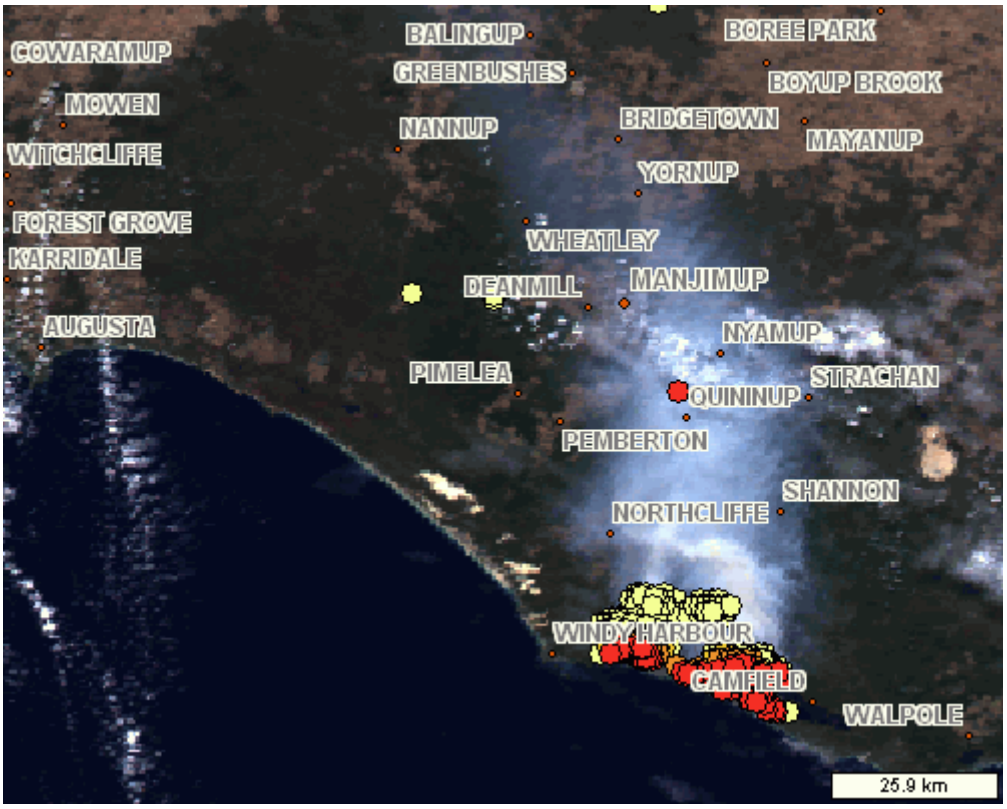
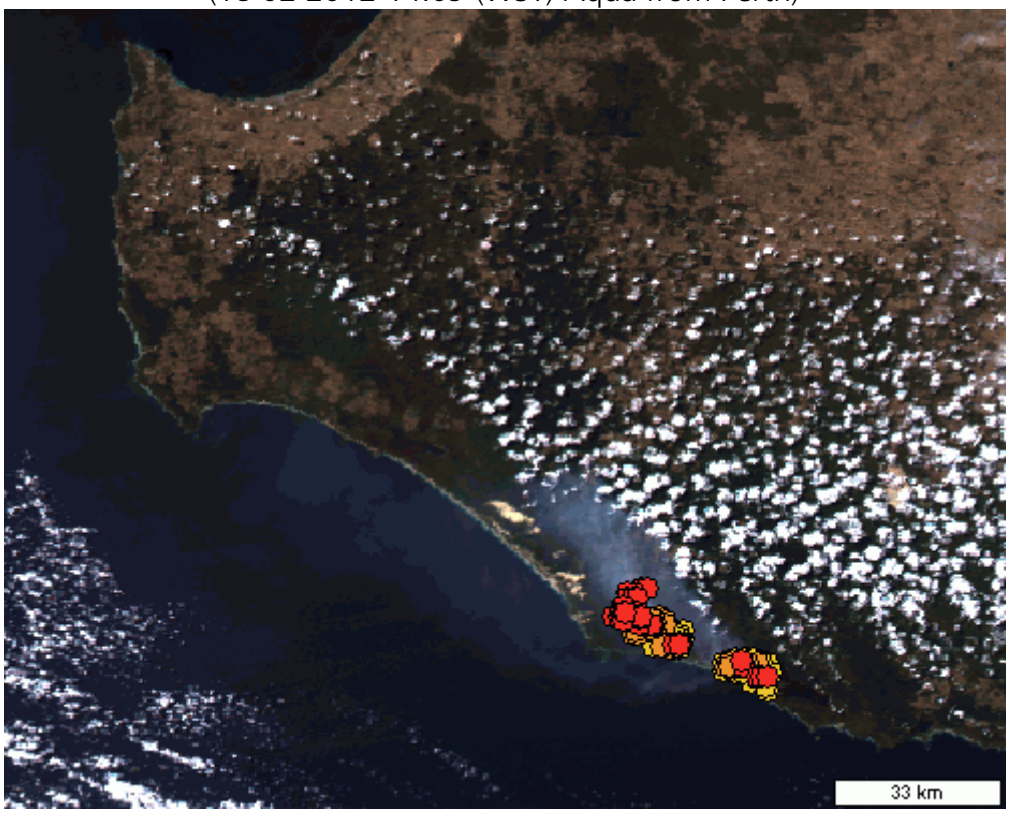
(16 02 2012 14:21 (WST) Aqua from Perth)





http://firewatch.dli.wa.gov.au/landgate_firewatch_public.asp
(18 02 2012 14:09 (WST) Aqua from Perth)



http://firewatch.dli.wa.gov.au/landgate_firewatch_public.asp
(19 02 2012 14:52 (WST) Aqua from Perth)