

# Perth air quality management plan report card 2011–12



## **Air Quality Coordinating Committee**

The Air Quality Coordinating Committee (AQCC) comprises representatives from State and local government, industry, business and the community. Its role is to monitor the implementation of the Perth Air Quality Management Plan and review the progress towards achieving its aims.

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# Perth air quality management plan report card 2011–12



## **More information**

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## Executive summary

Welcome to the third *Perth air quality management plan report card* for 1 July 2011 to 30 June 2012. This report provides a clear and concise overview of *Perth Air Quality Management Plan* (Perth AQMP) activities to inform the community and enhance interest in air quality issues.

The Air Quality Coordinating Committee (AQCC) has made significant steps towards implementing the reform actions recommended in the Five year review of the Perth AQMP and accepted in the Government response to the review.

Several key events occurred during this reporting period, including the first air quality forum opened by the Hon Bill Marmion, Minister for Environment in March 2012 and the commencement of the redraft of the Perth AQMP.

This year we would like to again recognise the efforts of the Perth community, who have worked together to allow for these achievements, and many more described in this report. Your feedback and continued involvement is encouraged and appreciated.

Stuart Cowie  
Chairperson  
Air Quality Coordinating Committee

June 2013



*Photos courtesy of DEC*



## Introduction

The Perth AQMP, released in December 2000, was developed to improve and maintain clean air throughout the Perth metropolitan region over a 30 year time period. It was a whole-of-government initiative developed via a consultative process including key government agencies, with lead roles in implementation, and a range of stakeholders. The Perth AQMP outlines strategies and programs aimed at continually improving air quality and avoiding adverse health and environmental impacts.

The 10 initiatives of the AQMP are:

1. community education
2. vehicle emissions reduction
3. industrial emissions reduction
4. health research
5. modelling and monitoring
6. indoor air quality
7. land use and transport planning
8. haze reduction
9. small to medium enterprise emissions reduction
10. smoke management



*Photos courtesy of DEC*

The following sections of the report card provide a summary of the management actions undertaken, an update of air quality influences, AQCC membership as well as the resources used to implement the actions (Table 1 and Table 2).

More information on the Perth AQMP can be found on the Department of Environment and Conservation website <http://www.dec.wa.gov.au/airquality>

## Resource tables

*Table 1: Resource use per agency 1 July 2011 to 30 June 2012*

Agency	Staff (FTE) <sup>1</sup>	Operations (\$)
Department of Environment and Conservation (DEC)	8.85	170,000
Department of Transport (DoT)	16.5	1,384,000
Department of Planning (DoP)	24.5	589,000
Department of Health (DoH)	0.25	Not reported
Total	50.10	2,143,000

<sup>1</sup>FTE (full-time equivalent)

Disclaimer: The figures provided are representative of the estimated contributions of each agency. These figures may not be exact as actions within the AQMP form part of agency business plan achievements.

*Table 2: Resource use per initiative 1 July 2011 to 30 June 2012*

Initiative	Staff (FTE) <sup>1</sup>	Operational (\$)
Initiative 1	16.25	1,326,000
Initiative 2	2.25	11,000
Initiative 3	Not reported	Not reported
Initiative 4	0.55 <sup>2</sup>	22,000
Initiative 5	1.6	10,000
Initiative 6	0.1	20,000
Initiative 7	26.5	659,000
Initiative 8	2.25	80,000
Initiative 9	0.1	Not reported
Initiative 10	0.5	15,000
Total	50.10	2,143,000

<sup>1</sup>FTE (full-time equivalent)

<sup>2</sup>DoH total contribution was 0.25 FTE for Initiatives 4, 6, 8 and 10. The whole figure was included with Initiative 4 (Health Research)

Disclaimer: The figures provided are representative of the estimated contributions of each agency. These figures may not be exact as actions within the AQMP form part of agency business plan achievements.

## Management actions

There has been good progress over the past twelve months implementing key aspects of the Perth AQMP. Other programs and projects complement the implementation of the initiatives. The continuation of community education based programs and regular updates and review of publications, agency programs and policy make up most of the activities undertaken over the past year.



*Photos courtesy of DEC*

### Smoky vehicle reporting

The number of smoky vehicle reports received for the twelve months from July 2011 to June 2012 had reduced from the previous year from 688 reports to 355 reports. Approximately 41 per cent of vehicle owners reported making repairs to their smoky vehicles. However 40 per cent believe that their vehicles do not smoke. Forty seven percent of respondents reported their vehicle as diesel.

The responses received in the 'Other' category were generally related to "my vehicle doesn't smoke" and includes the reasons why, such as "my vehicle was under excessive load", or "going up a steep hill". Comments such as "my vehicle is old and smokes, but not for 10 seconds" and "my vehicle smokes and will be repaired soon" were also common 'Other' reasons given.



*Photos courtesy of DEC*

### Perth Solar City Living Smart Households program

The Perth Solar City Living Smart Households program has achieved considerable reductions in the areas of energy, travel, waste and water.

From the meter readings of participating households, there were savings of 1.7 kilowatts per hour at the project mid-point. The conclusion of the project saw a reduction of between 28 and 68 litres of water and a 4.2 per cent reduction in car trips per household per day.

A further project is being carried out in Fremantle. A randomised control trial has started with 2,000 households which aims to ascertain which program components achieve the greatest impact on sustainable household behaviour. The trial will run from March to December 2012.



## New projects in 2011–12

- The draft Public Transport Plan for Perth 2031 was released for comment. Feedback has been received and is currently being reviewed (DoT).
- The draft Western Australian Bicycle Network Plan was released for comment and work commenced on the design of the proposed 'Connecting Schools' pilot program (Bicycle Infrastructure Grants program integrated with TravelSmart Schools program) (DoT).
- Due to the high attrition rate of schools in the original two year pilot program, a TravelSmart to Schools light model was developed and will be tested over the 2012 school year to determine if the program reach can be increased and the attrition rate of schools reduced while achieving reductions in car use. The focus of the light model is on a range of easily accessible self-help tools and resources with some teacher professional development, competitions/rewards and less onerous classroom data collection. By June 2012 six schools were participating in the light model (DoT).
- Integration of the TravelSmart to Schools messages and activities in the Nature Play WA passport program and website, extending the programs reach (DoT).
- A randomised control trial commenced with more than 2,000 households in Fremantle to assess the impact of each of the service elements of the Living Smart Households program. The project aims to ascertain which program components achieve the greatest impact on sustainable household behaviour. The trial will run between March 2012 and December 2012 (DoT).
- A Walkability Audit Tool was developed for use by local governments, consultants and community groups to identify issues affecting pedestrian safety, accessibility and amenity and identify and document appropriate measures and actions to address these (DoT).
- Commenced development of new educational DVDs and brochures for the haze reduction activities. Topics include: How to light and operate an efficient fire; How to undertake a smoke patrol; How to store firewood; The efficiency differences between a compliant and non-compliant wood heater. Brochures were also developed and included topics such as; Home heating options; A revision of the chimney checker; Backyard burning/green waste; Troubleshooting your smoky chimney (DEC).
- Moisture meters that are used to test the moisture content of firewood were purchased and calibrated for use in auditing. A draft standard operating procedure has been prepared which details how to undertake firewood seller audits. Moisture meters will be available to loan by environmental health officers (DEC).
- A guide is being developed for management of domestic smoke nuisance by local government. It includes complaint management, community education and a process for undertaking smoke patrols. The draft guide has been circulated to local government environmental health officers for their feedback (DEC).
- Conducted a literature review on bushfire smoke including monitoring levels for smoke impact and health alerts (DoH).
- Launch of EmpowerWA, information portal for renewable energy solutions for Western Australia developed by a number of community groups. Conservation Council of Western Australia (CCWA).
- Promoted the Cleaner Tomorrow competition through EmpowerWA where the public could submit a video showing the actions they take at home, school or work to help reduce their impact on the environment (CCWA).

## Annual program accomplishments

- A six-week Bike to Work Challenge was a key event, engaging about 2,000 employees from 200 workplaces across the State to use bikes to commute to work (DoT).
- Successful co-ordination and delivery of two major cycling promotion campaigns —Cycle Instead in Spring and Bikeweek 2012. Cycle Instead Bikeweek, attracted more than 14,000 adults as part of more than 80 community events throughout WA. Cycle to School Day promoted cycling as a means of transport and physical activity for children and in 2012 more than 18,000 school children from 130 schools took part. Major events during the campaign included the HBF Freeway Bike Hike for Asthma with 8,700 participants (DoT).
- The Walk Over October campaign in October 2011 included public announcements on all train lines, media statements and LED displays of walking messages. This resulted in:
  - ◆ 1,839 participants in the DoT online walking challenge
  - ◆ 56 community and workplace events
  - ◆ 119 schools for Walk to School day
  - ◆ 30 professionals attended the walking seminar
  - ◆ 15,000 walking guidebooks issued
  - ◆ 105 public displays (DoT).
- TravelSmart Workplace supported the City of Swan, Real Estate Institute of WA and St John of God Hospital Murdoch to prepare and adopt workplace travel plans. Ten organisations were recruited into the program—four promoted active transport in their workplaces, one completed a travel plan and five progressed towards travel plans (DoT/DEC).
- TravelSmart Workplace also had the following achievements:
  - ◆ delivered cycle skills training programs for city commuters
  - ◆ negotiated funding to expand the program under the Healthy Workers Initiative (funded by the Australian Government under the National Partnership Agreement on Preventative Health, administered in WA by the Department of Health)
  - ◆ provided seed grant funding to assist two local governments (Cities of Perth and Vincent) and the East Metropolitan Regional Council to employ TravelSmart officers (DoT / DEC).
- AirWatch conducted professional development sessions for primary and secondary school teachers, as well as continuation of the Energy Smart for Air program which included six schools (DEC).

## Completed projects

- Completed an evaluation of the TravelSmart Local Government and TravelSmart Workplace programs (DoT).
- The review of the *National Environment Protection (Ambient Air Quality) Measure* was released in September 2011. The recommendations will be implemented through the development of the National Plan for Clean Air (DEC).
- A short promotional video about *CleanRun EcoDrive* was uploaded onto the DEC YouTube channel (DEC).
- Investigated twenty relevant ambient air quality guidelines for application in WA (DEC/DoH).
- The final report of the CleanRun Remote Sensing program was submitted in December 2011. Exhaust emissions data of over 42,000 vehicles were collected. The objective was to collect emission data, targeting diesel vehicles, to facilitate vehicle fleet characterisation, which would ultimately be used to determine ongoing in-service vehicle emissions control programs. The vehicle testing was used to identify and encourage the emission performance improvement of gross emitting vehicles. The Remote Sensing smart sign, with its capacity to generate instant feedback messages to the driver of a vehicle, has also assisted in the delivery of key vehicle performance and maintenance messages to over 42,000 vehicle owners (DEC).
- Completion of Kwinana Children's Respiratory Health study (DoH).
- Reviewed Australian Standards on *Mechanical ventilation in buildings* and provided comment through enHealth on behalf of WA, NSW, VIC, QLD and TAS (DoH).
- The document *Guidelines for Preparation of Integrated Transport Plans* was published in May 2012. The document was circulated to local governments, interested consultants and agencies (DoP).
- Publication of *Planning and designing for pedestrians guidelines* developed in partnership with the Department of Planning, Main Roads WA, Disability Services Commission, Royal Automobile Club of Western Australia (RAC), Western Australian Local Government Association, Public Transport Authority and the Institute of Public Works Engineering Australia. The publication provides clear guidance to state, local government and private sector planners and engineers on current standards and best practice for the planning and design of pedestrian facilities in Western Australia (DoT).
- Implementation of *Directions 2031 and beyond* through the release of *Delivering directions 2031* Annual Report Card 2012 (DoP).



Photos courtesy of DEC

## Ongoing projects and programs

- Full evaluation of data from the Perth Solar City Living Smart Households program (DoT).
- Continued the TravelSmart to Schools pilot program as a joint initiative with the DoT, six local government authorities and 10 metropolitan primary schools. The two year pilot program (2010 and 2011) was extended into the 2012 school year so the six remaining schools (three existing schools and three new schools) can progress their actions plans through the program levels (DoT).
- Continuation of the Walking School Bus program which had about 30 walking school bus routes at 14 schools at the end of Semester 1, 2012 (DoT).
- Ongoing development of networking, training opportunities and development of tools and resources for TravelSmart Officers as part of TravelSmart Workplaces (DoT).
- Implementation of a new monitoring and evaluation plan for TravelSmart Local Government and ongoing support and development of the local government TravelSmart officer network, including training three new participants in the grants program (DoT).
- Work with user-groups to promote cycling and cycling safety (DoT).
- Provide training on the *Planning and designing for pedestrians guidelines* (DoT).
- Continuation of the *Electric Vehicle Trial*. Eleven electric vehicles are being used as part of regular corporate fleets to test their usability, as well as testing the first recharging network in WA (DoT/RAC/DEC).
- Progressing with the Curtin PhD project titled 'Increasing the Implementation of Cleaner Production and Industrial Symbiosis in Small-Medium Enterprises with Specific Focus on Air Emissions' (DEC).
- Continuation of the *CleanRun* program. Web pages, posters, fact sheets and brochures have been developed and produced to disseminate information on the program with workshops also planned for the CleanRun EcoDrive (DEC).
- A wood heater demonstration trailer was designed and built and will be used as a community education tool by assisting wood heater users to operate their heaters more efficiently and effectively (DEC).
- Progressing with amendments to the Environmental Protection (Diesel and Petrol) Regulations 1999 (WA) (DEC).
- Complete and report on the fourier transform infrared spectroscopy field monitoring of hydrogen chloride and hydrogen fluoride as part of the Midland background air quality study (DEC).
- Continued development of coordinated approaches to managing smoke from planned burning activities (DEC/FESA).
- Support the Green Stamp program through DEC and Motor Trade Association WA provides businesses with tools to allow them to manage environmental impacts through cleaner production and minimising waste in the motor trade industry (DEC/MTA WA).
- Finalisation of guidance document for air quality index during smoke incidents (internal review) (DoH).
- The document *Dust management for residential and commercial developments* is now in the final review stage (DoH).
- Engagement with community and government departments regarding air quality issues from smoke management, regional air quality and air toxics (CCWA)
- Promotion of alternative cleaner fuel, active transport and renewable energy (CCWA)
- Review of the Air Pollution Policy (CCWA)

## Future ideas and initiatives

- Develop additional TravelSmart resources and promotional materials and increase the number of workplaces engaged with additional funding under the Healthy Workers Initiative (DoT)
- Implementation of a CBD Transport Plan to address traffic congestion in and around the Perth Central Business District (DoT)
- Implementation of recommendations arising from DoT investigation into 'Wayfinding' in central Perth to reduce congestion and emissions by encouraging more efficient use of the available parking spaces and road space (DoT)
- Instruments and materials have been purchased to assemble an operational mobile smoke monitoring unit. Software will also be developed. This unit is based on the TravelBlanket system which was developed by the Tasmanian Environmental Protection Authority (DEC).
- Create new materials for the haze program and deliver training to environmental health officers (DEC).
- Finalise the fit out of the wood heater demonstration trailer and publicise the trailer for use by environmental health officers (DEC).
- A Statement of Planning Policy is being prepared relating to parking in major activity centres (DoP).
- The *Plan for the Future of Metropolitan Perth and Peel* will address strategic planning as informed by public submissions from the draft central and outer sub-regional strategies. The Strategy will be implemented through the *Directions 2031 Plan for urban consolidation for metropolitan Perth and Peel* and three outer sub-regional structure plans. All of the abovementioned initiatives will be informed by the strategic assessment led by the Department of Premier and Cabinet (DPC), in close collaboration with Department of Planning (DoP), the Department of the Environment and Conservation (DEC), and the Office of Environmental Protection Authority (OEPA).
- Review and finalise the *Transport assessment guidelines for developments* for a more formal inclusion into the statutory planning process (DoP).



Photo courtesy of DEC



## AQCC current membership

Membership at 30 June 2012:

### State government

- Stuart Cowie (Department of Environment and Conservation) – Chairperson
- Jim Dodds (Department of Health)
- Luke O'Donoghue (Department of Transport)
- Loretta van Gasselt (Department of Planning)
- Angela Heymans (Department of Commerce).

### Local government

- Joe Della Donne (Local Government representative).

### Community

- Prof. Philip Jennings (Conservation Council of Western Australia)
- Dr Sue Graham-Taylor (Pollution Action Network).

### Business and industry

- Gavin Scally (BP for Kwinana Industries Council)
- Regina Flugge (Royal Automobile Club of WA).

The AQCC is also supported by the Fire and Emergency Services Authority (FESA) and the Public Utilities Office (formerly the Office of Energy).

Four meetings of the AQCC were held during the reporting period on 27 September 2011, 6 December 2011, 6 March 2012 and 26 June 2012.

## New publications relevant to the AQMP

- Draft Public Transport Plan for Perth 2031 (DoT)
- Draft Western Australian Bicycle Network Plan (DoT)
- Evaluation of the TravelSmart Local Government and Workplace Programs (DoT)
- Walkability Audit Tool (DoT)
- 2011 WA Air Monitoring Report (DEC)
- Health Effects of Wood Smoke webpage (DoH)
- Kwinana Children's Respiratory Health Study (DoH)
- Guidelines for Preparation of Integrated Transport Plans May 2012 (DoP)
- Planning and Designing for Pedestrians Guidelines (DoT).

## Contact the AQCC

For more information please contact the Secretariat to the Perth AQMP at DEC on 9333 7435, [AQCCadmin@dec.wa.gov.au](mailto:AQCCadmin@dec.wa.gov.au) or via the website at <http://www.dec.wa.gov.au/pollution-prevention/air-quality.html>.

## Progress summary

Some of the programs have been removed as they have been completed since the Perth AQMP has been in place. Some other programs may have been marked as completed but may also be seen as an ongoing program, to be updated regularly, rather than being a project that has an end point. The programs that have been removed can be found in Table 4. The remaining programs will be re-numbered.

Table 3: Perth AQMP summary of progress on initiatives, programs and actions.

The table summarises progress undertaken by agencies to complete the initiatives and programs of the Perth AQMP.	Action				Lead agency
	No progress	Progress	Completed	Future work	
<b>Initiative 1: Community education</b>					
P1: Review existing education and behaviour change programs and establish a strategy and framework for developing and implementing supporting programs in future				✓	DoT and DEC
P2: Improve everyone's access to air quality information and programs via the Internet		✓			DEC, DoT and DoH
P3: Influence the community's travel behaviour through implementing TravelSmart, teleworking and other travel alternatives		✓		✓	DoT and DEC
<b>Initiative 2: Vehicle emissions reduction</b>					
P1: Develop policy and regulations for automotive fuel quality in WA, promote national fuel quality regulation in line with international standards and co-ordinate fuel quality standards with improved vehicle emission standards		✓		✓	DEC
P2: Evaluate various emissions testing options for introduction to Perth and implement the committed outcomes to reduce in-service emissions from motor vehicles				✓	DEC
P3: On-road enforcement of controls on excessive vehicle emissions		✓		✓	DoT and DEC
P4: Investigate the cost effectiveness of Stage II vapour recovery and promote if cost effective				✓	DEC
P5: Investigate the use of electric, alternative fuel vehicles and ultra-light vehicles		✓		✓	DoT
<b>Initiative 3: Industrial emissions reduction</b>					
P1: Assess contribution of industrial NO <sub>x</sub> and ROC emissions to smog formation in the Perth airshed				✓	DEC

The table summarises progress undertaken by agencies to complete the initiatives and programs of the Perth AQMP.	Action				Lead agency
	No progress	Progress	Completed	Future work	
P2: Assess cost effective NOx emission reduction options, and implement agreed options to reduce emissions from significant industrial sources.	✓				DEC
P3: Identify and assist the major emitters of ROCs to reduce industrial contributions, and encourage continuous improvement in ROC reduction measures already introduced.	✓				DEC
P4: Promote the awareness of industry achievements in atmospheric emission reduction through 'green industry' awards.				✓	DEC
P5: Ensure proper airshed planning for future industrial development and power generation in the Perth				✓	DEC
<b>Initiative 4: Health research</b>					
P1: Investigating the public health impacts of air pollution.		✓		✓	DEC
P2: Investigating sources of air pollutants and their impact on residents by determining the potential health impacts of variations in Perth's daily air quality.		✓		✓	DEC
P3: Development of an air pollution and health network.	✓			✓	DoT and DEC
<b>Initiative 5: Modelling and monitoring</b>					
P1: Update and consolidate air emissions databases.		✓	✓	✓	DoT
P2: Validate/improve emissions estimates for key emission sources.		✓		✓	DEC
P3: Improve modelling capability and accuracy.		✓		✓	DEC
P4: Establish a monitoring steering committee to review air quality monitoring issues in the Perth metro area.				✓	DEC

The table summarises progress undertaken by agencies to complete the initiatives and programs of the Perth AQMP.	Action				Lead agency
	No progress	Progress	Completed	Future work	
P5: Review air quality monitoring practices and procedures in the Perth metropolitan region.		✓			DEC
P6: Develop future monitoring programs.		✓			DEC
P7: Support community information and education programs on air quality monitoring.		✓		✓	DEC
<b>Initiative 6: Indoor air quality</b>					
P1: Development of an indoor air quality network.	✓				DoH and DEC
P2: Investigate indoor air quality and the contribution of indoor air exposure to personal exposure.	✓				DoH and DEC
P3: Increase community indoor air quality awareness.	✓			✓	DoH and DEC
<b>Initiative 7: Land use and transport planning</b>					
P1: Include regional and local air quality considerations in metropolitan strategic planning.				✓	DoP
P2: Include regional and local air quality considerations in the planning and implementation of development proposals.		✓		✓	DoP
P3: Monitor and review the effectiveness of land use and transport planning decisions in influencing Perth's air quality.		✓		✓	DoP and DEC
P4: Assist local government in influencing the community's travel behaviour to bring about positive change.		✓		✓	DoT and DEC
<b>Initiative 8: Haze reduction</b>					
P1: Increase community awareness of the impacts of domestic wood heaters on air quality.		✓		✓	DEC
P2: Increase awareness among wood suppliers and wood heater installers of the impacts of wood heaters on air quality.		✓		✓	DEC
P3: Domestic smoke nuisance resolution.		✓		✓	DEC, DoH, DLG

The table summarises progress undertaken by agencies to complete the initiatives and programs of the Perth AQMP.	Action				Lead agency
	No progress	Progress	Completed	Future work	
P4: Manage green waste disposal and recycling to reduce local haze creation		✓		✓	DEC, DLG
<b>Initiative 9: Small to medium enterprise emissions reduction</b>					
P1: Encourage cleaner production		✓		✓	DLG, DEC and POU
<b>Initiative 10: Smoke management</b>		✓		✓	
P1: Establish a smoke management awareness group to facilitate community education and information about smoke impacts from planned burns		✓		✓	DEC
P2: Smoke management liaison group		✓		✓	BoM, DEC, FESA
P3: Smoke management policy and regulation		✓		✓	FESA, DEC, DLG
P4: Smoke management research		✓		✓	DEC, BoM

Table 4: Programs that have been completed.

Initiative	Program	Lead agency
Vehicle Emissions Reduction	P2: Evaluate LPG and CNG as fuel sources for the passenger and freight sectors.	DEC
Vehicle Emissions Reduction	P5: Evaluate and introduce appropriate measures to remove older vehicles from the Perth fleet.	DEC with DoT
Vehicle Emissions Reduction	P6: Emissions testing training and equipment and technology review.	DEC



Photos courtesy of DEC



## Air quality influences

Statistics to quantify factors impacting on the Perth AQMP achieving its objectives are in Table 5. These parameters are updated regularly and are accessible through the Australian Bureau of Statistics.

Table 5: Context statistics.

Perth metropolitan area population <sup>1</sup>	1,738,807 (2.5% increase from previous year) (74.01% of WA total population)									
Airshed area <sup>1</sup>	5,382.4km <sup>2</sup>									
Population density <sup>1</sup>	323.1 persons / km <sup>2</sup>									
WA Vehicles <sup>2</sup>	1,912,739 (2.7% increase from 2010)									
Fuel type (by number of registered vehicles) <sup>2</sup>	Petrol leaded		Petrol unleaded			Diesel fuel		LPG/Dual/Other		
	82,327		1,402,985			364,294		63,133		
Vehicles per capita (WA) <sup>2</sup>	829 vehicles per 1,000 residents (highest in Australia)									
Vehicle use <sup>2</sup>	66.6% private vehicles (as the main form of transport on usual trip to work or full- time study)									
Motor vehicles on register <sup>2</sup>		Passenger vehicles	Camper vans	Light Commercial Vehicles	Light rigid trucks	Heavy rigid trucks	Articulated trucks	Non-freight carry trucks	Buses	Motorcycles
	2009	1,345,494	7,535	299,638	11,984	47,340	11,944	4,360	13,007	87,044
	2010	1,369,133	7,611	308,516	12,438	48,352	12,229	4,470	13,418	93,901
	2011	1,394,241	7,941	318,147	13,160	49,089	12,590	4,582	13,597	99,392
Public transport use <sup>3</sup>	11% used public transport as the main form of transport on usual trip to work or full- time study									
Wood heaters in Perth <sup>4</sup>	31,000 (4.7% of dwellings use wood heaters as their main source of space heating)									

<b>Heavy Industry</b>	The major heavy industrial area is located in Kwinana in the south-west of the Perth metropolitan region, between Fremantle and Rockingham.					
<b>WA Industrial growth (all sectors)<sup>5</sup></b>	Employment at end of June		Wages and salaries		Sales and service income	
	2009–10	2010–11	2009–10	2010–11	2009–10	2010–11
	'000	'000	\$m	\$m	\$m	\$m
	1,152	1,212	52,689	58,982	355,976	406,069
<b>AQ data</b>	Eight monitoring stations monitoring Perth ambient air quality					
<b>Topography</b>	The Perth metropolitan region is predominantly flat. The gently undulating sand dunes of the Swan Coastal Plain stretch from the coast to the Darling Ranges, which lie between 30km and 40km to the east. The Darling Ranges rise up to a height of around 300m above sea level.					
<b>Climate and weather</b>	<p>Perth has a Mediterranean climate, with hot and dry summers, and cool and wet winters. During summer months the major weather influences are the south-westerly sea breeze and the development of a low pressure trough along the west coast. During winter months, cold fronts move rapidly across the Indian Ocean, bringing frequent rain and gusty winds to the city. Air quality in Perth is significantly affected by features of the regional meteorology. Temperature inversions on very calm cold nights trap the pollutants near the earth's surface. Sea breezes can recirculate urban pollutants, which were blown offshore from Perth during</p>					

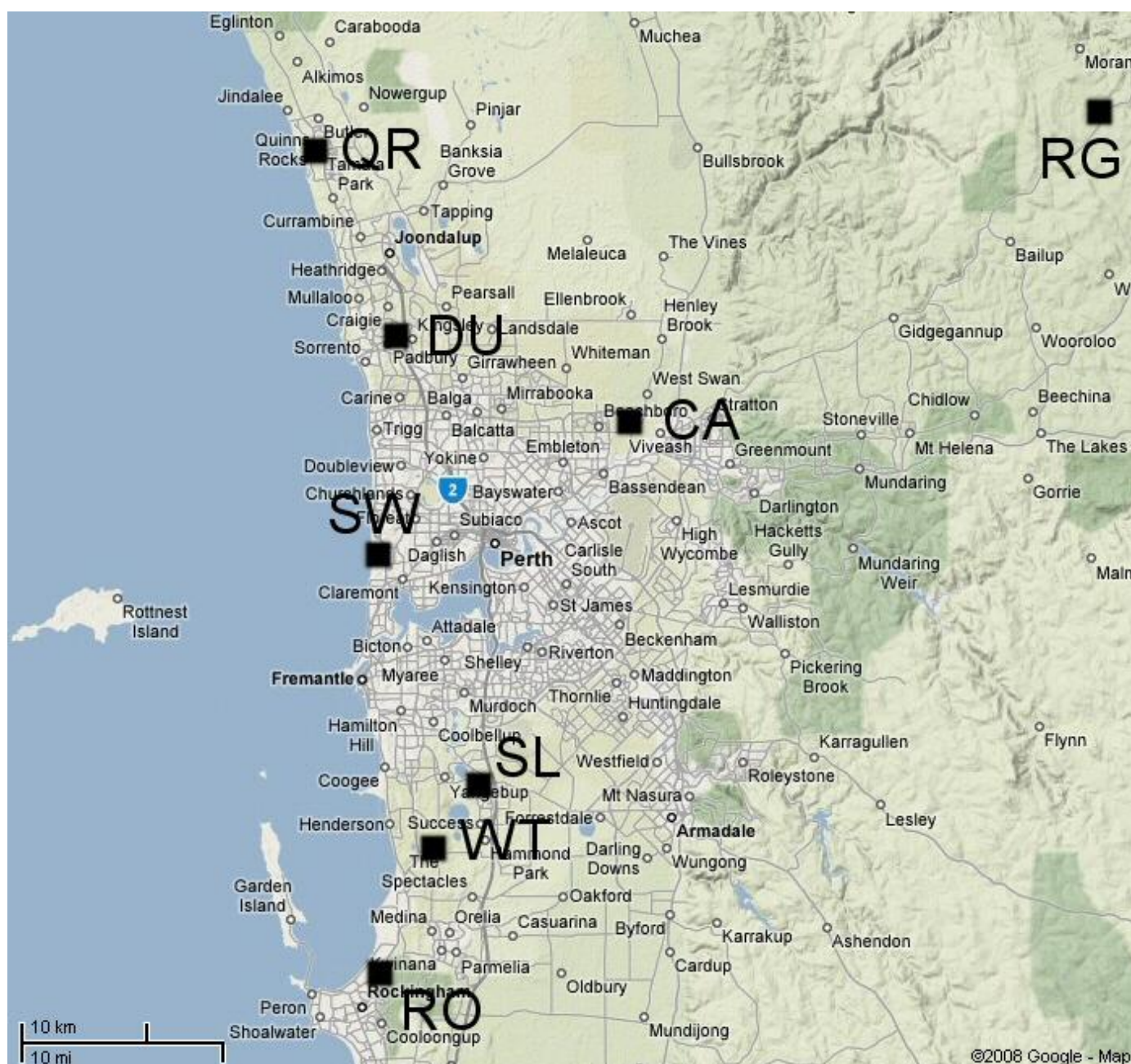
1. Australian Bureau of Statistics, 3218.0 *Regional Population Growth Australia*, March 2012
2. Australian Bureau of Statistics, 2011 Motor Vehicle Census Cat. No. 9309.0 – Vehicles registered at 31 January 2011 in Western Australia
3. Australian Bureau of Statistics, 4102.0 *Australian Social Trends 2008*
4. Australian Bureau of Statistics, 4602.0.55.001, *Environmental Issues: Energy Use and Conservation: Main source of energy for heating*, March 2011
5. Australian Bureau of Statistics, 8155.0 2010–11 *Australian Industry 2010-11: States, Territories and Australia by industry division* June 2012.

## Air quality monitoring data

The purpose of this section is to provide an indication of Perth's air quality and, by extension, the success or otherwise of the Perth AQMP. It is important to note there is no one measure of air quality that can provide this as each approach has its limitations and many programs cannot be directly related back to monitoring results. Additionally, for many pollutants there is no safe level below which health is not adversely affected; so even with relatively clean air, measurable adverse health impacts may still occur.

The *National Environment Protection (Ambient Air Quality) Measure* provides a nationally consistent framework for the monitoring and reporting of six common pollutants (criteria pollutants) - particles ( $PM_{10}$ ), ozone ( $O_3$ ), sulfur dioxide ( $SO_2$ ), nitrogen dioxide ( $NO_2$ ), carbon monoxide (CO) and lead (Pb). Additionally there is an advisory reporting standard for particles as  $PM_{2.5}$ . Presented below are the results of monitoring for the criteria pollutants in the Perth airshed.

Figure 1: Map of Perth Metropolitan Region showing the monitoring sites.



## Interpreting graphs

The following graphs show statistical information for the past 10 years' monitoring. Each graph shows 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 DEC. The nominated percentiles can also be expressed as an nth highest concentration. Based on 100 per cent data recovery and a normal year (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)

*Some graphs also have the NEPM standard included to allow easy comparison.*

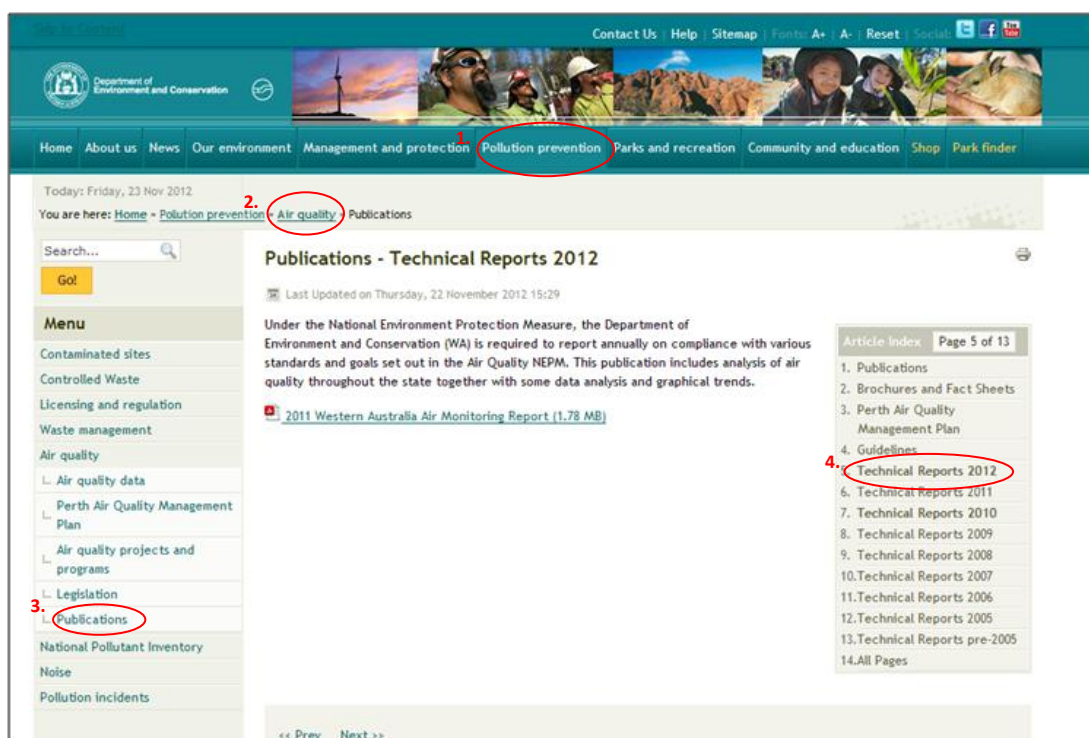
## 2011 National Environment Protection (Ambient Air Quality) Measure results summary

The AAQ NEPM standards for CO, NO<sub>2</sub>, O<sub>3</sub> and SO<sub>2</sub> were not exceeded at any site during 2011. There were exceedences for PM<sub>10</sub> at Caversham, Duncraig and South Lake (50µg/m<sup>3</sup> averaged over 24 hours), although there were still less than five exceedences over 24 hours in any calendar year which is still within the NEPM goal.

Caversham, Duncraig and South Lake each recorded one exceedence of the PM<sub>2.5</sub> advisory standard during 2011 while Quinns Rock recorded two exceedences (25ug/m<sup>3</sup> averaged over 24 hours). There were no exceedences for particles as PM<sub>2.5</sub> of 8ug/m<sup>3</sup> averaged over one year.

This information can be found in greater detail in the 2011 WA Air Monitoring Report which can be found on DEC's website: <http://www.dec.wa.gov.au/pollution-prevention/air-quality/publications>. (Figure 2).

Figure 2: Accessing information via the DEC website.





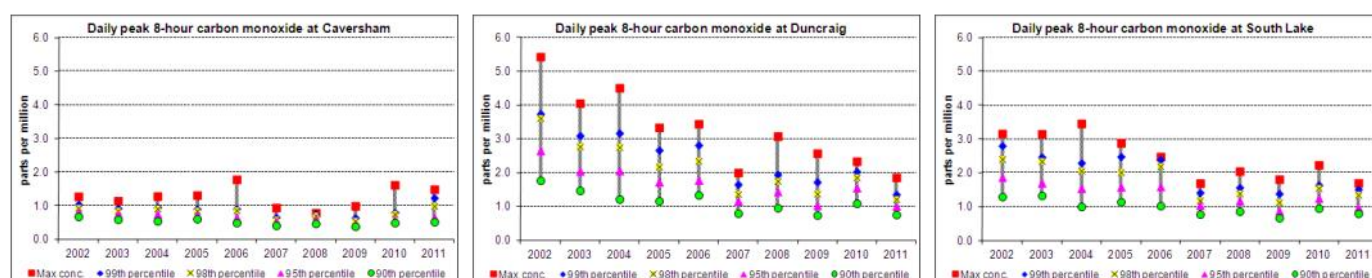
Note: This report card is based on achievements over the 2011/2012 financial year; however the data from the NEPM report is based on calendar year emissions data to ensure consistency with NEPM reporting.

Table 6: National Environment Protection (Ambient Air Quality) Measure standards and goals.

Pollutant	Averaging period	Maximum (ambient) concentration (ppm)	Maximum allowable exceedences by 2008
Carbon monoxide	8 hours	9.0	1 day per year
Nitrogen dioxide	1 hour	0.12	1 day per year
	1 year	0.03	None
Sulfur dioxide	1 hour	0.20	1 day per year
	1 day	0.08	1 day per year
	1 year	0.02	None
Photochemical oxidants (as ozone)	1 hour	0.10	1 day per year
	4 hours	0.08	1 day per year
Particles (as PM <sub>10</sub> )	1 day	50µg/m <sup>3</sup>	5 days per year
Lead	1 year	0.50µg/m <sup>3</sup>	None
<b>Advisory Standards (as at June 2011)</b>			
Particles (as PM <sub>2.5</sub> )	1 day	25µg/m <sup>3</sup>	
	1 year	8µg/m <sup>3</sup>	

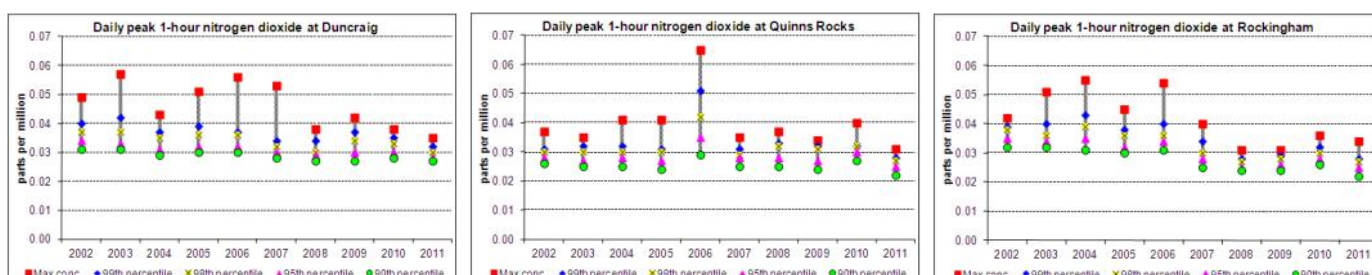
## CO

The graphs below show CO trends from 2000 to 2011. In 2011, AAQ NEPM standard for carbon monoxide of 9.0ppm averaged over eight hours was not exceeded at any site.



## NO<sub>2</sub>

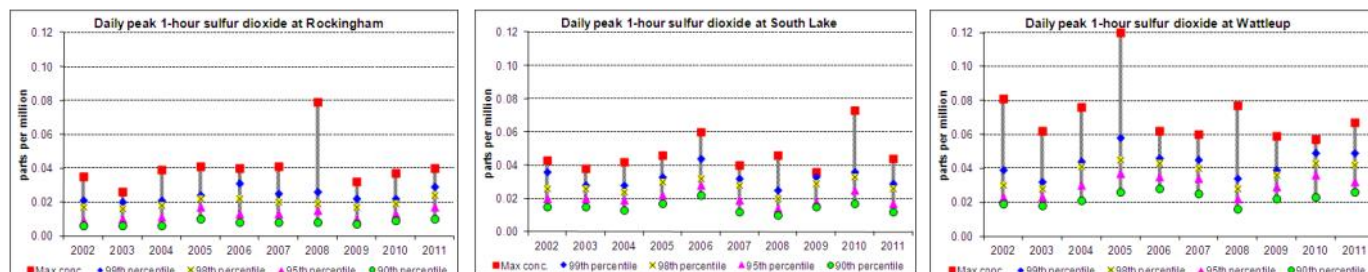
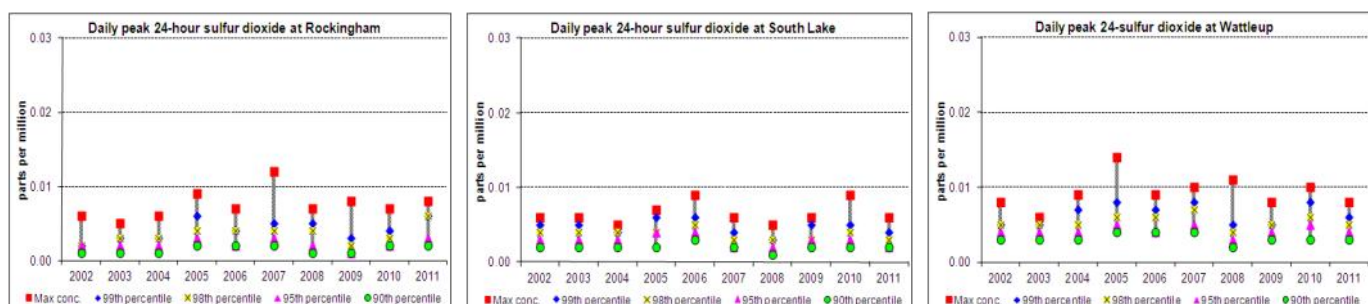
The graphs below show NO<sub>2</sub> trends from 2000 to 2011. In 2011, the AAQ NEPM standard for nitrogen dioxide of 0.12ppm averaged over one hour and the 0.03ppm annual average were not exceeded at any site.



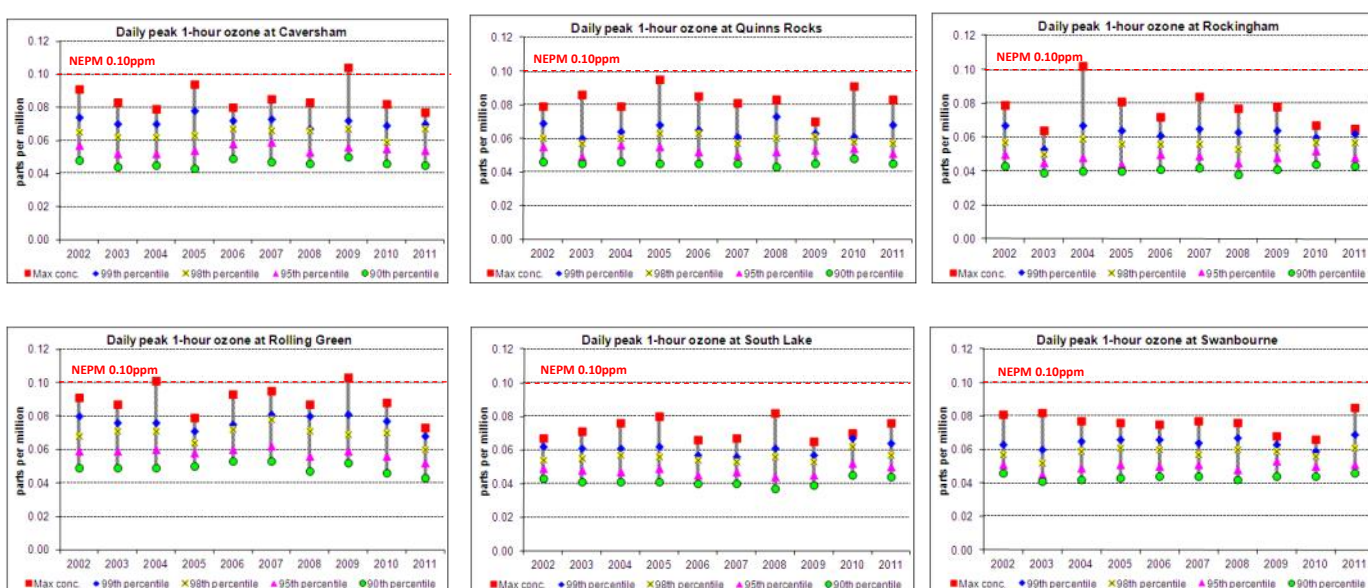


**SO<sub>2</sub>**

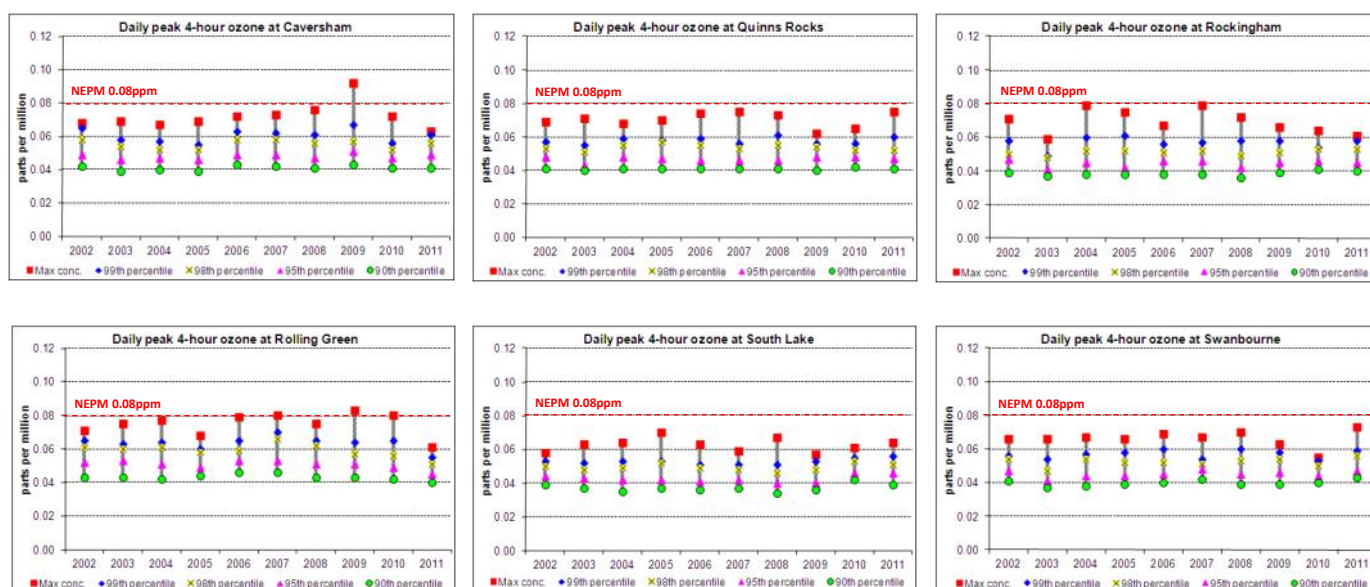
The graphs below show SO<sub>2</sub> trends from 2000 to 2011. In 2011, the AQ NEPM standard for sulfur dioxide of 0.20ppm averaged over one hour, the annual standard of 0.02ppm and 0.08ppm averaged over 24 hours were not exceeded at any site.

**Daily peak 1 hour****Daily peak 24 hours****O<sub>3</sub>**

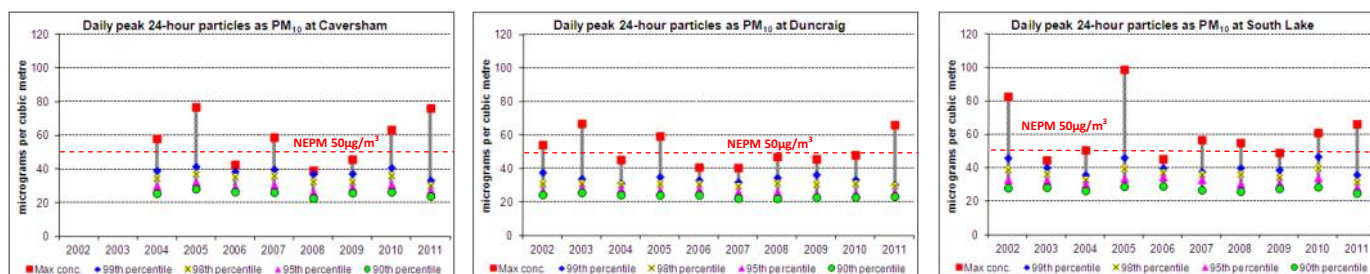
The graphs below show O<sub>3</sub> trends from 2000 to 2011. In 2011, the standard for ozone of 0.10ppm averaged over one hour and 0.08ppm averaged over four hours were not exceeded at any site.

**Daily peak 1 hour**

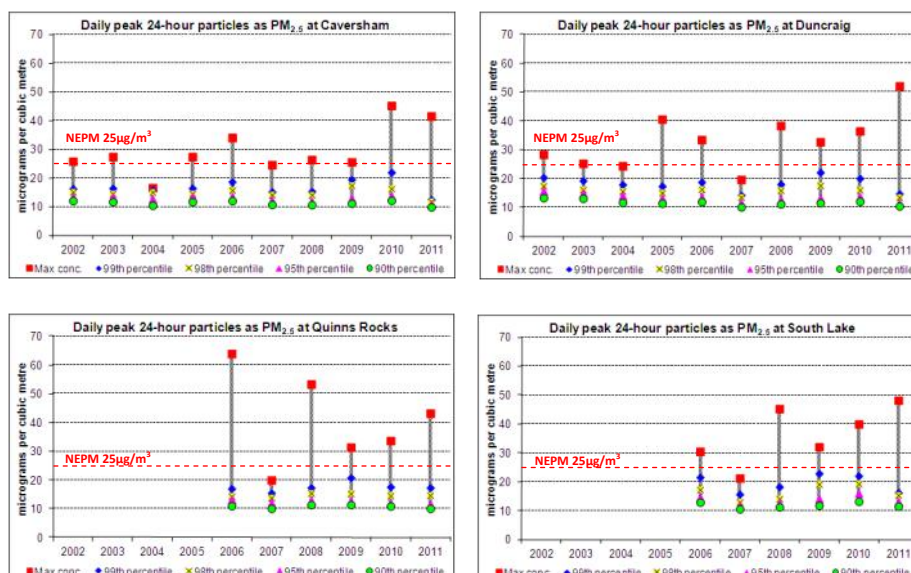
## Daily peak 4 hours

Particles (PM<sub>10</sub>)

The graphs below show PM<sub>10</sub> trends from 2000 to 2011. In 2011, the NEPM standard for particles as PM<sub>10</sub> of 50 µg/m<sup>3</sup> averaged over 24 hours was exceeded once each at Caversham, Duncraig and South Lake. However, the NEPM goal of no more than five exceedences was met at all sites.

Particles (PM<sub>2.5</sub>)

The graphs to the right show PM<sub>2.5</sub> trends from 2000 to 2011. In 2011, the NEPM advisory standard for particles as PM<sub>2.5</sub> of 25 µg/m<sup>3</sup> averaged over 24 hours was exceeded once each at Caversham, Duncraig and South Lake. It was exceeded twice at Quinns Rocks. The NEPM advisory standard for particles as PM<sub>2.5</sub> of 8 µg/m<sup>3</sup> averaged over one year was not exceeded.



## Pb

From 1995, lead levels at Queens Building in the Perth central business district have been below 60 per cent of the  $0.5\mu\text{g}/\text{m}^3$  annual NEPM standard. In 2001, the average lead level in Perth was  $0.022\mu\text{g}/\text{m}^3$ , less than five per cent of the NEPM standard. Due to these low levels, the performance monitoring station for lead was decommissioned in 2001.

*Table 7: 2011 Exceedences in the Perth airshed.*

Site	Pollutant	Concentration	Date / Time	Reason
Caversham	PM <sub>10</sub> – 24 hour	$76.1\mu\text{g}/\text{m}^3$	26/11/2011	Smoke haze
Caversham	PM <sub>2.5</sub> – 24 hour	$41.4\mu\text{g}/\text{m}^3$	26/11/2011	Smoke haze
Duncraig	PM <sub>10</sub> – 24 hour	$65.9\mu\text{g}/\text{m}^3$	26/11/2011	Smoke haze
Duncraig	PM <sub>2.5</sub> – 24 hour	$52.1\mu\text{g}/\text{m}^3$	26/11/2011	Smoke haze
Quinns Rocks	PM <sub>2.5</sub> – 24 hour	$28.1\mu\text{g}/\text{m}^3$	20/11/2011	Smoke haze
Quinns Rocks	PM <sub>2.5</sub> – 24 hour	$43.2\mu\text{g}/\text{m}^3$	26/11/2011	Smoke haze
South Lake	PM <sub>10</sub> – 24 hour	$66.2\mu\text{g}/\text{m}^3$	26/11/2011	Smoke haze
South Lake	PM <sub>2.5</sub> – 24 hour	$48.2\mu\text{g}/\text{m}^3$	26/11/2011	Smoke haze

### Key:

Crustal: A small proportion of PM<sub>2.5</sub> particles within PM<sub>10</sub>.

Smoke haze: A high proportion of PM<sub>2.5</sub> particles within PM<sub>10</sub>.



*Photos courtesy of DEC*



