Fact sheet

Air quality monitoring in Perth and Peel regions

Purpose

The purpose of this fact sheet is to provide information on air quality monitoring undertaken by the Department of Water and Environmental Regulation (the department) in Perth and Peel.

Introduction

Air quality monitoring is undertaken by the department at selected regional and metropolitan locations in Western Australia (WA) in accordance with the *National Environment Protection (Ambient Air Quality) Measure* (AAQ NEPM).

We are responsible for the operation and maintenance of 15 air quality monitoring sites in WA. This includes sites in the Perth and Peel regions at Armadale, Caversham, Duncraig, Quinns Rocks, Rolling Green, Rockingham, South Lake, Swanbourne and Mandurah.

Key points - air quality in Perth and Peel

- Air quality in Perth and Peel is considered good on most days, although some poor air quality events occur in any given year.
- Poor air quality events have been primarily attributed to fire hazard reduction burns or bushfires.
- Monitoring will continue in accordance with the AAQ NEPM as the national standard.

What is monitored?

Air quality pollutants monitored in Perth and Peel regions include:

- carbon monoxide – a gas found in air that is harmful to humans with the main source being attributed to motor vehicles and industrial activities
- photochemical oxidants (as ozone) – the principal component of a mixture of air pollutants commonly known as 'photochemical smog'. It is harmful to humans and is formed through a complex reaction between sunlight and air pollutants (volatile organic compounds and nitrogen oxides). Sources of air pollutants are industrial activities, motor vehicles and bushfires
- nitrogen dioxide – a toxic gas found in air that contributes to 'photochemical smog', which is also harmful to humans. Sources include motor vehicles and industrial activities
- sulfur dioxide – a toxic gas found in air that reacts to form compounds such as sulfuric acid, sulfurous acid and sulfate particles that are also harmful to humans. Sources include industrial activities and the processing of some mineral ores that contain sulfur
- particle matter (as PM_{10} and $PM_{2.5}$) found in air that is less than 10 micrometres in diameter (PM_{10}) and less than 2.5 micrometres in diameter ($PM_{2.5}$). The small particles are harmful to humans and can be attributed to industrial and domestic activities as well as natural sources such as bushfires, dust storms, marine aerosols and pollen.

Monitoring data collected at the department sites are available on the department's website.

Air quality standards

The AAQ NEPM provides standards for pollutants. Table 1 details the air pollutants and the current maximum concentration standards used to assess ambient air quality to protect human health and wellbeing.

Table 1 Air quality standards

Pollutant	Averaging period	Maximum concentration*
Carbon monoxide	8 hours	9.0 ppm
Nitrogen dioxide	1 hour	0.08 ppm
	1 year	0.015 ppm
Photochemical oxidants (as ozone)	8 hours	0.065 ppm
Sulfur dioxide	1 hour	0.10 ppm
	1 day	0.02 ppm
Particulate matter as PM_{10}	1 day	50 µg/m^3
	1 year	25 µg/m^3
Particulate matter as $PM_{2.5}$	1 day	25 µg/m^3
	1 year	8 µg/m^3

* ppm = parts per million; µg/m^3 = micrograms per cubic metre

Carbon monoxide

Four sites, Caversham, Duncraig, South Lake and Mandurah, measure carbon monoxide (CO) in the Perth and Peel regions. Long-term trend analysis for each site has shown that the maximum eight-hourly averages have consistently declined year on year from early 2000.

Figure 1 shows that between 2017 and 2021 maximum CO concentrations in Perth have continued to remain low at less than 30 per cent of the AAQ NEPM standard of 9.0 ppm averaged over eight hours.

The highest concentration over the five-year period 2017 to 2021 was 2.9 ppm measured at Caversham in June 2017.

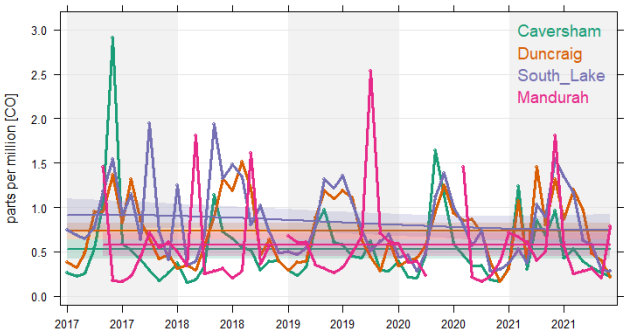

Figure 1 Maximum eight-hour averaged CO concentrations measured every month

Nitrogen dioxide

Eight sites, Caversham, Duncraig, Quinns Rocks, Rockingham, Rolling Green, South Lake, Swanbourne and Mandurah, measure NO_2 in the Perth and Peel regions.

Figure 2 shows that between 2017 and 2021 general NO_2 levels in Perth have remained low at about 50 per cent of the AAQ NEPM standard (0.08 ppm).

The highest concentration of 0.107 ppm was recorded at Rockingham in August 2019 due to a diesel locomotive idling in the nearby siding.

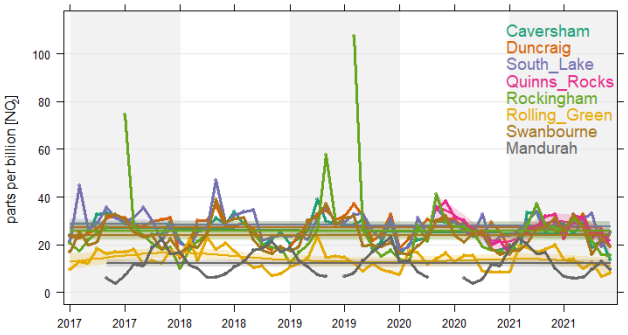

Figure 2 Maximum one-hour averaged nitrogen dioxide concentrations measured every month at a range of sites

Ozone

Seven sites, Caversham, Quinns Rocks, Rockingham, Rolling Green, South Lake, Swanbourne and Mandurah, measure O_3 in the Perth and Peel regions.

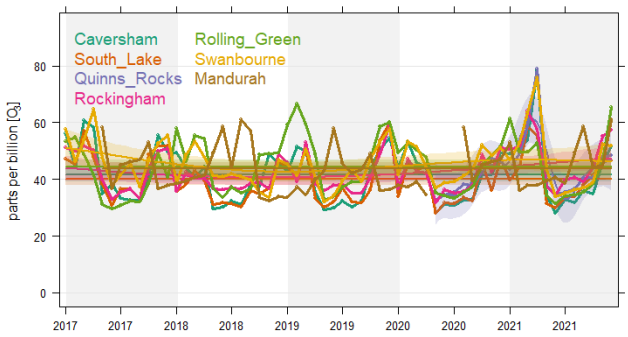

Figure 3 Maximum four-hour averaged ozone concentrations measured every month at a range of sites

Figure 3 shows that in April 2021, O_3 concentrations exceeded the AAQ NEPM eight-hour standard of 0.065 ppm at Caversham (0.078 ppm), Quinns Rocks (0.079 ppm) and Swanbourne (0.076 ppm). These exceedances were attributed to prescribed burns south of Perth.

Sulfur dioxide

Two sites, South Lake and Rockingham, measure SO_2 in the Perth region. A third site measuring SO_2 in Wattleup was decommissioned in 2023. A replacement site will be built in the Mandogalup area.

Figure 4 shows that between 2017 and 2021, SO_2 levels in Perth have remained low with the maximum concentration recorded below 67 per cent of the AAQ NEPM standard of 0.10 ppm.

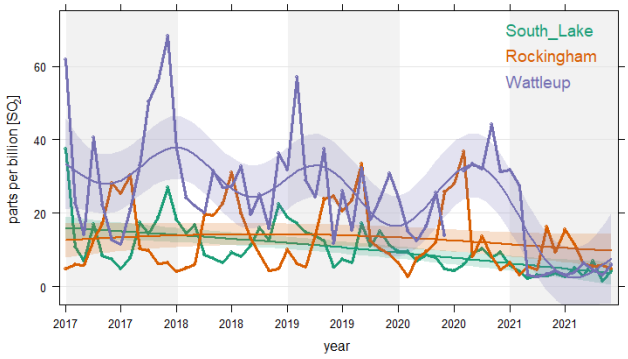

Figure 4 Maximum one-hour averaged sulfur dioxide concentrations measured every month at a range of sites

Particles

Six sites, Armadale, Caversham, Duncraig, Quinns Rocks, South Lake and Mandurah, measure PM_{10} and $PM_{2.5}$ particles in the Perth and Peel regions.

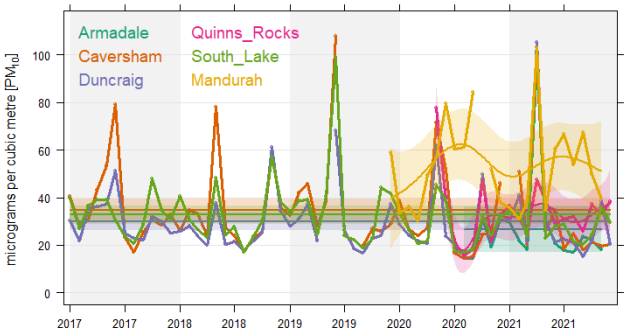

Figure 5 Maximum daily averaged PM_{10} particle concentrations measured every month at a range of sites

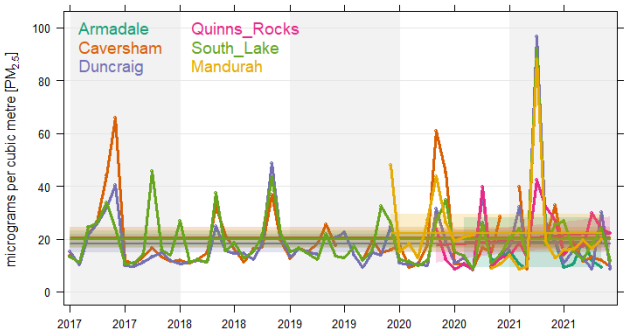

Figure 6 Maximum daily averaged $PM_{2.5}$ particle concentrations measured every month at a range of sites

Figures 5 and 6 show that there have been occasional exceedances to the NEPM standard of PM_{10} (50 µg/m^3) and $PM_{2.5}$ (25 µg/m^3) between 2017 and 2021.

Many of these particle exceedances were a result of authorised fire hazard reduction burns or bushfire events. These are indicated in the two figures by the 'humps' in the traces around autumn and spring each year.

The Mandurah site is about 100 metres from the ocean and so concentrations of PM_{10} are elevated by marine aerosols during periods of westerly winds.

Particles explained

Airborne particles are commonly classified by size in terms of their equivalent aerodynamic diameter (EAD). An EAD is the diameter of a spherical particle of density 1 gram per cubic centimetre (the same density as water) that exhibits the same aerodynamic behaviour as the particle in question. Particles are sampled and described on the basis of their EAD but are usually simply called the particle size.

PM_{10} particles are any substances that have an EAD less than or equal to 10 micrometres in diameter. $PM_{2.5}$ are any substances that have an EAD less than or equal to 2.5 micrometres in diameter. Particles in this size range make up a large portion of dust that can be drawn into the lungs. Larger particles tend to be trapped in the nose, mouth or throat.

The important thing to note is that PM_{10} and $PM_{2.5}$ is not one specific substance, but simply a classification of particle or dust size.

More information

For advice on air quality or related matters, please contact info@dwer.wa.gov.au.

Related documents

The WA air monitoring reports contain detailed air quality data for Perth and Peel regions. The Airborne particles in Mandurah fact sheet contains additional information on Mandurah's particle levels.

Legislation

This document is provided for guidance only. It should not be relied on to address every aspect of the relevant legislation. Please refer to the Western Australian Legislation website at www.legislation.wa.gov.au for copies of the relevant legislation.