KWINANA
INDUSTRIES COUNCIL

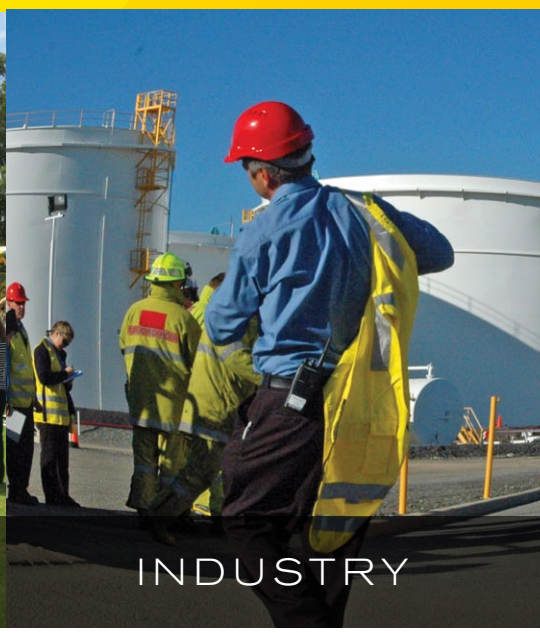
AIR QUALITY MANAGEMENT IN KWINANA

FACT SHEET ON

Sulphur Dioxide


ENVIRONMENT

COMMUNITY


INDUSTRY

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What is sulphur dioxide and how is it produced?

Sulphur dioxide (SO_2) is a colourless gas formed by the combustion of sulphur. At high concentrations SO_2 has a pungent odour, can cause eye, nose and throat irritation, and can lead to an increased incidence of respiratory symptoms in those who are susceptible to such illness, including the elderly and those already suffering from respiratory illnesses.

In the Kwinana Industrial Area (KIA), located south of Perth, Western Australia, SO_2 is primarily produced from fossil fuel electricity generation, oil refining, and other industrial processes that involve burning fuel with a significant sulphur content. Table 1 presents information on the relative contribution of SO_2 emissions in Kwinana according to industry sector. Fossil fuel electricity generation was the largest contributor to SO_2 emissions in 2008/09, making up over half (62%) of the total emissions of SO_2 from Kwinana industry. Petroleum refining and petroleum fuel manufacturing was the second largest contributor to SO_2 emissions in 2008/09, making up just over a third (34%) of the total emissions of SO_2 from Kwinana industry.

Table 1: Summary of SO_2 Emissions from Kwinana Industry for 2008/09

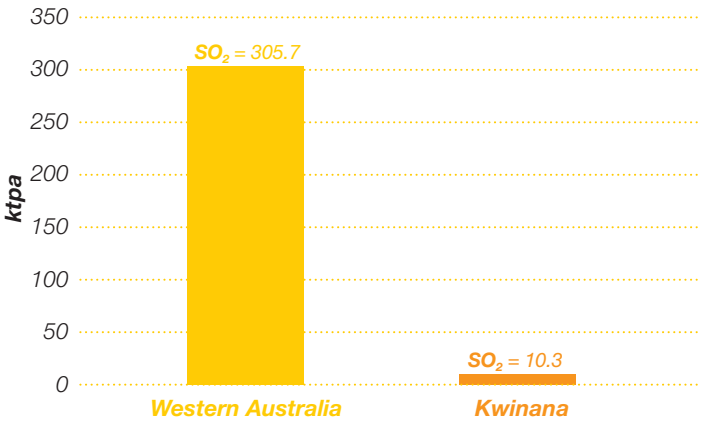
Industry Sector	Emissions (tpa)	Relative Contribution (%)
Alumina Production	18	0.2%
Basic Inorganic Chemical Manufacturing	80	0.8%
Cement and Lime Manufacturing	260	2.5%
Fertiliser Manufacturing	1.2	0.01%
Fossil Fuel Electricity Generation	6,321	62%
Other Basic Non-Ferrous Metal Manufacturing	15	0.1%
Petroleum Refining and Fuel Manufacturing	3,502	34%
Other	66	0.6%

How much is emitted by Kwinana Industry?

According to National Pollutant Inventory (NPI) data for the 2008/09 reporting period, the total quantity of SO_2 emitted to air by Kwinana Industry (i.e. all NPI reporting facilities located in the Cockburn, Kwinana and Rockingham local government areas) was equal to 10.3 ktpa. To put this quantity of emissions into context, according to NPI data for the same reporting period the total quantity of SO_2 emitted to air by Western Australian industry (i.e. all NPI reporting facilities located in Western Australia) was equal to 305.7 ktpa (Figure 1). Therefore, Kwinana industry contributed approximately 3% to the states total industrial emissions of SO_2 during 2008/09.

NPI data for the 2008/09 reporting period has also been analysed to compare the quantity of emissions released into the Perth Airshed by Kwinana Industry to large domestic sources, including motor vehicles and domestic solid fuel burning (e.g. wood heaters). The analysis shows that Kwinana Industry is the largest source of SO_2 within the Perth Airshed, and therefore it is important that ongoing measures are taken to manage emissions of SO_2 in the Kwinana area.

Figure 1: Annual Quantity of SO_2 Emissions Generated by Industry in 2008/09



Emissions information for Kwinana industry has been obtained from Australia's National Pollutant Inventory (NPI) database for the 2008/09 reporting period. NPI data for 2009/10 will not be publicly available until 2011. The NPI contains emissions information on 93 substances deemed important due to their possible effect on human health and the environment. Facility operators determine their emissions each year, and government agencies periodically estimate diffuse emissions such as from motor vehicles and households. NPI data are freely accessible via the website www.npi.gov.au.

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How are emissions managed?

The quantity of SO_2 produced from industrial processes depends on the sulphur content of the fuel and/or raw material process inputs. Kwinana industry manages SO_2 emissions through:

- choice of fuel;
- ensuring efficient fuel and/or raw material consumption within their manufacturing processes; and
- use of pollution control equipment.

Natural gas is very low in sulphur content, so SO_2 emissions associated with natural gas combustion are minimal. Most Kwinana industries switched to using natural gas following its availability to the area in 1984, resulting in a significant improvement in air quality.

The Kwinana Power Station is operated on a combination of natural gas, coal and low sulphur fuel oil. Fortunately Western Australian coal is low in sulphur content by international standards. The rates of natural gas, coal and low sulphur fuel oil consumed at the Kwinana Power Station required to meet the electricity demands of Perth's residential, business and industrial customers are closely managed to ensure compliance with environmental licence limits.

Verve Energy is progressively replacing old generation plant with new more efficient technology, and improving the efficiency of existing plant at the Kwinana Power Station.

The Cockburn Power Station (pictured left) was built in 2003 and is located immediately south of the Kwinana Power Station. It is operated on natural gas, and uses more efficient combined-cycle technology. Work is also underway to retire Stage B of the Kwinana Power Station and replace it with two high-efficiency gas turbines. Numerous environmental benefits will result from these projects, including reduced SO_2 emissions due to reduced fuel consumption per unit of electricity produced, and replacement of coal and fuel oil consumption with natural gas.

Crude oil imported for use at BP's Kwinana Refinery (pictured above) contains varying amounts of sulphur. The sulphur is removed as part of the oil refining process to ensure BP's products meet fuel specifications. Two Sulphur Recovery Units (SRUs) are installed at the Kwinana Refinery to extract sulphur, producing elemental sulphur which is sold for processing into other chemicals.

To ensure compliance with environmental licence limits, BP has developed a Sulphur Balance Model for the Kwinana Refinery. The Sulphur Balance Model calculates the amount of sulphur introduced into the process via crude oil, the amount of sulphur removed from the process via the SRUs and other minor sources, and allows for estimation of the remaining quantity of sulphur released into the air as SO_2. The results of the Sulphur Balance Model are one of the factors that help determine the rate of blending of high and low sulphur crude oils, and refinery throughput.

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What monitoring is conducted?

Source emission monitoring is conducted by Kwinana industry in accordance with environmental licence conditions. Depending on the significance of the emission source, this may involve continuous monitoring, periodic manual stack testing, or calculation techniques that estimate emissions based on process operation measurements.

Ambient air quality monitoring is conducted by the Kwinana Industries Council (KIC) on behalf of Kwinana industry in accordance with environmental licence conditions related to the Environmental Protection (Kwinana) (Atmospheric Wastes) Policy (Kwinana EPP) for the management of SO_2. Ambient air quality monitoring is also conducted by the Department of Environment and Conservation (DEC). Details of the ambient air quality monitoring network established in the Kwinana area are summarised in the Table 2.

Trends in ambient SO_2 levels measured in South Lake, Wattleup and Rockingham over the last decade are presented in Figures 2, 3 and 4 respectively. The monitoring results show that 1 hour average SO_2 concentrations measured in South Lake, Wattleup and Rockingham comfortably comply with the relevant 1-hour average Limit and Standard specified in the Kwinana EPP, and that the levels of SO_2 have remained relatively steady over this time period.

To find out about ambient air quality in your area, the KIC and the DEC operate interactive websites that enable users to define their search according to location, pollutant, and time period. The DEC also publishes an annual Western Australia Air Monitoring Report which includes monitoring results for the Kwinana area.

Table 2: Summary of Kwinana Ambient Air Quality Monitoring Network

Location	SO_2	NO_x	PM_{10}	$PM_{2.5}$
South Lake	■	■	■	■
Miguel Rd, Bibra Lake	■			
Fancote Av, Beeliar	■		■	
Wattleup	■			
Abercrombie Rd, Postans	■			
Calista		■		■
North Rockingham	■	■		
Hillman Primary School		■		■

■ ***DEC monitoring site*** ■ ***KIC monitoring site***

Figure 2: Trends in Ambient Sulphur Dioxide - South Lake

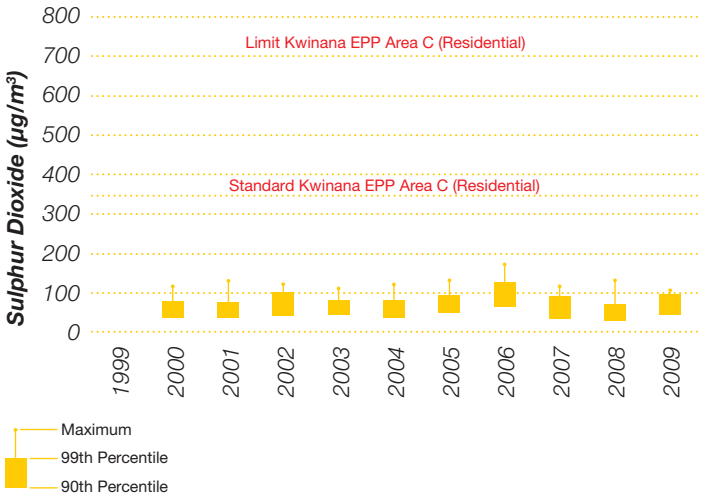


Figure 3: Trends in Ambient Sulphur Dioxide - Wattleup

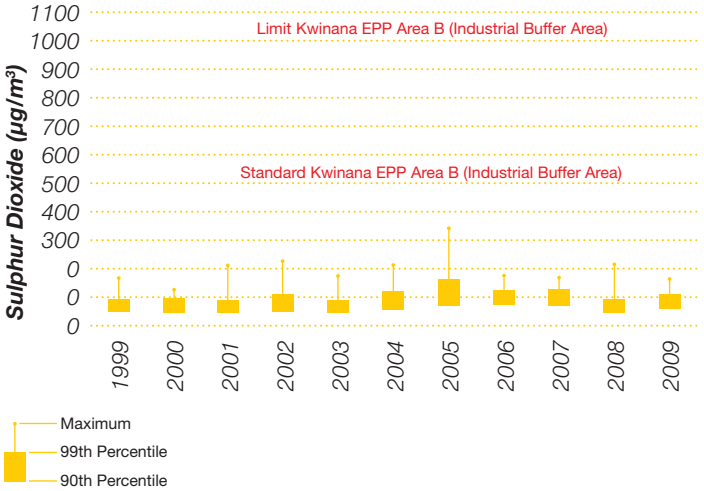
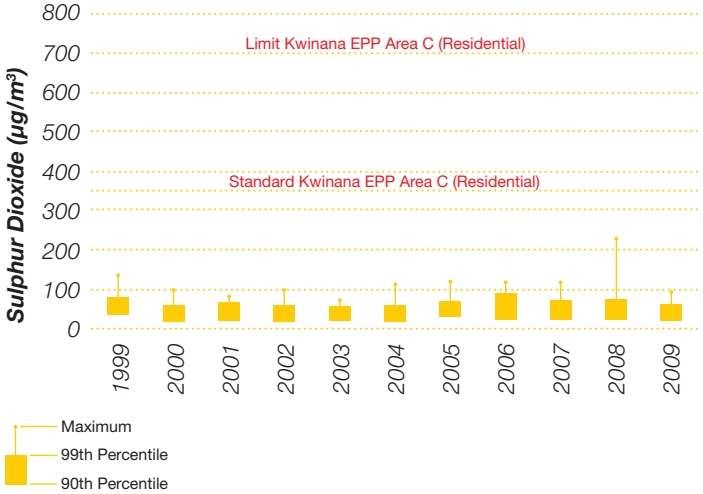


Figure 4: Trends in Ambient Sulphur Dioxide - North Rockingham



More Information

Fact Sheets in the “Air Quality Management in Kwinana” series include:

- Sulphur Dioxide;
- Nitrogen Dioxide;
- Particulate Matter (including PM_{10} and $PM_{2.5}$);
- Toxic Organic Compounds; and
- Heavy Metals.

Fact Sheets and the associated presentations are available on the KIC website www.kic.org.au

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