



AIR QUALITY MANAGEMENT IN KWINANA

FACT SHEET ON

Nitrogen Dioxide



ENVIRONMENT



COMMUNITY



INDUSTRY

What is nitrogen dioxide and how is it produced?

Nitrogen dioxide (NO₂) is one of several oxides of nitrogen (NO_x) compounds that are formed when atmospheric or fuel bound nitrogen combines with oxygen at high temperatures. At high concentrations NO₂ has a pungent odour, can cause eye, nose and throat irritation, and can lead to an increased incidence of respiratory symptoms in susceptible people such as the elderly and those already suffering from respiratory illness such as asthma. NO_x emissions can also contribute to the formation of photochemical smog.

In the Kwinana Industrial Area (KIA), located south of Perth, Western Australia, NO_x (and NO₂) is primarily produced from industrial processes involving the combustion of fossil fuel and high temperature chemical reactions. Table 1 presents information on the relative contribution of NO_x emissions in Kwinana according to industry sector. Fossil fuel electricity generation was the largest contributor to NO_x emissions in 2008/09, making up just under half (42%) of the total emissions of NO_x from Kwinana industry. Cement and lime manufacturing was the second largest contributor to NO_x emissions in 2008/09, making up just under a third (30%) of the total emissions of NO_x from Kwinana industry.

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

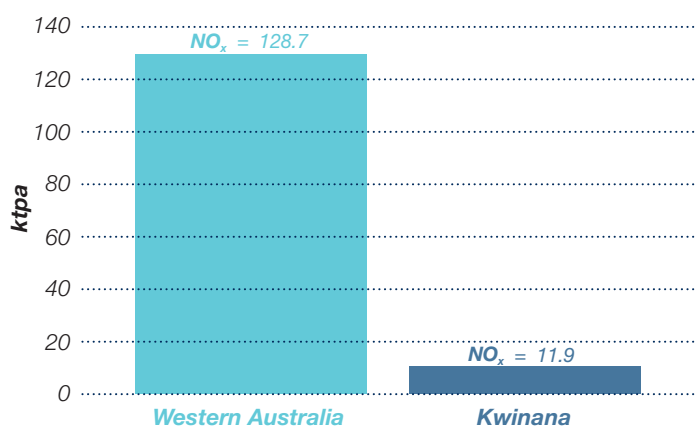
Industry Sector	Emissions (tpa)	Relative Contribution (%)
Alumina Production	1,500	13%
Basic Inorganic Chemical Manufacturing	60	0.5%
Cement and Lime Manufacturing	3,557	30%
Fertiliser Manufacturing	342	2.9%
Fossil Fuel Electricity Generation	4,974	42%
Other Basic Non-Ferrous Metal Manufacturing	116	1.0%
Petroleum Refining and Fuel Manufacturing	626	5.3%
Other	727	6.1%

How much is emitted by Kwinana Industry?

According to National Pollutant Inventory (NPI) data for the 2008/09 reporting period, the total quantity of NO_x 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 11.9 ktpa. To put this quantity of emissions into context, according to NPI data for the same reporting period the total quantity of NO_x emitted to air by Western Australian industry (i.e. all NPI reporting facilities located in Western Australia) was equal to 128.7 ktpa (Figure 1). Therefore, Kwinana Industry contributed approximately 9% to the state's total industrial emissions of NO_x 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 more emissions of NO_x are released into the Perth Airshed from motor vehicles than from Kwinana Industry. Notwithstanding, Kwinana Industry realises the importance of ongoing management of NO_x emissions.

Figure 1: Annual Quantity of NO_x 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.

How are emissions managed?

The quantity of NO_x produced from industrial processes depends on the combustion conditions, such as temperature, and fuel to air ratio. In order to minimise emissions of NO_x, Kwinana industry manage emissions by:

- » choice of fuel;
- » optimising combustion conditions within their manufacturing processes ensuring efficient fuel consumption whilst minimising the generation of NO_x; and
- » use of pollution control equipment.

Combustion processes fuelled on natural gas generally produce less NO_x emissions than alternative fossil fuels such as coal and distillate. With the availability of natural gas to Kwinana since 1984, natural gas is generally the preferred fuel for most Kwinana industry, providing local air quality benefits.

NO_x emissions from the Kwinana Power Station are progressively being reduced as old generation plant is replaced with new more efficient technology. Low-NO_x Burner technology is installed at the Cockburn Power Station (pictured below) built in 2003 and located immediately south of the Kwinana Power Station.



Low-NO_x Burner technology has also been incorporated into the design for the two new high-efficiency gas turbines that will replace Stage B of the Kwinana Power Station, resulting in reduced NO_x emissions.

Verve Energy's Environmental Improvement Plan for the Kwinana Power Station and Cockburn Power Station includes a NO_x Emissions Action Plan which includes investigating the potential for NO_x emission reduction from Stage A of the Kwinana Power Station.

Cockburn Cement (pictured above) kilns are operated on a combination of natural gas and coal. The combustion process is closely managed to ensure compliance with Environmental Licence Limits and is central to the production of cement based products for the local and international markets. Combustion efficiencies and associated emissions are continuously monitored and evaluated as part of Cockburn Cement's continual improvement program.



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 for NO_x is conducted by the Department of Environment and Conservation (DEC) at various residential locations surrounding the Kwinana Industrial Area. The Kwinana Industries Council (KIC) also conducts ambient air quality monitoring on behalf of Kwinana industry. As the KIC's ambient monitoring program was established in accordance with environmental licence conditions related to the Environmental Protection (Kwinana) (Atmospheric Wastes) Policy (Kwinana EPP) for the management of SO₂, it does not include monitoring for NO_x. Details of the ambient air quality monitoring network established in the Kwinana area are summarised in the Table 2.

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 Nitrogen Dioxide - South Lake

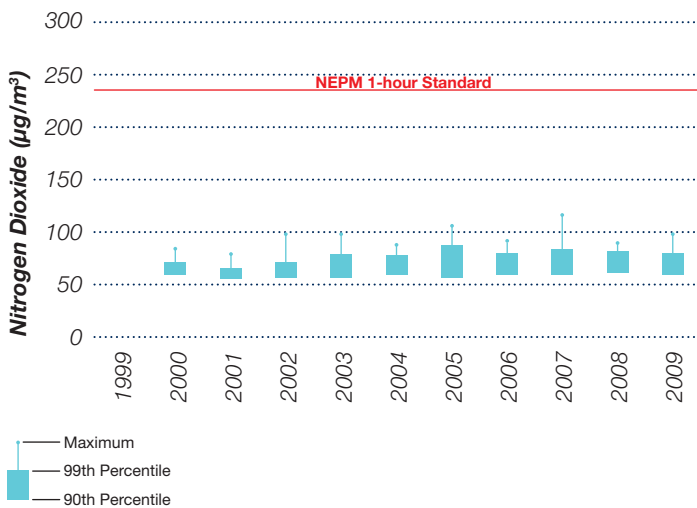
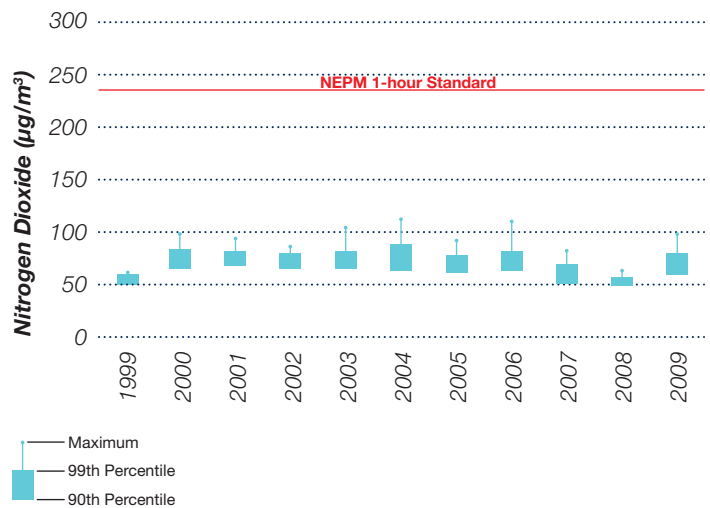


Figure 3: Trends in Ambient Nitrogen Dioxide - Rockingham



Trends in ambient NO₂ levels measured in South Lake and Rockingham over the last decade are presented in Figures 2 and 3 respectively. The monitoring results show that 1 hour average NO₂ concentrations measured in South Lake and Rockingham are considerably less than the relevant Standard specified in the National Environment Protection Measure (NEPM) for Ambient Air Quality, and that the levels of NO₂ 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.

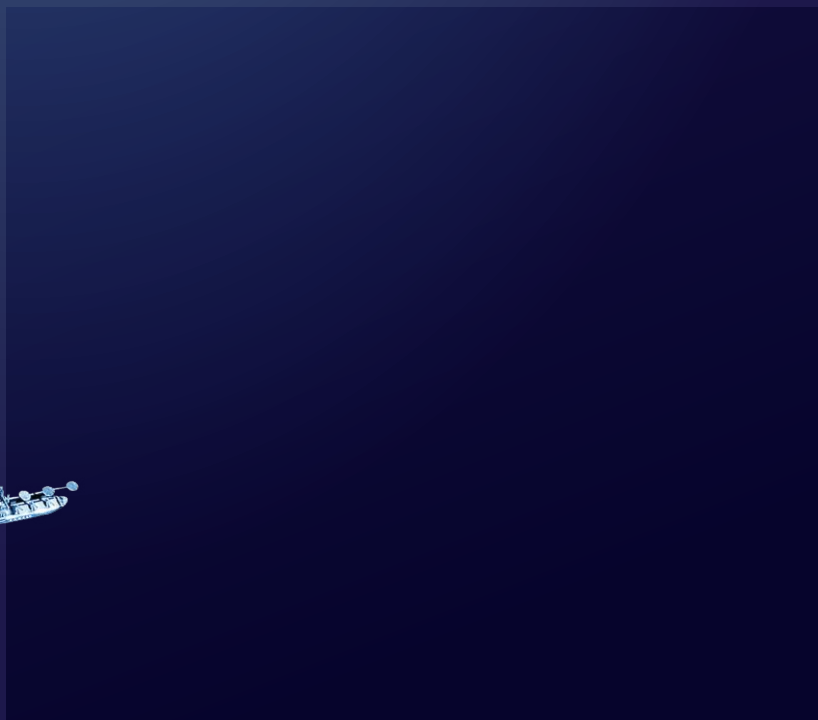


More Information

Fact Sheets in the "Air Quality Management in Kwinana" series include:

- » Sulphur Dioxide;
- » Nitrogen Dioxide;
- » Particulate Matter (including PM₁₀ 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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