

National Pollutant Inventory

South Australian Year 6 Summary Report

April 2005

WHAT IS THE NPI?

The National Pollutant Inventory (NPI) is an Internet database that provides information on the amounts of selected pollutants emitted to the environment (air, water and land) across Australia (www.npi.gov.au). The NPI provides pollutant emission estimates from:

- industrial and commercial sources, such as manufacturing sites, hospitals, dry cleaners, smelters. These emissions are estimated annually by the facilities.
- diffuse sources, such as motor vehicles, households and agriculture. These emissions are estimated by government agencies—in SA, by the EPA.

The NPI reporting requirements are described in the National Environment Protection Measure (NPI NEPM)¹. The desired outcomes of the program are to:

- maintain and improve ambient air quality and ambient marine, estuarine and fresh water quality
- minimise environmental impacts associated with hazardous waste
- expand the re-use and recycling of used materials.

The NPI began in July 1998 with reports on 36 pollutants. In July 2001, this increased to 90 pollutants. The pollutants were selected based on an assessment² of the risks to human health and the environment.

THE NPI IN SOUTH AUSTRALIA

Airsheds

Diffuse emissions were calculated for six major and, within them, eleven minor airsheds within South Australia (Figure 1), covering the major populated, commercial and surrounding industrial areas.

Major airsheds: Adelaide, Barossa, Port Lincoln, Riverland, Spencer Gulf and South East.

Minor airsheds: Barmera, Berri, Loxton, Lyndoch, Nuriootpa, Millicent, Mount Gambier, Port Augusta, Port Pirie, Renmark and Whyalla.

Diffuse emissions can be added to emissions from industries within an airshed to determine total emissions to the environment.



Figure 1: Airsheds within South Australia

2002-2003 diffuse data is used in this report and is available on the NPI web site (www.npi.gov.au).

¹ National Environment Protection (National Pollutant Inventory) Measure: www.ephc.gov.au/nepms/npi/npirev2002_intro.html

² National Pollutant Inventory Technical Advisory Panel: www.npi.gov.au/publications/tap/pubs/npi-tap-report.pdf

Number of reporters

In 2003-2004, the sixth year of the NPI, 357 South Australian facilities reported NPI emissions—5% more than the 340 reporters in 2002-2003. The increase resulted as the SA EPA continued to identify and contact eligible reporters. National reporters also increased by 6.5% in 2003-2004.

Figure 2 shows the increase in reporters since 1999.

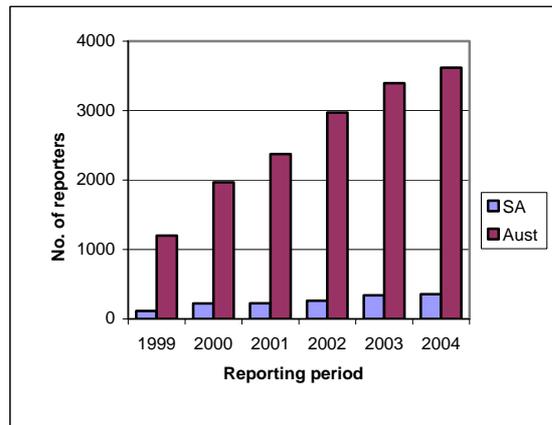


Figure 2: Number of reporters in SA and Australia

ADELAIDE EMISSIONS

Locating reporters using the web site

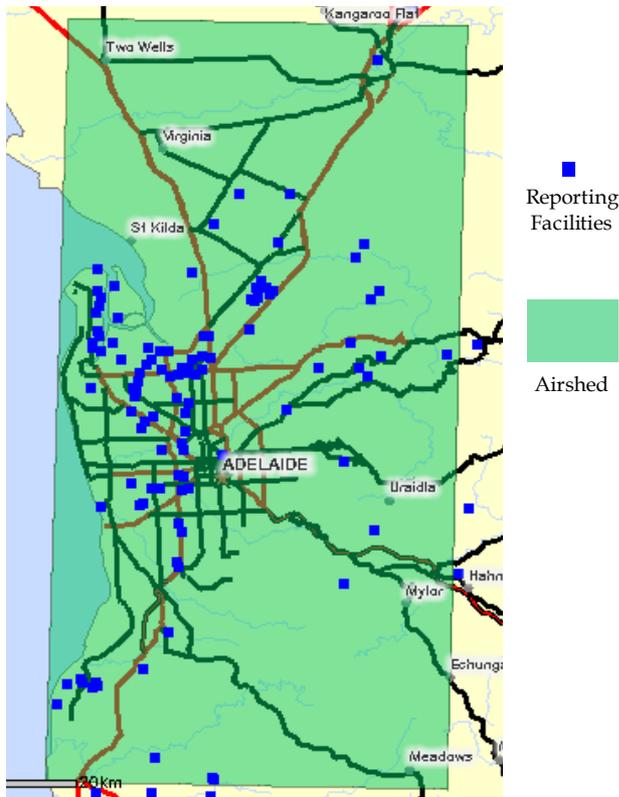


Figure 3: Adelaide airshed using 'Make a Map'

Using the 'Make a Map' function on the NPI web site, you can see the locations of NPI reporting facilities and airsheds; you can also identify areas that have higher quantities of pollutant emissions.

Figures 1 and 3 show how the 'Make a Map' function looks on the NPI web site. Figure 3 shows that NPI industry reporters are scattered across Adelaide, with more facilities located west of the city centre. The industrialised areas of Port Adelaide and Wingfield show a greater concentration of NPI reporters.

On the web site, you can identify individual facilities by zooming in on the image. You can then download the NPI report for that facility.

Sources of emissions within the Adelaide airshed

Figure 4 shows the five largest sources of NPI pollutants within the Adelaide airshed³. Most pollutant emissions within metropolitan Adelaide are from diffuse sources, and 45% are from just four sources. The fifth is an industrial source—Water Supply, Sewerage and Drainage Services—and emissions from this industry are directly related to public usage.

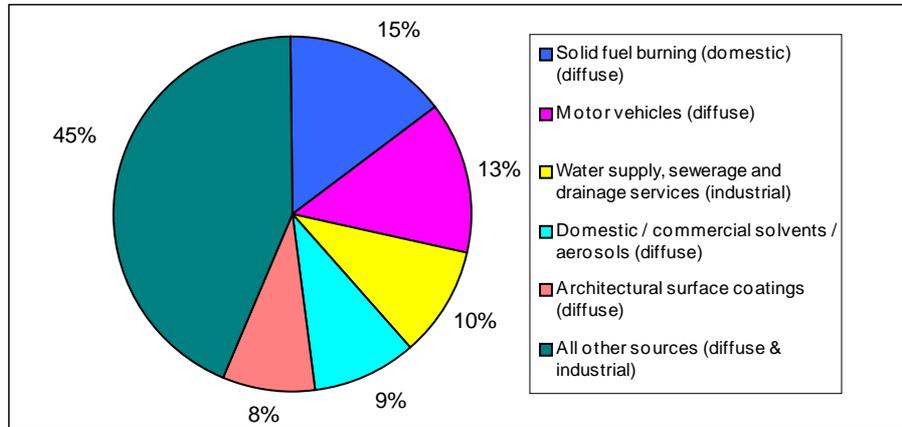


Figure 4: Indicative top emission sources in Adelaide airshed for 2003-2004⁴

Motor vehicles and solid fuel burning are the largest pollution sources within the Adelaide airshed, contributing 13% and 15% of the air pollutants respectively.

Industry facilities contribute a smaller proportion of the pollutant emissions than diffuse sources. The data shows that a large number of small diffuse sources, which are generally not licensed by the EPA, collectively contribute the major proportion of pollutants.

Diffuse sources also dominate emissions within the Adelaide airshed when looking at individual substances.

Figure 5 compares the relative emissions from diffuse and industrial sources for five major pollutants: CO, VOC, NO_x, PM₁₀ and toluene. Only a small portion of the total emission of each pollutant comes from industrial facilities.

Motor vehicles are the main contributors to the large emissions of carbon monoxide—80.5% of the total. They are one of the 'indicative top sources' of pollutants in the Adelaide airshed, as shown in Figure 4.

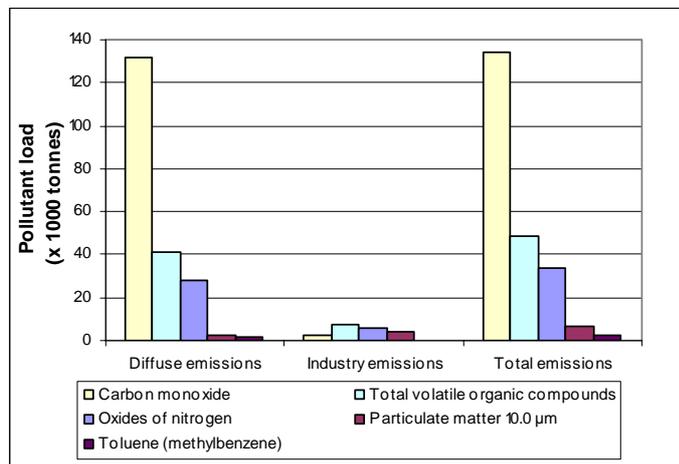


Figure 5: Diffuse (2002-2003) vs. industry (2003-2004) emissions for Adelaide airshed

³ Graph available on NPI web site: www.npi.gov.au: These are indicative top sources derived by converting each emission into proportional units and pooling those units. For example, total benzene emission: 30,000 kg. Motor vehicle benzene emission 28,000 kg. Proportional units of benzene are $(28,000/30,000) \times 100 = 94.1$. This calculation is repeated for each substance/source combination and the proportional units for a source are then summed to provide a total contribution of that source to the emission profile for the area.

⁴ In Figure 4, each source in 'All other sources (diffuse & industrial)' contributed less than 8% each.

Getting your own results

You can see graphs of top indicative sources and additional information for all 17 airsheds on the NPI web site: www.npi.gov.au. Just visit the web site and search using the 'Location' option.

REGIONAL EMISSIONS

Sources of emissions within the regional airsheds

Figures 6, 7 and 8 show the top emission sources within regional airsheds of SA's Spencer Gulf region—Port Augusta, Whyalla and Port Pirie respectively.

In each region, the dominant industry at that location is the highest emission source, very closely followed by domestic solid fuel burning, which is also the largest diffuse source of emissions in all three regions.

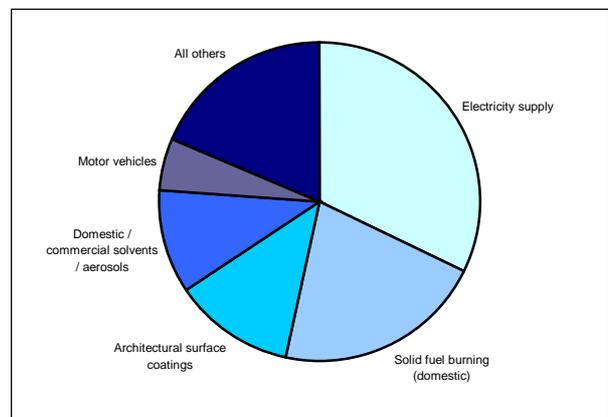


Figure 6: Port Augusta airshed

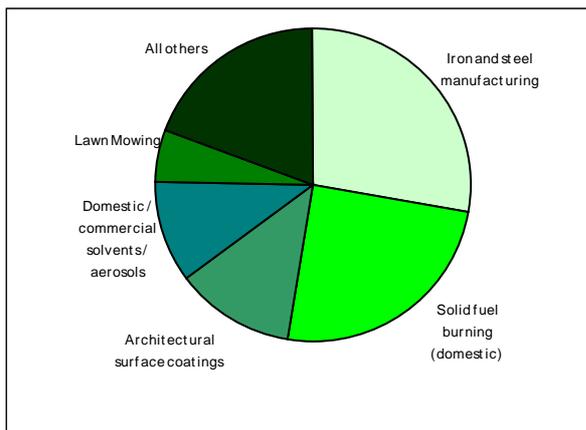


Figure 7: Whyalla airshed

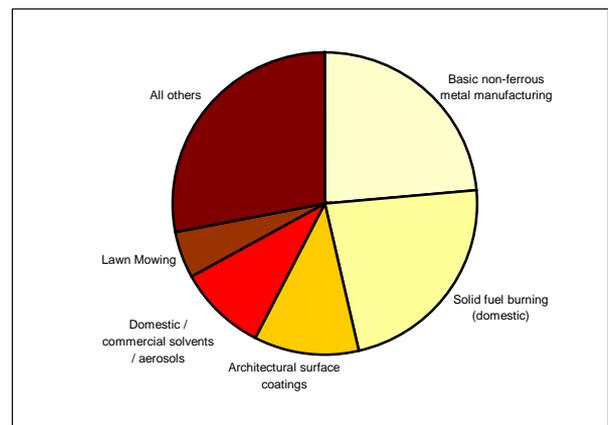


Figure 8: Port Pirie airshed

INDUSTRY REPORTING

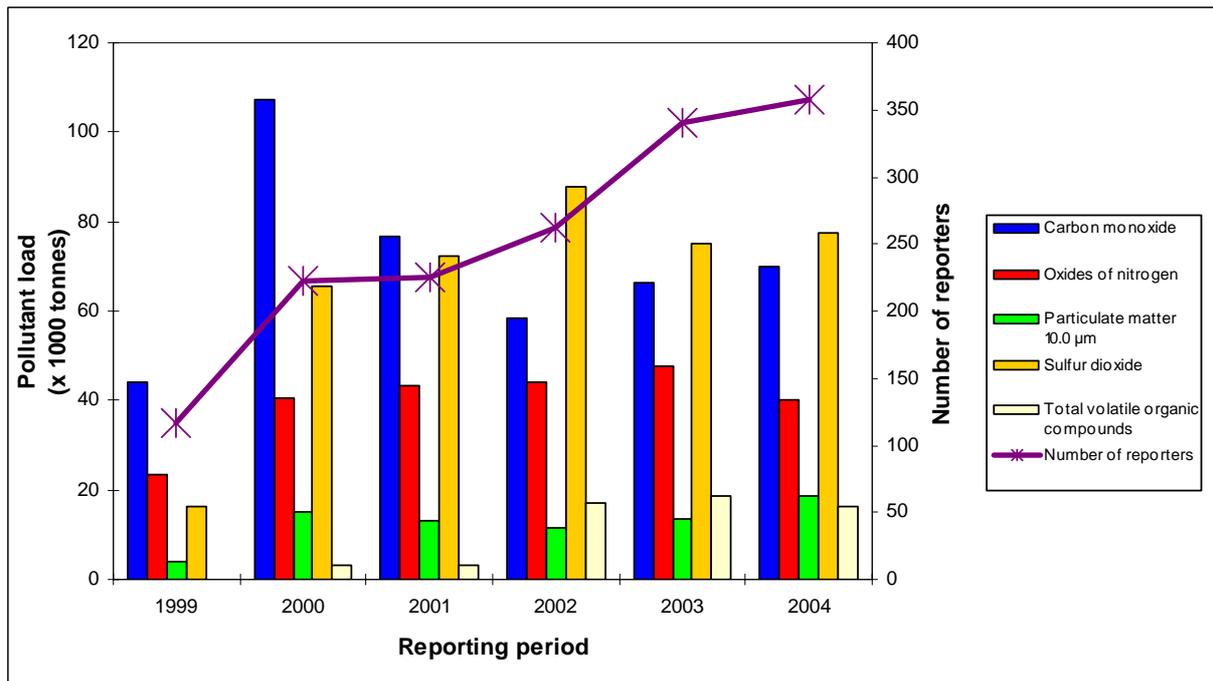


Figure 9: Total pollutant emissions vs. number of reporters (total volatile organic compounds (VOCs) were not required to be reported until 2001-2002)

South Australian annual data trends

Figure 9 shows that over the last six years the number of industry reporters here has increased significantly. Given the increase in reporters, it might be expected the reported pollutant emissions would also increase. However, this is not so for all pollutants.

The majority of new reporters after 1999-2000 (the second year of reporting) have been smaller facilities, which have less impact on the total emissions. So, while there were an additional 134 reporters in 2003-2004 compared to 1999-2000 (an increase of 60%), sulfur dioxide increased by only 18% and particulate matter 10.0 µm (PM10) increased by only 23%. The total emissions of carbon monoxide (CO) and oxides of nitrogen (NOx) decreased, so the increase in new reporters was outweighed by a greater reduction of emissions from existing reporters.

During the same period, many facilities refined and improved their emission estimation techniques. This increased accuracy resulted in lower emission reporting.

Industry emissions to air can affect the air quality of surrounding areas. While it does not monitor industry emissions, the EPA does monitor the ambient air quality for the *National Environment Protection (Ambient Air Quality) Measure* (Air NEPM), and a number of NPI pollutants are included. Current monitoring results show a decrease in the concentration of carbon monoxide in the metropolitan area, consistent with the NPI data.

Carbon monoxide

Carbon monoxide is emitted into the environment from industrial plant exhaust (steel plants or foundries), vehicle exhaust, burning of fuels, cigarette smoking, and natural sources such as forest fires.

Once in the atmosphere, carbon monoxide acts as a precursor to greenhouse gases before eventually converting to carbon dioxide.

Carbon monoxide enters the human body through our lungs when we breathe, and is then absorbed into the blood stream. Exposure to carbon monoxide may cause poor concentration, memory and visual problems, and loss of muscle coordination.

See 'Substance Profiles' on the NPI web site for more information on the pollutants.

Comparison of industry sectors

Comparing emissions from facilities or industry sectors is complex due to the differences in toxicity and the receiving environment—the air, land and water around us—for each pollutant. However, by applying a weighting system to each substance, we can obtain a reasonable comparison of total emissions. It is important when using a weighting system that we understand and consider the potential biases of that system.

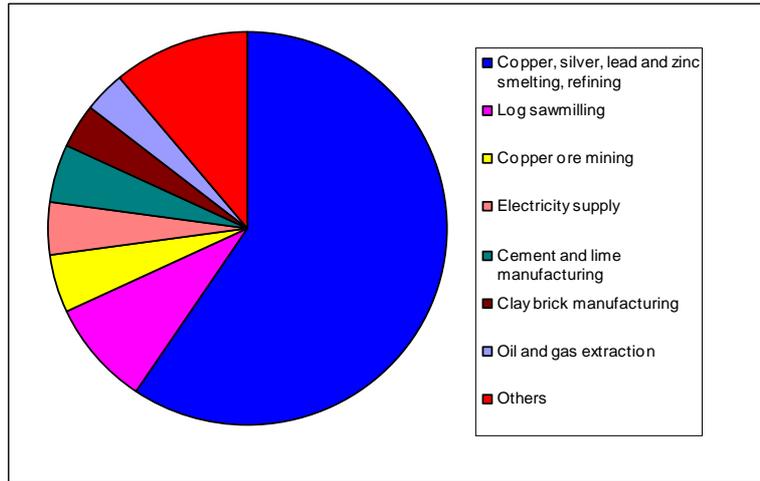


Figure 10: Weighted emissions to air (largest industry sector contributors)

Figures 10 and 11 represent the emissions to air and water for South Australia, showing the seven largest industry sector contributors, and using a 'risk score' from a weighting system⁽⁵⁾ developed for the US EPA's TRI data⁽⁶⁾. This weighting tends to highlight the risk in human exposure to heavy metals, resulting in the dominance of industries with large heavy metal emissions.

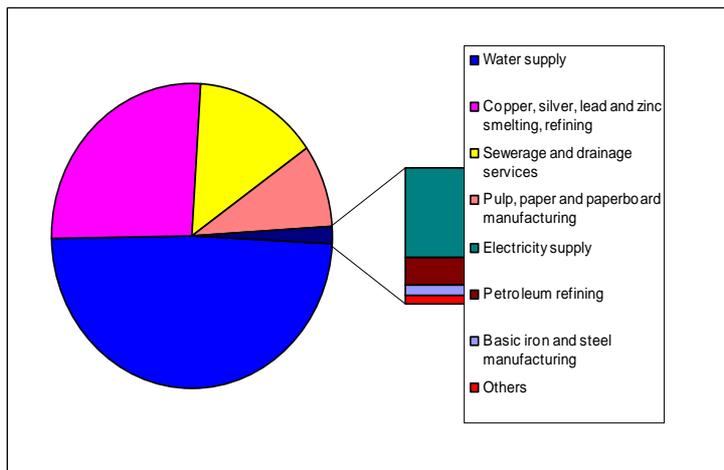


Figure 11: Weighted emissions to water (largest industry sector contributors)

Based on this weighting system, Figure 10 shows the smelting industry is a significant contributor to total pollutants emitted to air in South Australia. This relates to the type of pollutants emitted by a smelting process (including heavy metals) and the large quantities of pollutants emitted. The weighted water emissions, shown in Figure 11, indicate the water supply industry sector is the major contributor of pollutants to water in South Australia. Emissions from the water supply industry sector relate to copper sulfate dosing of several water supply reservoirs to control algal growth*.

The smelting industry is also a significant contributor to the weighted water emissions.

More information on industry reporters

You can get information on the quantities of pollutants emitted by specific facilities around Australia using the 'Facility' search on the NPI web site: www.npi.gov.au/.

Information on facility location, contact details, ranking of emissions and previous reports are also available.

You can compare industry sectors by using the 'Download Spreadsheet' function, selecting 'Download Facility Emission Data' and then specifying an ANZSIC Group or ANZSIC Class.

COMPARING THE SUBSTANCES

Annual variability of substances emitted by industry

Although the emissions of different substances cannot be added together, adding all emissions for a specific pollutant from industry sources allows us to examine annual state-wide comparisons. Table 1 shows data for the last two NPI years for a number of pollutants.

The changes in total emissions for each pollutant in 2003-2004 when compared to 2002-2003 were as follows:

- 32 substances showed a decrease in total emissions
- 28 substances showed an increase in total emissions
- 30 substances showed zero emissions in both years.

It is encouraging that more substances showed a decrease in total emissions than an increase, and also that thirty of the NPI substances reported zero emissions, indicating that the use of these substances in South Australia is low.

Table 1: Comparison of industry emissions (in kg) for selected substances

Substance	2003	2004	% Change	Change type
Cyanide (inorganic) compounds	1,600	29,000	1641	Increase
Sulfuric acid	160,000	840,000	408	Increase
Cyclohexane	8,200	36,000	336	Increase
Chromium (III) compounds	3,200	8,800	177	Increase
Particulate matter 10.0 µm	13,000,000	19,000,000	39	Increase
Carbon monoxide	66,000,000	70,000,000	6	Increase
Sulfur dioxide	75,000,000	77,000,000	3	Increase
Ammonia (total)	3,900,000	4,000,000	1	Increase
Benzene	95,000	91,000	-4	Decrease
Lead & compounds	59,000	57,000	-4	Decrease
Polycyclic aromatic hydrocarbons	33,000	30,000	-9	Decrease
Total volatile organic compounds	19,000,000	16,000,000	-12	Decrease
Toluene (methylbenzene)	520,000	450,000	-14	Decrease
Oxides of nitrogen	48,000,000	40,000,000	-16	Decrease
Methanol	160,000	13,000	-17	Decrease
Chromium (VI) compounds	520	190	-63	Decrease
Mercury & compounds	830	180	-79	Decrease
Tetrachloroethylene	900	10	-99	Decrease

Substance increases

Table 1, above, shows the changes from 2002-2003 to 2003-2004 for selected NPI pollutants, highlighting the large variation in the total emissions for some substances. Some of the reasons for this change from one year to the next are detailed below.

The three substances with the highest percentage increase for total emissions were cyanide, sulfuric acid and cyclohexane.

The significant increase in cyanide was due to a new reporter in the mining sector, which uses cyanide to extract the gold from ore and is now the largest emitter of cyanide in South Australia.

The increases in sulfuric acid and cyclohexane were because a number of facilities with large sulfuric acid or cyclohexane emissions had not previously reported on these substances.

Table 2: Tetrachloroethylene emissions

Year	Visy Board emission (kg)	Total emission (kg)
2002	2200	2684
2003	900	902
2004	0	10

Table 3: Toluene emissions

Year	Bridgestone emission (kg)	Total emission (kg)
2003	36,746	515,915
2004	33,265	445,996

Cleaner production

Often, the most effective means for an industry to reduce its pollutant emissions is through a process change that minimises the need to use toxic material or reduces the amount of pollutant generated as a by-product. As an example, the reduction (99.6%) in tetrachloroethylene emission during the past three reporting periods (Table 2) can largely be attributed to Visy Board Pty Ltd. This progressive company trialled a more environmentally friendly substance in their process, so reducing their use of tetrachloroethylene. The trial was successful and, over a period of two years, they eliminated the use and subsequent emissions of tetrachloroethylene.

The 14% drop in total toluene was partly due to a 9% decrease in toluene emissions by Bridgestone TG Australia Ltd (Edwardstown plant); they improved their coating production system, resulting in more efficient usage of solvent-based coatings (Table 3).

MORE INFORMATION

The NPI web site

All emissions data used in this report has been sourced from the NPI database located at www.npi.gov.au/ This web site also contains information on:

- how the emissions were calculated
- the substances and their chemical properties
- how to search the database
- *How industry reports to the NPI: The NPI Guide*—The NPI Guide outlines the reporting requirements for industry, and provides a list of the 90 substances with reporting thresholds.

The SA EPA web site

You can find information specific to South Australia, including how to register as a reporter, on the SA EPA web site at www.epa.gov.au/npi.html.

The SA EPA is developing a guide for interpreting NPI data. It contains information on industry vs. aggregate data, important tips on interpreting the data, and common errors that result in misinterpretation. This guide will be available in late 2005.

REFERENCES

- 1) Department of the Environment and Heritage (Commonwealth) 2004, *National Pollutant Inventory Database* (www.npi.gov.au/), Department of the Environment and Heritage, Canberra.
 - 2) Environment Protection and Heritage Council 2002, *National Environment Protection (Ambient Air Quality) Measure*, National Environment Protection Council, Adelaide. (www.ephc.gov.au/nepms/air/air_nepm.html)
 - 3) Environment Protection and Heritage Council 2002, *National Environment Protection (National Pollutant Inventory) Measure*, National Environment Protection Council, Adelaide. (www.ephc.gov.au/nepms/npi/npirev2002_intro.html)
 - 4) Environment Protection Authority (SA) 2002, *South Australian National Pollutant Inventory Adelaide and regional airsheds emissions study 1998-99*, Environment Protection Authority, Adelaide. (www.epa.sa.gov.au/pub_list.html#Other)
 - 5) National Environment Protection Council 1999, *National Pollutant Inventory Technical Advisory Panel*, National Environment Protection Council, Adelaide. (www.npi.gov.au/publications/tap/pubs/npi-tap-report.pdf).
 - 6) Armstrong, I 2004, Visy Board Pty Ltd, *personal communication*.
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