



South Australia summary report 2005-06

National Pollutant Inventory (NPI)

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INTRODUCTION

The South Australian Environment Protection Authority (EPA) has written this report to provide some summarised information on the National Pollutant Inventory (NPI) for the 2005–06 reporting year¹ to industry and other interested parties.

The NPI is a publicly accessible internet database² that provides information on substance emissions to the environment (air, water and land) across Australia. It contains pollutant emission estimates from industrial and commercial sources (estimated annually by the facilities) and diffuse emissions from sources such as motor vehicles (estimated by government agencies).

This summary report contains the following sections:

- Use of NPI data by the SA EPA
- Industry reporting
- Emission reductions—a success story
- Industry emissions study—Kilburn and Gepps Cross Area
- Regional emissions: motor vehicles vs solid fuel burning.

USE OF NPI DATA BY THE SA EPA

To give some context to the industry emissions that appear on the NPI website, the SA EPA calculates emissions to air and water from diffuse sources. This aggregate data not only appears on the NPI website but is also used in air and water modelling programs. An example of NPI data usage in air quality work is provided below.

Figure 1 shows how NPI data, here the formaldehyde emissions in the Adelaide airshed grid, was used to assist the Air and Noise Branch in determining compliance with the National Environment Protection (Air Toxics) Measure (Air Toxics NEPM). Each cell in the grid was assigned one of four categories based on the formaldehyde emissions for that cell³. The categories are:

Category	Formaldehyde emissions (kg/year)
1	>2300
2	1600–2300
3	800–1600
4	<800

¹ The data used in this report is the industry data for 2005-06 as published on the NPI website on 31 January 2007 and the aggregate data calculated for 2002-03.

² See <www.npi.gov.au>

³ The Air Toxics NEPM defines the monitoring Investigation Levels (MIL) in ground concentrations of ppm. For formaldehyde the MIL is 0.04 ppm. These concentrations are converted to annual loads using the protocol approved by NEPC for desktop studies. The categories are then defined as Category 1 equal to or above the MIL, Category 2 is two-thirds the MIL to the MIL, Category 3 is one-third to two-thirds the MIL and Category 4 is below one-third the MIL.

Categories 1 and 2 are overlaid on an aerial photograph in Figure 1 to show which areas of Adelaide have the highest formaldehyde emissions and which areas are closest to the investigation levels as set out in the Air Toxics NEPM.

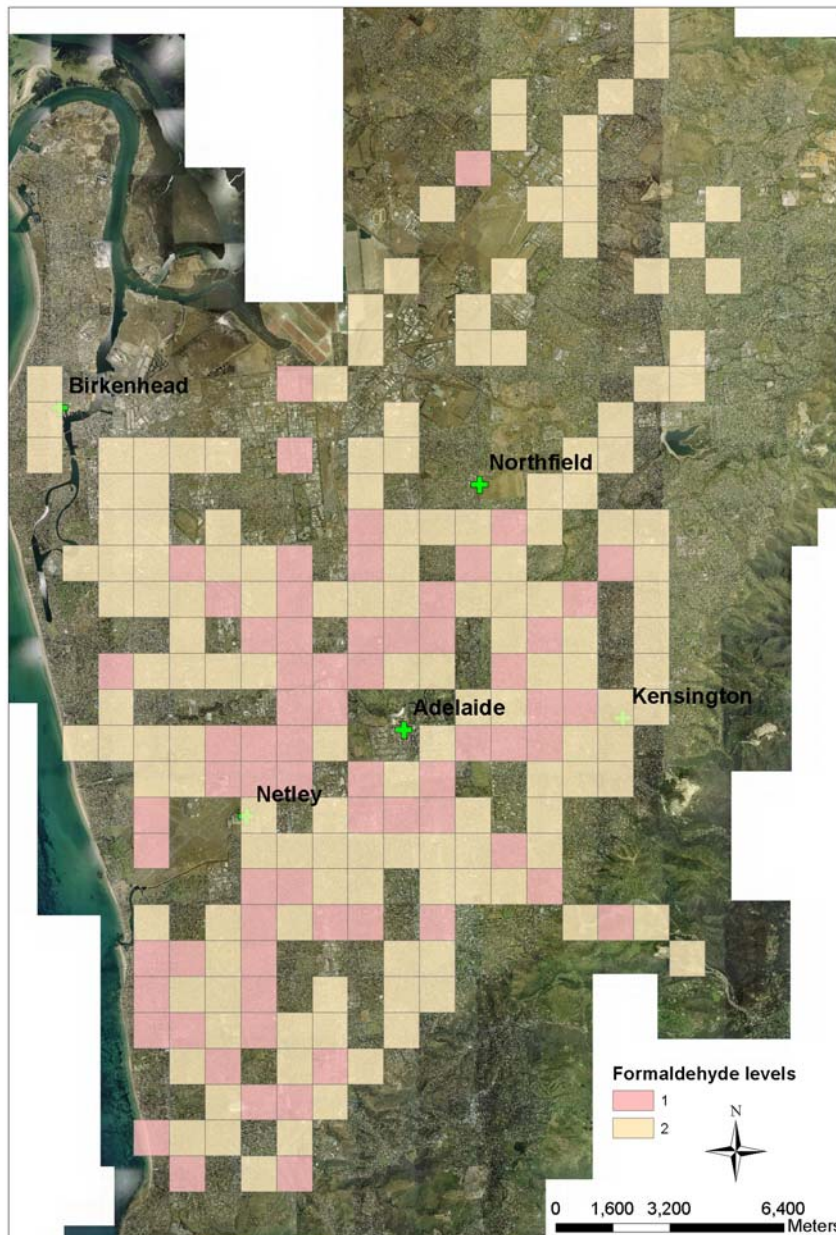


Figure 1 Preliminary study of formaldehyde emissions in the Adelaide airshed

This is a preliminary study based entirely on the annual emission loads of formaldehyde. The emissions to air calculated from the NPI form the basis for air quality modelling in the Air and Noise Branch. The NPI emission estimates have emission profiles⁴ applied to them before they can be used in the models. Two of the current models using NPI emissions are The Air Pollution Model (TAPM) and the Australian Air Quality Forecasting System (AAWFS). These models take into account additional factors such as wind direction and time variations in emissions and can be used to calculate ground level concentrations of substances.

⁴ Emission profiles are used to estimate how an emission varies over time instead of assuming a constant emission over the entire year.

INDUSTRY REPORTING

Number of reporters

The number of South Australian facilities reporting their emissions to the NPI continues to increase with 403 reports appearing on the website for 2005–06. This is a 5.8% increase from 381 reports in 2004–05 and includes the following 27 new facilities:

ABB Grain Ltd (three sites)	Inghams Enterprises Pty Ltd
Adelaide Airport Ltd	Intercast & Forge P/L
Adelaide Plains Feedlot	KT Ashby & Sons Pty Ltd
Baiada Poultry Pty Ltd	Limerock Holdings Pty Ltd
Bird in Hand Winery	Lucas Waste Management
BN & DM Fredericks Pty Ltd	Malwa Nominees
Capral Aluminium Ltd	Mountadam Vineyards Pty Ltd
Clipsal Aust P/L	Old Penola Pastoral Company
Coolalie Feedlot Pty Ltd	Tinlins Wines Pty Ltd
Fleurieu Vintners Pty Ltd	Tyrrell's Vineyards Pty Ltd
Gary Jones & Alena Crosbie	Unimin Australia Limited
Gemlake Pty Ltd	UU Victor Harbor P/L
Hanson Construction Materials P/L	

In addition, there were 10 facilities that returned to the program and 14 facilities that ceased reporting. This was generally due to site closure or facilities falling below reporting thresholds.

Figure 2 shows the increase in the number of South Australian facilities reporting to the NPI over the last seven years. The number of SA EPA licensed facilities to the NPI has also increased however, while approximately three-quarters of NPI reporting facilities are licensed, it represents only a small portion of the nearly 2000 companies licensed by the SA EPA.

Some of these facilities, such as waste transporters, are not required to report to the NPI and other facilities do not trip any thresholds, however the SA EPA will continue to investigate other licensed and unlicensed facilities to ensure they are meeting their NPI reporting requirements.

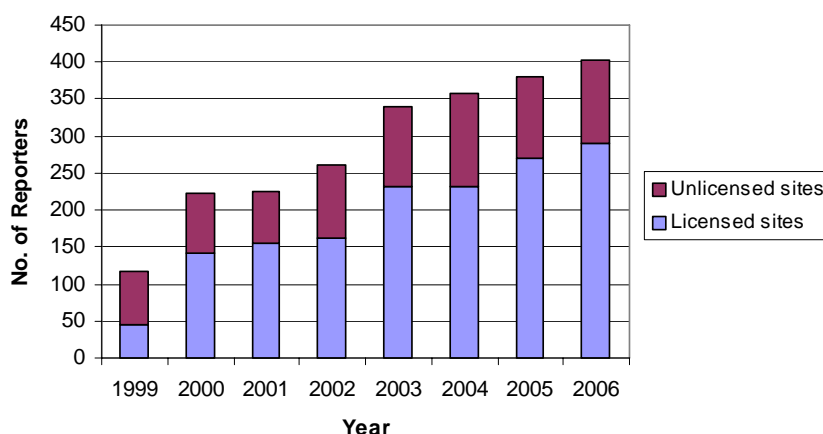


Figure 2 Number of South Australian NPI reporters (licensed and unlicensed)

The majority of unlicensed facilities reporting are poultry farmers, water treatment plants and petroleum storage depots⁵.

EMISSIONS REDUCTIONS: A SUCCESS STORY

Mitsubishi Motors plant at Tonsley Park in Adelaide

Mitsubishi Motors has been an NPI reporter since 2002. The plant is the main assembly area for the company's car production in Adelaide. The 2005–06 NPI report has shown that the company had achieved significant emission reductions (98%) in many reported volatile organic compounds or VOCs (refer Figure 3).

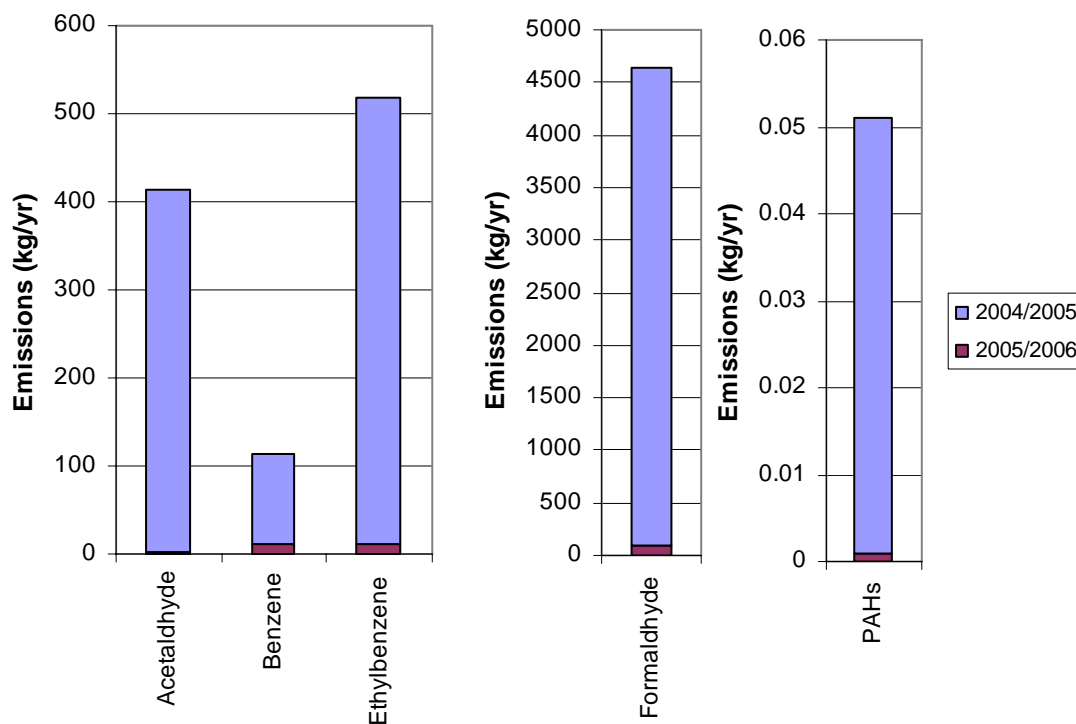


Figure 3 VOC emissions by Mitsubishi Motors, Tonsley Park

One of the ways in which NPI reporting data can be used by industries is to provide a measure of the effect which introducing cleaner production processes and environmental controls can have on emission outputs. Mitsubishi reported that the addition of new environmental controls were the reason for the significant decrease in VOC emissions as part of their NPI report.

How was the reduction achieved?

In 2005 Mitsubishi installed a regenerative thermal oxidiser (RTO) in response to SA EPA requirements and odour complaints from the surrounding community. The device works by heating the VOC-laden air stream to temperatures several hundred degrees above the auto ignition temperatures of the organic compounds that need to be oxidised. A sketch and photo of a thermal oxidiser are shown in Figures 4 and 5.

⁵ Large petroleum storage facilities are licensed by the SA EPA

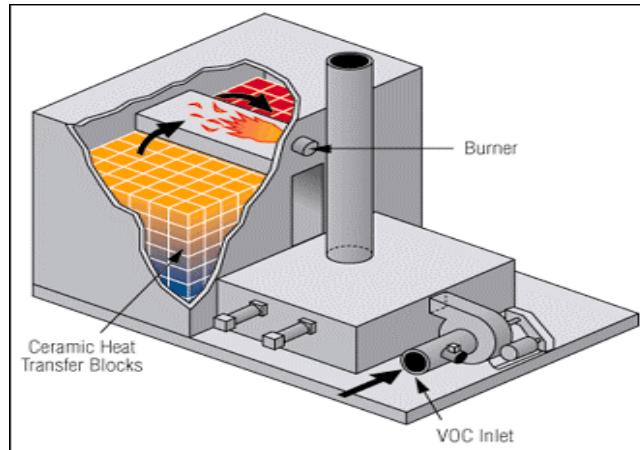


Figure 4 Schematic of a thermal oxidizer with regenerative heat exchanger



Figure 5 The thermal oxidizer with regenerative heat exchanger at Mitsubishi

Process gas with VOC contaminants enters the regenerative thermal oxidiser (RTO) through an inlet manifold. A flow control device directs this gas into an energy recovery chamber, which preheats the process stream. The process gas and contaminants are progressively heated on the stoneware bed as they move towards the combustion chamber. The VOCs are then oxidised, releasing energy in the second stoneware bed. The stoneware bed is heated and the gas is cooled so that the inlet temperature of the gas is only slightly higher than the outlet temperature. The process gas from the painting operations within the Mitsubishi plant contain enough VOCs so that the energy released from their combustion allows self sustained operation with limited energy use.

Outcomes for Mitsubishi

- The relationship between the site and the surrounding community has improved with a decrease in the number of odour complaints received by the SA EPA in relation to the site.
- The benefit from the installation of the pollution control equipment can be found with the reduction of emissions to the local environment.

Outcomes for the NPI and SA EPA

The annual NPI reporting from Mitsubishi was able to demonstrate the VOC reduction that was achieved as a result of the EPA's regulatory activities.

INDUSTRY EMISSIONS STUDY: KILBURN AND GEPPTS CROSS AREA

The Kilburn and Gepps Cross area in the Adelaide metropolitan area contains a number of major arterial roads and includes a mix of industrial, commercial and residential zones.

In response to community concerns, the SA EPA undertook a compliance audit program of licensed sites in the Kilburn and Gepps Cross area in 2005–06. This was combined with an ambient air quality monitoring program of the area to determine the main sources impacting on localised air quality.

The compliance audit identified a range of compliance issues in relation to potential air quality impacts and other non-air quality related issues. The ambient air quality monitoring identified impacts to the local airshed as a result of localised sources, including but not limited to local industry activity. Fifteen EPA licensed sites were highlighted as having a potential impact on local air quality and were audited as part of the program. Seven of the sites are reporters to the NPI (refer Table 1).

Table 1 Sites audited in 2005–06 as part of the Kilburn study

Audited Site	NPI Reporter
Barbaro Galvanising Pty Ltd	Yes
McKechnie Iron Foundry Pty Ltd	No
Fletcher & Sons	No
Intercast & Forge	Yes
Master Butchers Cooperative Limited	Yes
T&R Pastoral Pty Ltd	No
Adelaide Galvanising Industries Pty Ltd	Yes
Korvest Ltd	Yes
Plastics Granulating Services	No
LF Jefferies Nominees Pty Ltd	No
Collex Pty Ltd	No
Asphalt SA	No
WP Crowhurst Pty Ltd	Yes
Bradken Resources Pty Ltd	Yes
IJF Australia Pty Ltd	No

The NPI provides data on usage and emissions of NPI listed substances at a site level and in a broader context with a local and regional perspective. This data can be used in addition to point source monitoring by the industries, to assist in the identification of pollutants emitted. This information could also be used to assist in measuring the success of any pollution control or cleaner production initiatives.

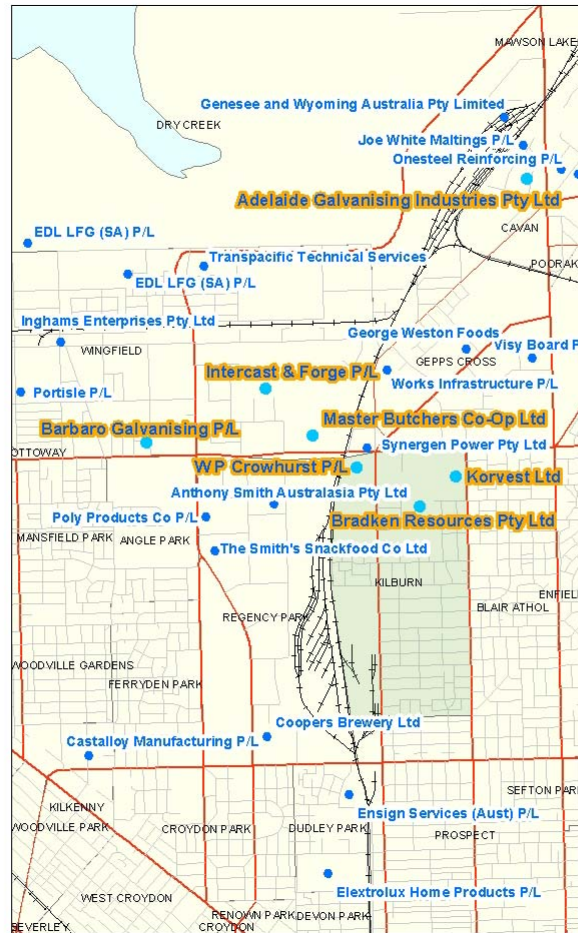


Figure 6 NPI reporters in Kilburn and surrounding areas

Ambient air quality results from the audit and NPI data

The major outcomes of the audit program included the detection of elevated levels of zinc compounds and iron at the Kilburn and Gepps Cross ambient air monitoring sites. Iron is not reported under the NPI, however zinc compound emissions are and were reported by a number of the NPI reporters included in the audit.

Zinc Compounds

What are zinc compounds?

Elemental zinc is a bluish-white lustrous metal, which becomes covered with a white coating of zinc carbonate on exposure to moist air, but is stable in dry air.

There are many types of zinc compounds, including zinc salts (zinc chloride, zinc oxide) and fumed zinc. Zinc oxide is a white or greyish powder that is odourless and non-combustible. It is almost insoluble in water and alcohol, but is soluble in dilute acetic or mineral acids and ammonia.

Where do zinc compounds come from?

There are a number of sources of zinc oxides including:

- industry sources: such as mining and galvanising
- diffuse sources: such as the corrosion of galvanised structures

- natural sources: natural levels of zinc are found in rocks, soil, air, waters, plants, animals, and humans
- transport sources: including the wear and tear of car tyres.

Industrial sources of zinc compounds in Kilburn

Results from the audit process and NPI data reporting differ. The audit reported ambient levels of zinc while the NPI data provides the zinc compounds emission data from particular industrial sites. The figures below show the reported emissions from the NPI reporting facilities in the 2005–06 reporting period (Figure 7) and also an historic look at the reported emissions from the sites from 2002–03 (Figure 8).

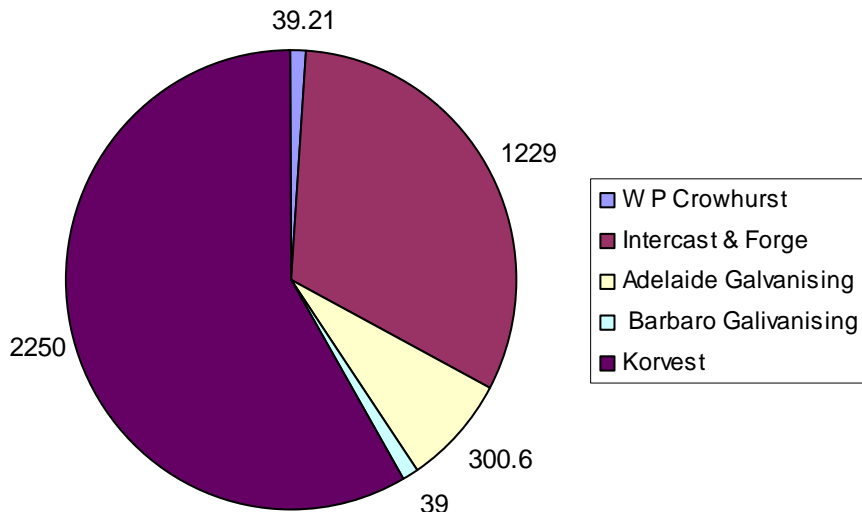


Figure 7 Zinc emissions as reported to the NPI in 2005–06 by Kilburn audit sites (kg/year)

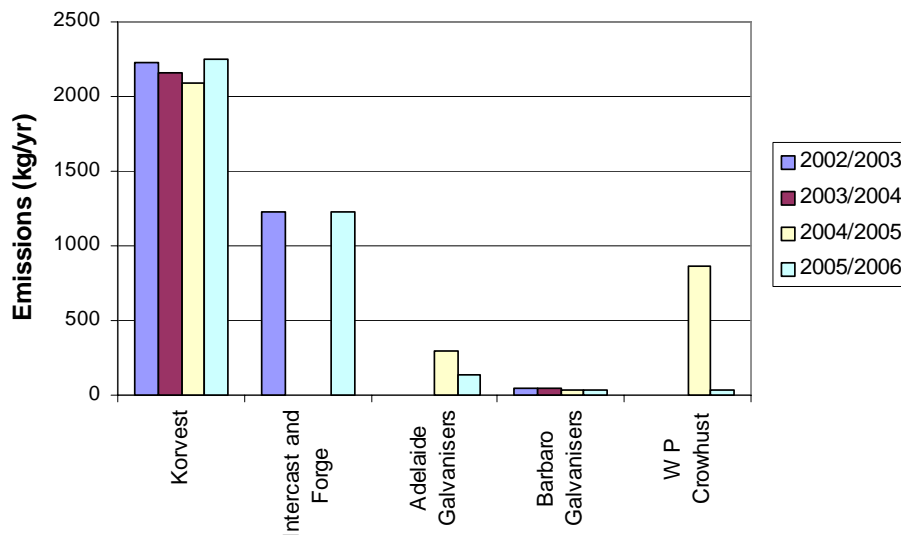


Figure 8 Historical zinc emissions from Kilburn audit sites (kg/yr)

Figure 8 shows the historical zinc emissions reported to the NPI for these sites. WP Crowhurst reported data shows a distinct reduction in emissions reported from 2004–05 to 2005–06. The installation of a fabric filter to control zinc compounds in smoke is identified as resulting in this reduction.

Outcomes of the Audit

One of the main purposes of the audit was to identify the ambient air quality in the Kilburn and Gepps Cross area. An outcome of the audit is to encourage improved environmental performance by industry within the region. The NPI data collected the audit area, could be used internally by the SA EPA as an indicative measure of any emissions reduction achieved by the industries through improved performance measures.

Another outcome was also a local community awareness program to be developed and to raise awareness and provide a greater appreciation by industry in regard to the quality of the local environment and the pressures that this creates on the adjacent community. As NPI data is publicly available the emissions of the NPI reporting industries in the area can be utilised by the community to measure emission reduction and to gauge the environmental performance of the local industries.

REGIONAL EMISSIONS: MOTOR VEHICLES VS SOLID FUEL BURNING

Industry emissions occur as point sources and the location of the facility is, as such, represented as a single blue dot on the NPI website. In comparison, diffuse emissions occur from many different locations and are therefore shown as an area (an airshed in the case of air emissions). The different representation for industry and diffuse emissions is shown in Figure 9.

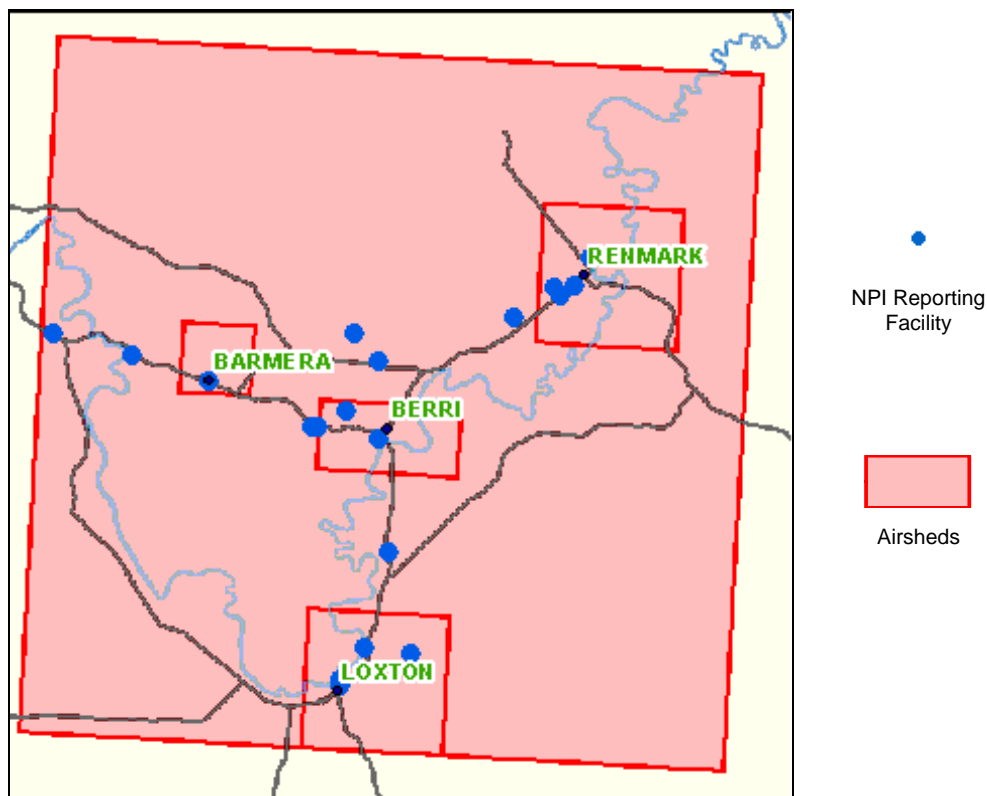


Figure 9 Map of Riverland area showing airsheds and NPI reporting facilities

It is important to note that although the diffuse emissions are shown for an area, they are not distributed evenly within the airshed. Figures 10 and 11 show the distribution of diffuse emissions from motor vehicles and solid fuel burning for the South East region⁶.

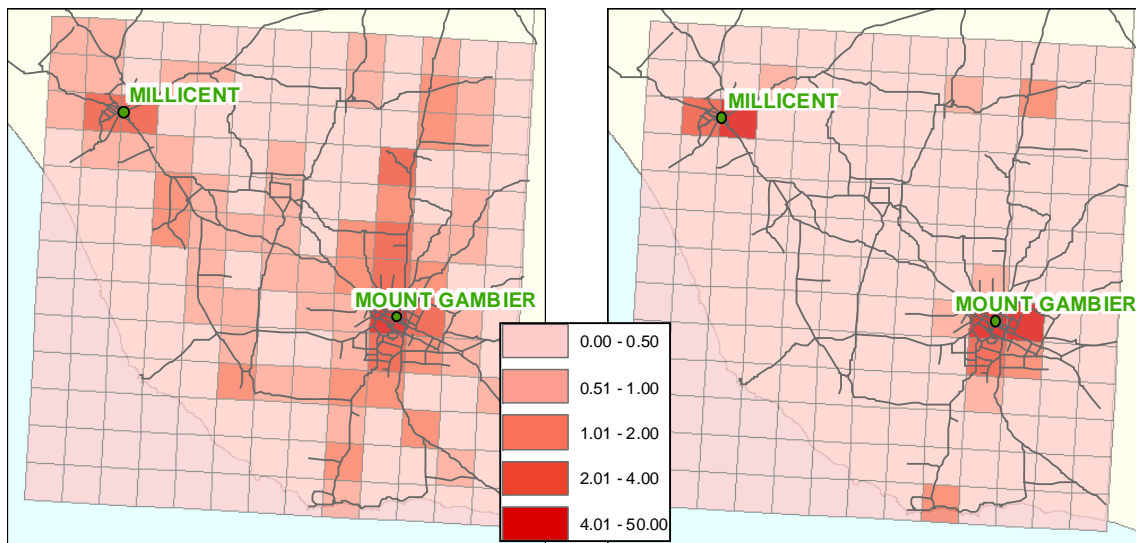


Figure 10 Motor vehicle emissions in the South East airshed

Figure 11 Solid fuel burning emissions in the South East airshed

As is expected, the majority of solid fuel burning emissions come from within the major town centres, since this is where most of the houses are situated. In comparison, a large proportion of the motor vehicle emissions come from outside the major town centres, as vehicles are mobile and can move around the entire region. This is also demonstrated in Figures 12 and 13 by comparing the ratio of emissions associated with the minor airsheds (town centres) with the ratio of emissions for the major airshed (regional).

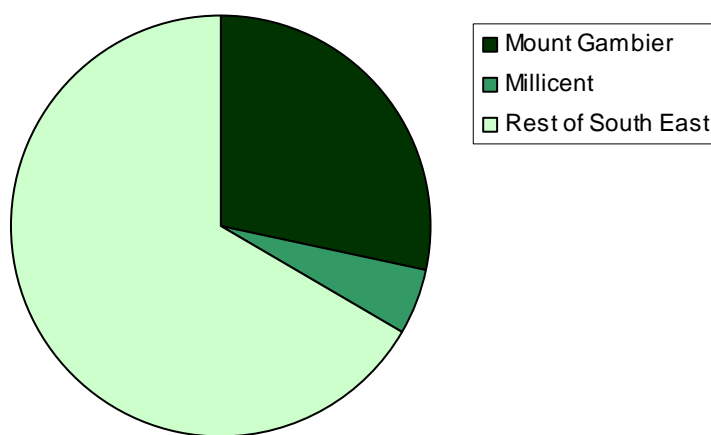


Figure 12 Areas contributing to motor vehicle emissions in South East

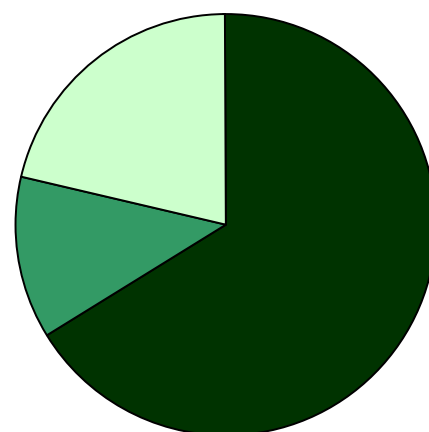


Figure 13 Areas contributing to solid fuel burning emissions in South East

A similar distribution to those demonstrated in the South East Region of emissions from solid fuel burning and motor vehicles is also displayed by the Riverland airshed⁷.

⁶ Carbon monoxide was used as an indicator of emissions for these sources. The units are percentage (emission from one grid cell divided by emissions for the entire airshed).

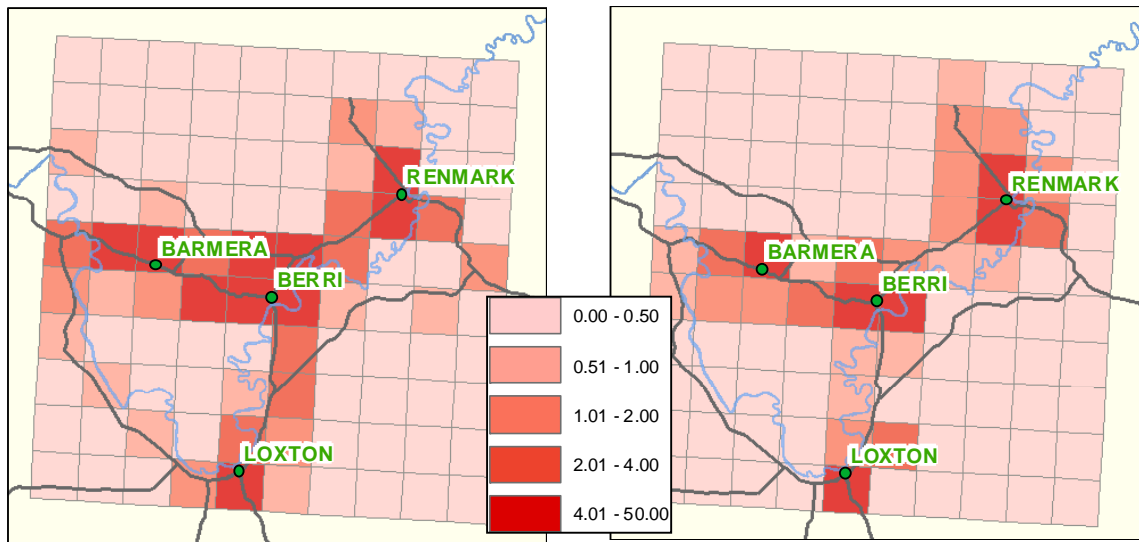


Figure 14 Motor vehicle emissions in the Riverland airshed

Figure 15 Solid fuel burning emissions in the Riverland airshed

MORE INFORMATION

The NPI website

The NPI database and website at <www.npi.gov.au> is the primary location for obtaining information relating to the NPI. All emissions data used in this report can be obtained from the NPI database. The website also contains information on reporting to the NPI, calculating emissions, searching the database and details of the NPI substances and their chemical properties.

The SA EPA website

The SA EPA website at <www.epa.gov.au/npi.html> contains NPI information specific to South Australia including how to register as a reporter, previous annual summary reports and an Interpretive Guide. The Interpretive Guide contains information on industry vs aggregate data, important tips on interpreting the data, and common errors that result in misinterpretation.

The SA EPA NPI team

If you have any queries in relation to this document or the NPI in general, the SA EPA NPI team can be contacted via email on <npi@epa.sa.gov.au> or phone on 8204 9095.

REFERENCES

Department of the Environment and Heritage (Commonwealth) 2007, *National Pollutant Inventory Database*, DEH, viewed 13 April 2007, <www.npi.gov.au>.

⁷ Carbon monoxide was used as an indicator of emissions for these sources. The units are percentage (emission from one grid cell divided by emissions for the entire airshed).