ENVIRONMENT PROTECTION AUTHORITY

Interpretive Guide for the NPI

a guide to understanding South Australia's NPI data

Government of South Australia

EPA South Australia

Interpretive Guide for the NPI
—a guide to understanding South Australia's NPI data

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Summary

The National Pollutant Inventory (NPI) is an Internet database that provides information on the types and quantities of pollutants emitted to the environment. The NPI gives estimates of pollutants emitted by industrial and commercial sources, as well as by diffuse sources.

Each year industrial facilities around Australia have to decide whether they need to report to the NPI and if so, calculate the emissions from their site and inform environmental agencies in their state or territory about them. The agencies check the data before it is published on the NPI web site in January each year.

The NPI is the most comprehensive dataset of pollutant emissions in South Australia. The NPI data is an important resource for numerous organisations, including industry, public interest groups, government and other businesses. The SA EPA considers that the NPI program is very useful for managing and reducing pollution in the state and encourages people and organisations to use the data to its full potential.

Interpreting NPI data

Before interpreting NPI data, it is important that the assessor understands the program and its limitations. When using and interpreting NPI data it is necessary to understand how the NPI works, including common causes of data variation, which methods of analysis to avoid, and which techniques to employ. It is also essential to consider the factors that contribute to the emissions rather than only focusing on total emissions.

1 Introduction

The National Pollutant Inventory (NPI) is an Internet database[1] that provides information on the types and quantities of pollutants emitted to the environment. The NPI provides pollutant emission estimates from:

- industrial and commercial sources, such as manufacturing sites, dry cleaners, hospitals, and lead smelting (emissions are estimated annually by the facilities)
- diffuse emissions from sources such as motor vehicles, households and agriculture (emissions are estimated by government agencies[2]).

NPI National Environment Protection Measure (NPI NEPM) provides the framework for the development and establishment of the NPI. The NPI NEPM also outlines the goals of the program and its desired environmental outcomes of:

- *maintenance and improvement of:*
  - *i. ambient air quality; and*
  - *ii. ambient marine, estuarine and fresh water quality;*
- *minimisation of environmental impacts associated with hazardous waste; and*
- *expansion in the re-use and recycling of used materials.*

The NPI began in 1998–1999 by reporting on 36 substances. In the fourth year, the number of substances it reports on was increased to 90. A risk assessment[3] of exposure and its effects on human health and the environment was the basis for the selection of the 90 substances.

[1] Located at www.npi.gov.au

[2] For NPI purposes, the government agency responsible for NPI in each state is referred to as a 'jurisdiction'

[3] NPI Technical Advisory Panel Report, located at www.npi.gov.au/publications/tap/pubs/npi-tap-report.pdf

2 Sources of NPI Data

The NPI database contains two types of data: facility emissions and diffuse emissions. When interpreting the NPI data, it is important to understand the differences between these emission types.

The data can be accessed via the NPI web site <www.npi.gov.au> by using one of three tools:

- **Searching the data:** search for a facility, substance, source, location or a combination of these and get information that includes a map of the area, a graph of the major sources and a breakdown of the emissions.
- **Make a map**: zoom in to a map of Australia to see the locations of reporting facilities, and run queries to obtain output similar to that of searching the data.
- **Download spreadsheet:** download the yearly raw emission data; the download can be restricted to an area(s), substance(s) or source(s).

2.1 Facility emission data

Each year industrial facilities around Australia decide whether they need to report to the NPI. The decision is based on how much fuel, electricity and NPI substances they have used.[4] If any NPI thresholds[5] are exceeded, the facility must calculate the emissions from their site and provide the results to the environmental agency in their state or territory. The agency will check and, if required, correct the data before it is published on the NPI web site in January each year.

Industry handbooks are available to assist facilities in reporting to the NPI. These handbooks describe the methods available for calculating the emissions: mass balance, engineering calculations, direct measurement (monitoring) and emission factors.

Emissions to air, land and water must be reported. Air emissions are a combination of stack (point) and fugitive sources. Emissions to the atmosphere from a single point such as a vent, pipe or stack are point source emissions. A facility may have one or many point sources. Emissions released from multiple or mobile sources are fugitive emissions. Examples of fugitive emissions include:

Example: How do emission factors work?

Emission factors generally relate to a facility's production or compound usage. In the case of bakeries, the emission factors are based on the amount of bread produced (in tonnes).

ethanol air emission factor = 0.83 kg/t

loaves bread produced = 20 million loaves

average weight of loaf = 700 g

amount bread produced= 20,000,000 x 700 g
= 1.4×10^{10} g
= 14,000 t

ethanol emission = 0.83 kg/t x 14,000 t
= 11,620 kg

Therefore the ethanol emission of this facility is 11,620 kg.

[4] A complete list of the 90 substance can be found on the NPI web site <www.npi.gov.au/about/list_of_subst.html>

[5] More information on industry thresholds can be found in the NPI Guide <www.npi.gov.au/handbooks/guidetoreporting.html>

- dust from stockpiles
- volatilisation of substances from vats, open vessels or spills
- emissions from unsealed buildings
- leaks from valves and flanges.

2.2 Diffuse emission data

The environmental agencies in each state and territory calculate diffuse data on a less frequent basis (in South Australia they have been calculated for 1998–1999 and 2002-2003). When searching the NPI database, the reports provided will include the most recent diffuse information available.

Diffuse data includes emissions from smaller industries, and mobile and non-industrial sources. They are included to provide a more comprehensive picture of emissions to the environment.

Smaller industries are those that have not triggered thresholds for reporting to the NPI as well as those for which there is no industry handbook. Mobile sources are transport-related; non-industrial sources cover both household activities and area-based sources[6].

Table 1 : Examples of diffuse sources

Smaller industries	Mobile sources	Non-industrial sources	
		Household activities	**Area-based sources**
service stations	motor vehicles	lawn mowing	road marking
dry cleaners	aircraft	solid fuel burning	bushfires
fish farming	ships	use of solvents (e.g. hair spray)	cut-back bitumen
		cigarette smoking	urban emissions to watercourses

In South Australia, 17 airsheds (six major and 11 minor—Figure 1) and two water catchments (Figure 2) are included in the NPI.

The airsheds were designed to cover the major populated, commercial and industrial areas of the state. The third catchment, the River Murray, is part of a national study.

[6] *www.npi.gov.au/about/how_npi_data.html*

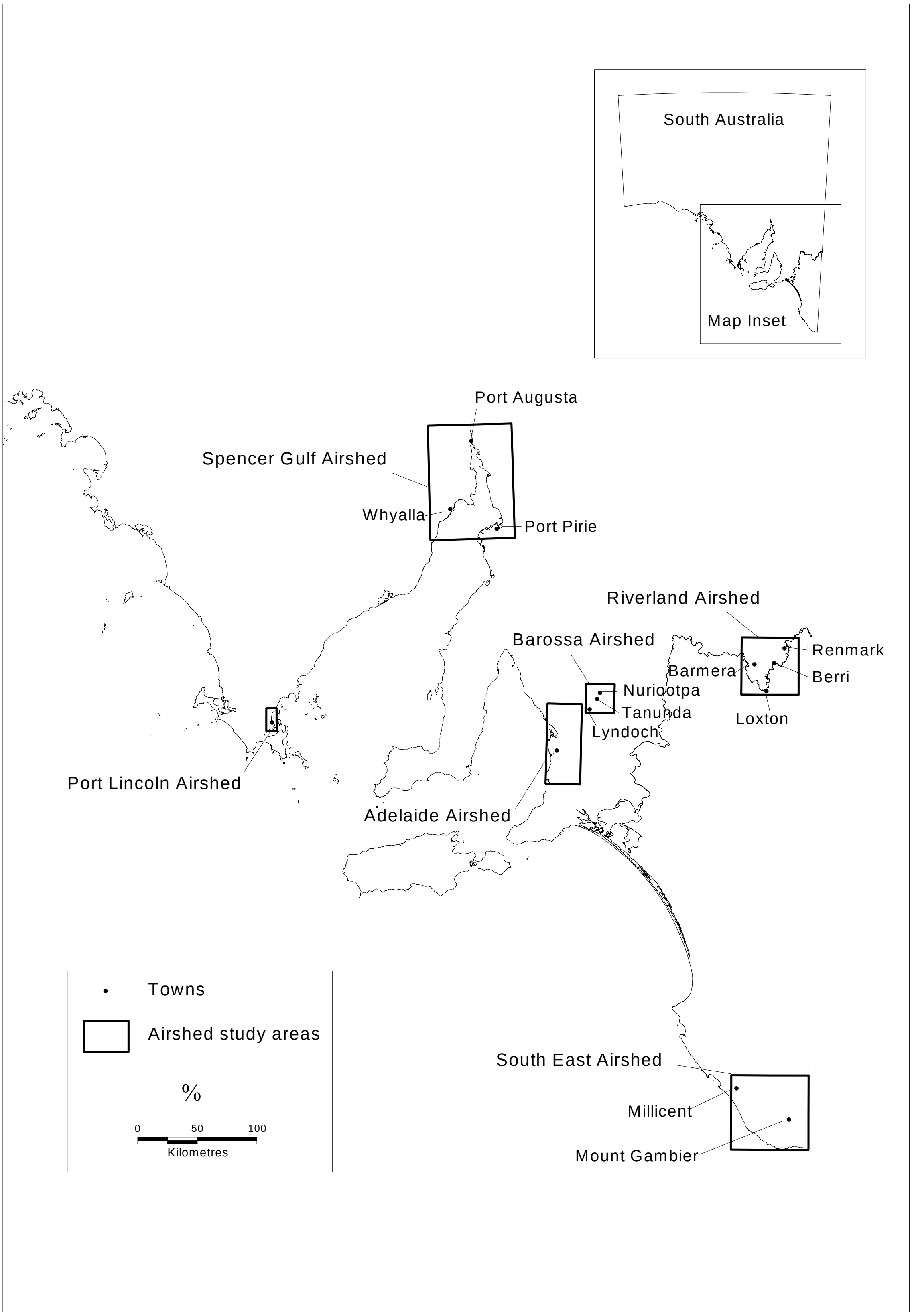

Figure 1: South Australian airsheds

Figure 2: South Australian water catchments

3 Uses for NPI Data

The NPI is the most comprehensive dataset of pollutant emissions in South Australia. The NPI is an important resource for numerous organisations, including industry, public interest groups, government and other businesses. The potential uses of NPI data are extensive. It is hoped that as the program grows, government, industry and the community will use the NPI to help them manage their effects on the environment. Some examples of the potential uses of the data are given in this section.

3.1 *Industry use*

While operators may often only report on the quantities of materials used and pollutants emitted simply to satisfy legislative requirements, they can and should use the data they obtain. The NPI process can help them save money as well as improve their environmental performance, process systems and the public’s perception of them.

Improved system processes

When reporting to the NPI, a facility must investigate their processes to find out the types and quantities of materials used (threshold calculations) and the sources, types and amount of NPI pollutants emitted (emission calculations). Identification and quantification of the inputs and outputs of the facility, including by-products and waste products, help the facility to better understand its systems.

As a result, the performance of processes or systems can be improved. For example, points in processes where material is lost, either raw material and/or product, may be found. Once it has identified these, the facility can improve its processes to reduce the loss and thus increase production efficiency.

Cost reduction

The NPI can help companies to reduce costs. From the example above, reduction in losses of either raw materials or product can increase profit. Improved production efficiency lessens the amount of waste produced, which in turn reduces treatment or disposal costs.

A better understanding of the chemicals used on a site can also reduce costs. By identifying NPI substances in materials used at a facility, toxic substances can be identified[7] and either replaced or used in smaller quantities.

International examples of NPI

The United States has had a program similar to the NPI, the Toxics Release Inventory, since 1988. A report produced in 2003 gave a number of examples of cost savings in industry. One included the relocation of ‘a methanol stripper purge line that resulted in the recovery of 9,300 gallons of methanol that previously underwent biological waste treatment’. This would have resulted in decreased disposal costs for the company.

[7] Substance profiles on the NPI pollutants are available on the NPI web site

Environmental performance

NPI data provides a measure of current environmental performance. With a good understanding of on-site processes, emissions from one facility can be compared with those from similar facilities to establish reduction targets or set goals for environmental performance. Once the targets are set, NPI data can be used to monitor the facility's progress towards achieving its goals.

Examples of environmental goals that the NPI can monitor are decreases in emission levels and the reduction or elimination of toxic chemicals.

The NPI database allows for inter-facility comparisons of emissions. This could be used by a facility to inform other operations in its industry sector about emission reduction techniques.

Public relations

The environment is a topical issue and the NPI process allows facilities to report on their emissions and what they are doing to reduce them. Facilities can use the data to demonstrate their environmental progress.

Substance profiles

Substance profiles on NPI pollutants can be obtained from the NPI web site: <www.npi.gov.au>

Information available includes:

- physical & chemical properties
- common uses
- sources of emissions
- health & environmental effects
- NPI rank.

3.2 Public use

The public can use the NPI web site to learn more about the sources and types of NPI pollutants in their local area. They can compare the emissions from their everyday activities, such as driving a car, with those from nearby industrial facilities (diffuse emissions versus industry emissions). The 'Make a Map' function on the NPI web site allows people to search for a postcode and find out about emission sources in their neighbourhood or in areas to which they may be considering moving.

The fact that facilities report on a yearly basis means that the public can track the environmental behaviour of companies. Tracking could be simply noting which companies report on a regular basis. Alternatively a more in-depth study could focus on the actual emission levels of the companies.

By using the substance profiles on NPI pollutants, communities can learn about pollutants and the health and environmental risks posed by them. This knowledge, combined with NPI data, allows communities to communicate in an informed manner with polluters on matters such as reducing emissions. It can also assist communities to participate effectively in environmental decision making by using the NPI data to demonstrate issues that may require addressing.

What emissions come from wood combustion?

Burning wood produces a large number of NPI substances, including heavy metals and hydrocarbons, that are emitted to the environment. Carbon monoxide, volatile organic compounds and particulate matter 10.0 micrometres or less in diameter make up the bulk of pollutants in wood smoke. In 2003–04, wood heating was the second highest source of air emissions in the Adelaide airshed.

3.3 Government use

Federal, state and local governments can use NPI data for policy and planning, as well as for facility regulation. Government can use the NPI data combined with the NPI mapping facility to identify geographical areas of high emissions (for example, areas from which high nutrient loads enter water) and then target these areas for policy and regulation development (for example, by setting output limits, receiving environment targets).

By searching the NPI by industry sector, a sector with significant emissions could be earmarked for improvement. This information can assist government to set work priorities and allocate resources by focusing on the most pressing issues in that industry sector.

Regulators can use the NPI data in a similar manner to industry—to check on a facility's performance. By comparing it with other facilities of a similar size and type, regulators can set target limits. The NPI then monitors performance and indicates whether or not the facility is complying with those limits. Facilities with high emissions compared to other facilities in their industry sector can be encouraged to improve their environmental performance.

As the NPI provides annual pollutant emission data from individual facilities, governments can use it to assess and modify load-based fees.

The NPI also provides important information for 'state of environment' reporting.

3.4 Other businesses use

Businesses other than reporting facilities can use NPI data. Some possible uses include:

- identification of business opportunities: consultants or similar businesses may find NPI reporting facilities that have significant emissions and then offer to design and develop new technologies to reduce emissions
- determination of the environmental performance and commitment of companies by prospective investors
- investigation of potential environmental liabilities (i.e. significant emissions) from a facility by the finance sector—insurance companies, investors, banks etc.

4 Interpreting NPI Data

When interpreting NPI data it is important to understand how the NPI works, its limitations, common causes of data variation, which methods of data analysis to avoid and how emissions are quantified. It is also essential to consider factors that contribute to the emissions, rather than focusing only on the total emission.

4.1 Factors to consider in the NPI setup

Before interpreting NPI data, it is imperative that the assessor understands the program and its limitations.

Pollutant addition

NPI pollutants should be assessed on an individual basis, such as carbon monoxide or nitrogen. This is because adding unrelated pollutants gives a meaningless result. The sum of all emissions from a facility does not provide a valid indication of environmental impact. This is because different pollutants have different effects on the environment (see next section). Small amounts of one pollutant can have a greater effect than large amounts of another pollutant.

To find a facility's total emissions and/or effect, it is necessary to use a weighting system. Once the weighting system is applied, the addition of multiple pollutants can give a useful result.

The other reason for assessing pollutants individually is that adding emissions of different pollutants together can lead to double counting. NPI substances are not always mutually exclusive and substances such as TVOCs may include emissions of other substances reported to the NPI (there are 40 NPI substances included in the Total VOC emission).

Meaningless results

Facility A emits 0.0005 kg polychlorinated dioxins & furans and 20,000 kg carbon monoxide.

Facility B emits 0.001 kg polychlorinated dioxins & furans and 10,000 kg carbon monoxide

If the substances were added it would give:
- facility A: 20,000.0005 kg
- facility B: 10,000.001 kg

Facility A appears to have the highest emissions, but based on toxicity (polychlorinated dioxins & furans are highly toxic) Facility B would probably have a greater effect on the environment.

Double counting

Wineries generally report on emissions from their fermentation process as well as TVOC emissions from fuel usage. A typical NPI report is:

ethanol:3925 kg
TVOC: 4004 kg

Saying that the total emission is 7929 kg would be inaccurate, as ethanol is included in TVOC and makes up 98% of TVOC emissions.

Toxicity, exposure and environmental impact

NPI emission data is simply a measure of the amount of NPI pollutants released into the environment. It does not indicate the exposure, toxicity or environmental effects of those pollutants. Information about these is needed when interpreting NPI data. It is important to consider the following:

- NPI substances vary significantly in their toxicity. Thus a small release of a highly toxic pollutant can have greater environmental effect than a large release of a less toxic pollutant. This, however, is not definitive, since environmental harm is measured by more than just toxicity. Other factors such as mobility, solubility, bioavailability, rate of degradation, bio-concentration, synergistic effects, and products of degradation come into play.
- The environmental medium (air, land or water) and the location from which the pollutant is released will affect the exposure risk to the general population. An air stack emission in a town will result in greater human exposure than an air stack emission in a less densely populated area.
- The pollutant's environmental pathway (mobility, solubility, bioavailability, rate of degradation and bio-concentration) can affect exposure. Increased exposure can result from a pollutant that persists in the environment or accumulates in the food chain.

Trending pollutants not required in initial 36

Reporting on the full list of 90 substances was not required until the fourth reporting period (2001–02). It is important that substances that were not in the initial list of 36 only be analysed from 2001–02 onwards, as data before that period is not comprehensive. The result would be a large increase in total emissions in the 2001–02 reporting period for any substance not included in the original list of 36.

Emission factor changes

NPI manuals are regularly updated to ensure they reflect current practices. When analysing an industry sector it is important to check for changes in the manuals, handbooks and emission factors during the period you are looking at. Alterations to emission factors would lead to a change in emissions across the entire industry sector.

Bakery emission factors

A study of emissions from bakeries showed that the original emission factors for ethanol and TVOC to air (based on US emissions) were too high for Australian bakeries. The emission factors decreased from 2.75 and 2.7522 to 0.83 and 0.832 kg/tonne of bread produced for ethanol and TVOC respectively, leading to a two-thirds reduction in emissions of these pollutants from bakeries. Researching the changes in emission factors shows the assumption that all bakeries improved their performance to reduce emissions would be incorrect.

4.2 Reasons for variation in facility emissions

Each reporting facility is required to calculate its emissions annually. Two factors: real changes (such as process changes) and estimation changes (such as variation in the calculation method) influence the NPI calculation. As the NPI program matures, so does data consistency. However, when interpreting data from the first few years of the program, it is recommended that consideration be given to the information below.

Real changes

Process change

When a facility changes a process, emissions can either increase or decrease. A process change could entail:

- changing the raw materials (e.g. replacing copper sulphate with nickel sulphate would reduce copper emissions but increase nickel emissions)
- manufacturing a new product
- ceasing manufacture of a product
- installing new equipment
- improving emission reduction techniques (refer below).

While these changes are not specifically listed on the NPI web site, accessing the facility's own web site may provide details of process changes.

Production levels

Increases and decreases in emissions can directly reflect changes in production at a facility (although the relationship is not necessarily linear). Production levels are not displayed on the NPI web site, so it is difficult to determine whether this is the cause of data variation.

Emission reduction techniques

Reductions in emissions can be due to initiatives undertaken at a facility. These could include, but are not limited to:

- installing end-of-pipe reductions (e.g. fabric filters, activated carbon filters, flue gas desulphurisation, pre-discharge treatments)
- using cleaner raw materials and chemicals (e.g. aqueous versus organic-based solvents)
- installing vapour or product recovery systems
- improving internal processes (e.g. maintenance scheduling, installing low NO_x burners, material transport, production schedules or inspections)
- modifying and improving processes, equipment, layout or piping (e.g. installing overflow alarms, increasing dust suppression).

Pollution reduction measures introduced by a facility during a reporting year appear with the NPI emission data from that facility on the NPI web site.

Spills

Spills are included in the NPI calculations and, as such, can have a significant effect on emissions. A facility's emissions may be higher if a spill occurred during the reporting period. The NPI web site does not specifically list spills.

Estimation changes

Estimation techniques or methods

There are four general estimation techniques available for a facility to calculate emissions. There is a 5th option available by which a facility can request approval from the environmental agency in their state or territory to use a site-specific estimation technique. A facility may use one, or a combination of, estimation techniques. This may vary for each reporting period. Although facilities are encouraged to maintain a consistent approach to calculating emissions, they can change their method; this often leads to a more accurate emission calculation. Reasons for changing the method of calculation include:

- an increased number of substances being monitored at a facility (estimation technique changing to direct monitoring from emission factor, mass balance or engineering calculations)
- updating of the emission factors in the manuals (further research of an industry sector can reveal that emissions factors could sometimes be more accurate, thus the technique does not change but the additional information leads to more accurate emission factors)
- discovery and correction of an error in a facility's calculation tool (facilities often set up an Excel spreadsheet or similar to calculate emissions and occasionally errors such as an incorrect calculation or factor are discovered and require correction)
- improvement in the accuracy of calculations (a facility can sometimes improve on their calculations by calculating emissions from separate waste streams rather than combining into one).

Monitoring data

The number of samples taken during a reporting year can vary greatly, anything from one per year to daily samples to 5-minute averages. When only a small number of samples are used, variations in results can have a significant effect on the emission quantity as is demonstrated in Table 2.

Table 2 : Effect of number of direct monitoring samples on NPI emission

	Site 1	
	Year 1	**Year 2**
Sample 1	56.8 g/kg	96.3 g/kg
Sample 2	64.4 g/kg	48.2 g/kg
Sample 3	45.6 g/kg	69.7 g/kg
Sample 4	89.9 g/kg	87.2 g/kg
Sample 5	97.2 g/kg	75.6 g/kg
Sample 6	84.3 g/kg	91.4 g/kg
Average	73.02 g/kg	78.07 g/kg
Throughput	600 tonnes	600 tonnes
Emission	43,810 kg	46,840 kg

	Site 2	
	Year 1	**Year 2**
Sample 1	56.8 g/kg	96.3 g/kg
Average	56.8 g/kg	96.3 g/kg
Throughput	600 tonnes	600 tonnes
Emission	34,080 kg	57,780 kg

Number of monitoring samples

The emission result from Site 2 is based on one sample only, thus variation between samples causes variation in the total emission. The Site 1 result shows how additional samples reduce the impact of sample variation.

If a facility only direct-monitors yearly it can apply for an Approved Alternate EET (emission estimation technique) based on its results if:

- emission factors are not suitable for calculating emissions from the site
- the direct monitoring results are reasonably consistent over a number of years.

Errors

One of the commonest causes of variation in NPI data is errors in units, either in a calculation or in the reported emissions. This can result in, for example, a thousand-fold difference—a facility may incorrectly report an emission of 12 tonnes as 12 kg. During the following period, the facility corrects the error and the reported emission is 10,000 kg. It appears as though there has been a dramatic increase in the emission (12 kg to 10,000 kg) but the facility has in fact decreased its emission by 2000 kg.

Errors can also occur as a result of transcription from paper to electronic form or between electronic forms. This can result in an emission being reported for the wrong substance or the actual emission for a substance being incorrect.

The frequency of errors is decreasing each year as the program becomes more familiar to industry. It should be noted that once the data has been published on the NPI web site it cannot be changed, due to Australian Government restrictions.

4.3 Group analysis factors

When assessing facilities as a group (such as industry sectors, all facilities in a state or all facilities in Australia) the site-specific causes of data variation listed in section 4.2 are still relevant. In addition, factors such as size and composition of the group and the presence of dominating reporters must be considered.

Group composition

Since its inception, the number of facilities reporting to the NPI has steadily increased. However, not all facilities have reported every year or on the same substances each year. This is more evident, and more important, when assessing small groups, such as an industry sector or a substance. When assessing a group, it is important to look at the details and not focus entirely on the total emissions, since an increase in the number of reporters can often show up as an increase in emissions.

The example in Table 3 shows how a variation in the number of reporters in the group can affect total emissions. In this example the increase and decrease in emissions follow the increase and decrease in the number of reporters. Although it appears that there is a decrease in emissions from year 2 to 3, this is mainly due to a decrease in the number of companies reporting, rather than a decrease in emissions.

The second example in Table 4 shows the effect of the addition of a large reporter to the group in the second year. To say that that there was an increase in total emissions would be correct. However, when looking at the detail, each facility that reported both years decreased their emissions and new facility caused the increase.

Table 3: Effect of the number of reporters on NPI emission

	Year 1 emissions	Year 2 emissions	Year 3 emissions
Company 1	350	360	
Company 2		870	890
Company 3	500	490	510
Company 4	230	250	240
Company 5	1200	1300	
Company 6		390	
Company 7	990	950	920
Company 8	760	760	800
Total emissions	4030	5370	3360
No. companies reported	6	8	5

Table 4: Effect of new reporters

	Year 1 emissions	Year 2 emissions
Company 1	710,000	620,000
Company 2	520,000	380,000
Company 3	460,000	160,000
Company 4	410,000	340,000
Company 5	110,000	92,000
Company 6	88,000	72,000
Company 7	42,000	41,000
Company 8	360	
Company 9		1,100,000
Company 10		15,000
Total	2,340,360	2,820,000

Group size

It is important that when reporting on the emissions of a group of industries that the nature of the group is specified. One facility is not representative of an entire industry, but it may be representative of the NPI reporters within that industry sector. For example, the ANZSIC Class 141 Construction Material Mining has only one reporter in South Australia. A statement that 'emissions from the construction material mining industry have doubled' would be misleading when, in fact, the increase in emissions is from one facility, which in terms of NPI reporting makes up the entire industry.

Dominating reporters

When one facility contributes a large percentage of the total emissions of a group, that facility also dominates the data variation and must be considered when interpreting the data. If the dominant facility's emissions increase, the total emissions for the group will most likely also increase. Variations in emissions from other facilities in the group, or changes in the number of facilities reporting, may have little or no effect on the trend, as a dominant reporter can mask the overall trend of the majority of facilities.

In Table 5, Company 1 is the dominant reporter and contributes over 99% of the total emissions. A statement saying that there was an increase in emissions of 2.4% for the group would be accurate, but is misleading. All other facilities in the group decreased their emissions; the increase was entirely due to one facility (a 2.6% increase by the dominant reporter). This information should be considered in any data interpretation.

Table 5 : Effect of a dominant reporter on NPI emissions

	Year 1 emission	Year 2 emission	Percent contributio n
Company 1	76,000	78,000	99.626%
Company 2	370	250	0.319%
Company 3	47	34	0.043%
Company 4	32		
Company 5	16	7.8	0.010%
Company 6	9.8		
Company 7	1.7	0.8	0.001%
Company 8	0.81	0.23	0.000%
Total emissions	76,477.31	78,292.83	

4.4 Suggestions for interpreting NPI data

Indicative top sources

The method employed by the NPI web site to compare sources is to convert each emission into proportional units, thus deriving the indicative top sources. Although this method provides an equal weighting for each pollutant, it does not account for variations in toxicity, exposure or environmental effect. The example below shows how this method works.

Table 6: Calculation of equivalent percentage units in a queried area[8]

Substance	Total emissions	Motor vehicles		Repeat for all sources
		Emission	Proportional emission units [emission/total × 100]	
Benzene	30,000 kg	28,000 kg	28,000/30,000 × 100 = 94.1	. . . .
Chromium (VI) compounds	4.4 kg	3.7 kg	3.7/4.4 × 100 = 80.8	. . . .
Repeat for all substances	. . . .	. . . .	. . . .	. . . .
Total proportional units			Sum for each source	

Explanation of Table 6: The total reported emission for benzene in the queried area is 30,000 kg. Motor vehicles emit 28,000 kg.
The proportional units for motor vehicles for benzene are therefore = 28,000/30,000 × 100 = 94.1.
If the same procedure is applied for chromium (VI) compounds: proportional units = 3.7/4.4 × 100 = 80.8.
This calculation then needs to be repeated for each substance and source combination. The proportional units are then added to provide a total contribution from that source to the emission profile of the area.

Weightings based on toxicity

To provide an indication of the quantity of pollutants a facility is emitting to the environment, based on toxicity, a weighting system needs to be applied. Some examples of this are the USA cancer and non-cancer risk scores for air and water. These weighting systems are based on toxic equivalency potential (TEP) which determines the relative human health risk resulting from release of a chemical, compared to the risk posed by release of a reference chemical (toluene).

It is important that, when using a weighting system, you understand and consider the potential biases of the system. The USA non-cancer risk score weightings tend to highlight the risk of human exposure to heavy metals, hence the dominance of industries with large emissions of heavy metals.

Identification of sources of NPI pollutants

The NPI web site's 'Make a Map' function can be used to provide general and specific detail on NPI pollutants based on:

- location: year, postcode, state, local government area, airshed or water catchment
- facility: year, facility name and location
- substance: year, substance name, CASR number and location
- source: year, ANZSIC Group, ANZSIC Class and location.

For each search, the map will show the location of reporting facilities that meet the criteria specified and a report will be produced that lists the sources and quantities of NPI pollutants emitted. An example of the map produced when searching for ANZSIC

[8] NPI web site <www.npi.gov.au>

Class 2183 Wine Manufacturing in SA is shown in Figure 3. The small blue squares represent reporting facilities and the larger red squares indicate reporting facilities with the ANZSIC Class 2183.

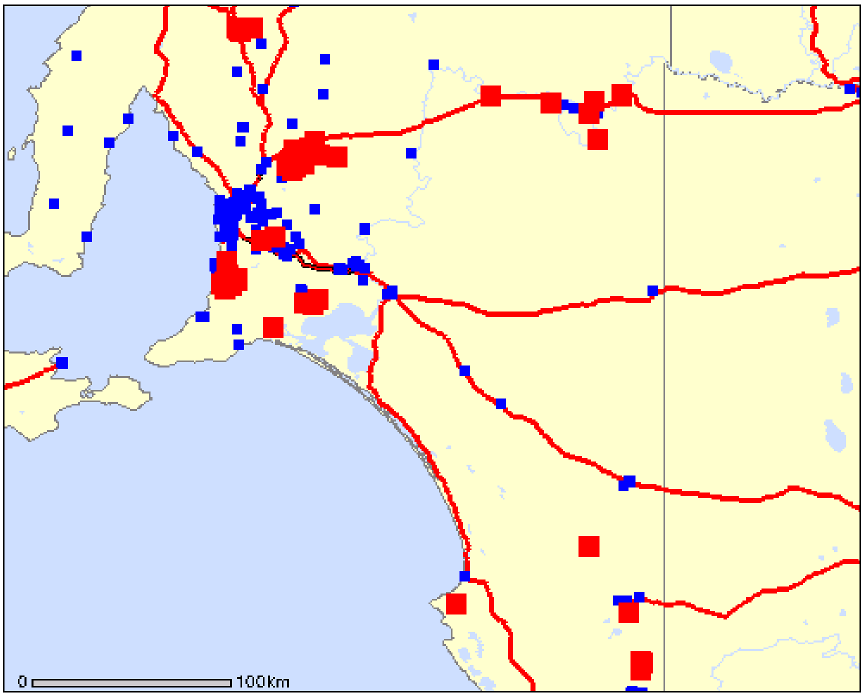

Figure 3: Location of wineries reporting to the NPI in South Australia

The report produced provides information on:

- the sources of NPI pollutants in that area (both facility and diffuse emission data)
- the types of NPI pollutants emitted
- the quantity of pollutants emitted.

By restricting the search criteria, information about particular NPI pollutants or areas can be obtained.

4.5 Diffuse emissions

The South Australian EPA has only calculated water diffuse emissions for the 1998–99 period. Air diffuse emissions were calculated for 1998–1999 and then updated for 2002–03. Currently only the most recent diffuse data appears on the web site, so no variation in diffuse data will be observed between reporting periods.

References

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Appendix A—Risk scoring system

This risk scoring system was developed by Drs. Edgar Hertwich and William Pease, in collaboration with colleagues at the School of Public Health at the University of California at Berkeley. It is available at <*www.scorecard.org/env-releases/def/tep_gen.html*>

Note: substances that did not have a suitable weighting value were given a default value of 1.

Corresponding NPI substance	EDF chemical name	CAS OR EDF ID	Risk Score			
			Cancer air release	Cancer water release	Non-cancer air release	Non-cancer water release
1,1,1,2-tetrachloroethane	1,1,1,2-tetrachloroethane	630-20-6	3.1	0.28	56	5
1,1,2-trichloroethane	1,1,2-trichloroethane	79-00-5	2.1	2.4	4.9	14
1,2-dibromoethane	1,2-dibromoethane	106-93-4	6.2	12	1500	1300
1,2-dichloroethane	1,2-dichloroethane	107-06-2	2.5	2.9	4.2	4.8
1,3-butadiene (vinyl ethylene)	1,3-butadiene	106-99-0	0.53	4.8	2.2	7.5
2-ethoxyethanol					1	1
2-ethoxyethanol acetate					1	1
2-methoxyethanol					1	1
2-methoxyethanol acetate					1	1
4,4'-methylene-bis (2-chloroaniline) (moca)					1	1
acetaldehyde	acetaldehyde	75-07-0	0.016	0.0063	9.3	5.1
acetic acid (ethanoic acid)					1	1
acetone	acetone	67-64-1			0.079	0.076
acetonitrile	acetonitrile	75-05-8			30	15
acrylamide	acrylamide	79-06-1	130	1.6	2000	25
acrylic acid	acrylic acid	79-10-7			62	0.22
acrylonitrile (2-propenenitrile)	acrylonitrile	107-13-1	3.9	1.6	38	19
ammonia (total)	ammonia	7664-41-7			3.8	0.016
aniline (benzenamine)	aniline	62-53-3	0.01	0.0066	91	57
antimony & compounds	antimony compounds	ADQ500			8100	1500
arsenic & compounds	arsenic (organic or inorganic compounds)	ARF750	2600	630	84000	20000
benzene	benzene	71-43-2	1	0.76	8.1	6.1
benzene hexachloro- (HCB)					1	1
beryllium & compounds	beryllium compounds	BFQ500	26	0	24000	540
biphenyl (1,1-biphenyl)	biphenyl	92-52-4			0.98	3.4
boron & compounds					1	1
cadmium & compounds	cadmium compounds	CAE750	26000	1900	1900000	140000
carbon disulphide	carbon disulphide	75-15-0			1.2	1.8

Corresponding NPI substance	EDF chemical name	CAS OR EDF ID	Risk Score			
			Cancer air release	Cancer water release	Non-cancer air release	Non-cancer water release
carbon monoxide	carbon monoxide	630-08-0			0.14	
chlorine					1	1
chlorine dioxide					1	1
chloroethane (ethyl chloride)	chloroethane	75-00-3			0.024	0.024
chloroform (trichloromethane)	chloroform	67-66-3	1.6	1.5	14	16
chlorophenols (di, tri, tetra)					1	1
chromium (III) compounds	chromium	7440-47-3	130	0	2400	260
chromium (VI) compounds	chromium compounds	CMJ500	130	0	3100	440
cobalt & compounds	cobalt compounds	CNB850			31000	65
copper & compounds	copper compounds	CNK750			11000	6600
cumene (1-methylethylbenzene)	cumene	98-82-8			0.41	0.38
cyanide (inorganic) compounds					1	1
cyclohexane	cyclohexane	110-82-7			0.057	0.26
di-(2-ethylhexyl) phthalate (DEHP)					1	1
dibutyl phthalate	dibutyl phthalate	84-74-2			11	1.8
dichloromethane	dichloromethane	75-09-2	0.2	0.13	7	4.4
ethanol					1	1
ethyl acetate	ethyl acetate	141-78-6			0.092	0.024
ethyl butyl ketone					1	1
ethylbenzene	ethylbenzene	100-41-4			0.14	0.28
ethylene glycol (1,2-ethanediol)	ethylene glycol monomethyl ether	109-86-4			2	15
ethylene oxide	ethylene oxide	75-21-8	11	5.5	57	29
fluoride compounds	fluorene	86-73-7			3.2	17
formaldehyde (methyl aldehyde)	formaldehyde	50-00-0	0.02	0.00034	16	0.29
glutaraldehyde					1	1
hydrochloric acid	hydrochloric acid	7647-01-0			12	
hydrogen sulphide	hydrogen sulphide	04/06/83			34	59
lead & compounds	lead compounds	LCT000	28	2	580000	42000
magnesium oxide fume					1	1
manganese & compounds	manganese compounds	MAR500			780	3.5
mercury & compounds	mercury compounds	EDF-033			5000000	5400000
methanol	methanol	67-56-1			0.099	0.016
methyl ethyl ketone	methyl ethyl ketone	78-93-3			0.05	0.013
methyl isobutyl ketone	methyl isobutyl ketone	108-10-1			1.4	0.35
methyl methacrylate	methyl methacrylate	80-62-6			0.53	0.93

Corresponding NPI substance	**EDF chemical name**	**CAS OR EDF ID**	**Risk Score**			
			Cancer air release	**Cancer water release**	**Non-cancer air release**	**Non-cancer water release**
methylenebis (phenylisocyanate)					1	1
n-hexane	n-hexane	110-54-3			0.037	6.2
nickel & compounds	nickel compounds	NDB000	2.8	0	3200	26
nickel carbonyl					1	1
nickel subsulphide					1	1
nitric acid	nitric acid	7697-37-2			2.2	
organo-tin compounds					1	1
oxides of nitrogen					1	1
particulate matter 10.0 µm	PM_{10}	EDF-077			1.5	
phenol	phenol	108-95-2			0.38	0.0046
phosphoric acid	phosphoric acid	7664-38-2			16	
polychlorinated dioxins and furans	2,3,7,8-tetrachlorodibenzo-p-dioxin (tcddTCDD)	1746-01-6	1.2E+9	6.9E+8	8.8E+11	4.9E+11
polycyclic aromatic hydrocarbons	pyrene	129-00-0			11	0.24
selenium & compounds	selenium compounds	SBP500			2400	1600
styrene (ethenylbenzene)	styrene	100-42-5			0.085	0.34
sulphur dioxide	sulphur dioxide	05/09/46			3.1	0.79
sulphuric acid					1	1
tetrachloroethylene	tetrachloroethylene	127-18-4	0.96	2.3	57	43
toluene (methylbenzene)	toluene	108-88-3			1	0.88
toluene-2,4-diisocyanate					1	0.88
total nitrogen					1	1
total phosphorus					1	1
total volatile organic compounds					1	1
trichloroethylene	trichloroethylene	79-01-6	0.054	0.14	0.63	1.2
vinyl chloride monomer	vinyl chloride	75-01-4	1.9	4.6	69	140
xylenes (individual or mixed isomers)	xylene (mixed isomers)	1330-20-7			0.27	0.56
zinc and compounds	zinc compounds	ZFS000			190	14