

South Australian  
National Pollutant Inventory

**SUMMARY REPORT**

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ADELAIDE AND REGIONAL AIRSHEDS  
AIR EMISSIONS STUDY 1998-99

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**SUMMARY REPORT – SECTION 5 onward**

## Section 5: Results summary

The results presented in this section provide an overview of all NPI substance emissions by each aggregated source type. The information is provided in the form of tables indicating actual and percentage contributions. Comparisons have been made between airsheds, sources and NPI substances emitted in the Adelaide and each of the major regional airsheds. These are presented according to the following category types: mobile (motor vehicles), mobile (other), area-based, sub-threshold reporting and industry reported sources. Some comparisons are made for the three basic source categories – mobile, area-based and industry.

### 5.1 Results

#### 5.1.1 Total emissions of NPI substances

The total inventory of NPI substances in the Adelaide airshed is presented in Table 40. This table provides a summary of emissions estimated from aggregate sources as well as industry reported emissions for 1999–2000. The aggregate emissions consist of emissions estimated for 1998–99 from the three main source categories – mobile, area-based and sub-threshold facilities. For comparison purposes, industry reported emissions for 1999–2000 are included as opposed to the 1998–99 data. These were considered more complete than the early version that consisted of preliminary data collected during the implementation period of the NPI. For the latest industry reported data, please refer to the NPI Internet database directly: [www.npi.ea.gov.au](http://www.npi.ea.gov.au).

The NPI provides emission estimates for 59 substances in the Adelaide airshed, 58 substances in the South East airshed and 56 substances in the remaining airsheds – Barossa, Port Lincoln, Riverland and Spencer Gulf – from the total list of 90 substances. However, NPI substance emissions were only calculated for those substances where emission factors were available. Substances with no emission data are either not related to the sources studied or emission factors for their estimation were unavailable.

The total NPI substance estimates for the Adelaide airsheds are presented in Table 40. Table 41 indicates the percentage contribution made by individual sources to the total annual emissions of each NPI substance in the Adelaide airshed. These include all aggregate and industry emission sources and the totals for each of the grouped source categories – motor vehicles, other mobile, area-based, sub-threshold and industry reported. The list of substances presented includes only those with actual estimates.

The complete list of NPI substances emitted in the Barossa is presented in Table 42. Emissions from aggregate source emissions are provided separate to those reported by NPI reporting facilities. The percentage contribution made by individual sources to the annual total of each NPI substance is presented in Table 43.

Similarly, total annual estimates of NPI substances for the remaining regional airsheds of Port Lincoln, Riverland, South East and Spencer Gulf are presented in Table 44, Table 46, Table 48 and Table 50 respectively. The proportion each source contributes to the total emissions of each substance within these airsheds is presented in Table 45, Table 47, Table 49 and Table 51.

Table 40 Total emissions of NPI substances in the Adelaide airshed

NPI substance	Aggregated emissions	Industry reported (1999-2000)	TOTAL
	TOTAL (kg/yr)	TOTAL (kg/yr)	(kg/yr†)
1 Carbon monoxide	170,758,037	2,630,353	170,000,000
2 Total volatile organic compounds	36,779,465	2,830,390	40,000,000
3 Oxides of nitrogen	22,010,320	7,713,902	30,000,000
4 Particulate matter < 10 µm	8,138,951	2,907,117	11,000,000
5 Sulfur dioxide	1,186,069	2,059,224	3,200,000
6 Toluene (methylbenzene)	2,578,478	343,699	2,900,000
7 Xylenes (individual or mixed isomers)	1,910,713	511,585	2,400,000
8 Formaldehyde (methyl aldehyde)	989,561	1,204	990,000
9 n-Hexane	882,443	109,416	990,000
10 Benzene	903,316	25,034	930,000
11 Acetaldehyde	588,034		590,000
12 Acetone	525,699	16,010	540,000
13 Cyclohexane	504,703	10,993	520,000
14 Methanol	421,658	21	420,000
15 Ammonia (total)	255,952	14,000	270,000
16 Ethylbenzene	263,525	4,738	270,000
17 Polycyclic aromatic hydrocarbons	63,938	190,175	250,000
18 1,3-Butadiene (vinyl ethylene)	159,792	14	160,000
19 Trichloroethylene	102,222	35,700	140,000
20 Tetrachloroethylene	131,153	61	130,000
21 Methyl ethyl ketone	33,565	72,487	110,000
22 Lead & compounds	64,655	463	65,000
23 Ethylene glycol (1,2-ethanediol)	59,426		59,000
24 Dichloromethane	45,967	110	46,000
25 Styrene (ethenylbenzene)	44,735	600	45,000
26 Fluoride compounds	592	43,471	44,000
27 2-Ethoxyethanol acetate	29,619	8,400	38,000
28 Zinc and compounds	29,656	272	30,000
29 Ethanol	13,670	11,000	25,000
30 Manganese & compounds	23,086	17	23,000
31 Methyl isobutyl ketone	18,853	19	19,000
32 Carbon disulfide	0.50	13,000	13,000
33 Ethylene oxide	7,137		7,100
34 Ethyl acetate	6,600		6,600
35 Cumene (1-methylethylbenzene)	4,900	1,026	5,900
36 Copper & compounds	4,757	13	4,800
37 Cobalt & compounds	3,442	0.0043	3,400
38 Nickel & compounds	2,318	440	2,800
39 Hydrogen sulfide	1,554		1,600
40 Arsenic & compounds	1,342	44	1,400
41 Cadmium & compounds	683	32	720
42 Chromium (III) compounds	668		670
43 Mercury & compounds	479	12	490
44 Chloroform (trichloromethane)	468		470
45 Chromium (VI) compounds	399	30	430
46 Sulfuric acid		424	420
47 Antimony & compounds	394	27	420
48 1,2-Dichloroethane	2.2	350	350
49 Hydrochloric acid	143	173	320
50 Phenol	131	53	180
51 Selenium & compounds	69	4.0	73
52 Biphenyl (1,1'-biphenyl)	10		10
53 Cyanide (inorganic) compounds	9.5		9.5
54 Nickel carbonyl		4.8	4.8
55 Beryllium & compounds	3.3	0.00093	3.3
56 1,2-Dibromoethane		3.2	3.2
57 Nickel subsulfide		0.60	0.60
58 Di-(2-Ethylhexyl) phthalate (DEHP)	0.28		0.28
59 Acrylic acid	0.0019		0.0019

† Total emissions to 2 significant figures



Table 4.1 (cont) Aggregate source contribution to total emissions (%) in the Adelaide airshed

ADELAIDE AIRSHED	MOBILE SOURCES (%)		AREA BASED SOURCES (%)											SUB-THRESHOLD FACILITIES (%)			Reporting Facilities 1999-2000 (%)					
	Motor vehicles	OTHER MOBILE	Architectural surface coatings	Cutback Bitumen	Domestic/ Commercial solvents/ aerosols	Dry Cleaning	Gaseous fuel burning (domestic)	Lawn Mowing	Motor Vehicle Refinishing	Paved Roads	Print Shops / Graphic Arts	Service stations	Solid fuel burning (domestic)	TOTAL AREA BASED	Fuel Combustion	Solvent Use		TOTAL SUB-THRESHOLD				
<b>NPI substance %</b>																						
Di-(2-Ethylhexyl) phthalate (DEHP)					<0.1								100.0	100.0					98.7			
Fluoride compounds					<0.1								1.3	1.3					<0.1			
Formaldehyde (methyl aldehyde)	46.9	0.8	0.2	0.2	<0.1								49.5	51.4					0.1			
n-Hexane	31.0	<0.1	<0.1	<0.1	4.1								<0.1	53.2					11.0			
Hydrochloric acid					0.3									0.3					57.3			
Hydrogen sulfide	100.0																					
Lead & compounds	54.2	1.4	<0.1	<0.1									<0.1	43.6					0.7			
Manganese & compounds			<0.1	<0.1									0.2	99.6					<0.1			
Mercury & compounds			<0.1	<0.1									0.1	96.0					2.5			
Methanol													21.1	100.0					<0.1			
Methyl ethyl ketone													4.9	31.6					68.4			
Methyl isobutyl ketone													8.5	99.9					<0.1			
Nickel & compounds		3.0	<0.1	<0.1									<0.1	73.9					16.0			
Nickel carbonyl																			100.0			
Nickel subsulfide																			100.0			
Oxides of nitrogen	60.0	0.7	1.8	<0.1									0.6	1.7					26.0			
Particulate matter < 10 µm	5.1	1.5	0.1	<0.1									13.6	64.9					26.3			
Phenol		71.2											<0.1	<0.1					28.8			
Polycyclic aromatic hydrocarbons	10.8	0.2	<0.1	<0.1									11.8	14.0					74.8			
Selenium & compounds			<0.1										8.9	91.8					5.5			
Styrene (ethenylbenzene)	77.4	0.5	0.1	<0.1									16.3	20.6					1.3			
Sulfur dioxide	19.7	1.3	0.7	<0.1									1.8	2.0					63.5			
Sulfuric acid																			100.0			
Tetrachloroethylene													<0.1	100.0					<0.1			
Toluene (methylbenzene)	59.3	<0.1	<0.1	0.2									0.8	2.7					11.8			
Total volatile organic compounds	43.9	0.1	<0.1	0.1									4.0	47.9					7.1			
Trichloroethylene													0.2	0.2					25.9			
Xylenes (individual or mixed isomers)	62.6	<0.1	<0.1	<0.1									0.4	1.7					21.1			
Zinc and compounds			<0.1	<0.1									2.6	96.5					0.9			
TOTAL SUBSTANCE COUNT (N)	20	22	27	23	30	32	13	10	20	4	24	23	9	12	1	10	36	53	29	1	29	48

Table 42 Total emissions of NPI substances in the Barossa airshed

NPI substance		Aggregated emissions TOTAL (kg/yr)	Industry reported (1999-2000) TOTAL (kg/yr)	TOTAL (kg/yr†)
1	Carbon monoxide	4,036,560	89,000	4,100,000
2	Oxides of nitrogen	735,428	1,134,350	1,900,000
3	Particulate matter < 10 µm	388,064	1,182,760	1,600,000
4	Total volatile organic compounds	863,394	130	860,000
5	Toluene (methylbenzene)	51,813		52,000
6	Xylenes (individual or mixed isomers)	38,770		39,000
7	Formaldehyde (methyl aldehyde)	32,340		32,000
8	Sulfur dioxide	18,098	7,900	26,000
9	Benzene	23,253		23,000
10	Acetaldehyde	22,793	170	23,000
11	Acetone	18,519		19,000
12	n-Hexane	18,371		18,000
13	Cyclohexane	7,638		7,600
14	Methanol	6,070		6,100
15	Ethylbenzene	5,428		5,400
16	Ammonia (total)	5,170		5,200
17	1,3-Butadiene (vinyl ethylene)	3,535		3,500
18	Polycyclic aromatic hydrocarbons	2,917	2.8	2,900
19	Lead & compounds	2,085	28	2,100
20	Trichloroethylene	1,403		1,400
21	Zinc and compounds	1,448		1,400
22	Manganese & compounds	1,137		1,100
23	Styrene (ethenylbenzene)	1,030		1,000
24	Tetrachloroethylene	890		890
25	Ethylene glycol (1,2-ethanediol)	852		850
26	Methyl ethyl ketone	843		840
27	Fluoride compounds	2.6	790.37	790
28	Dichloromethane	660		660
29	2-Ethoxyethanol acetate	430		430
30	Methyl isobutyl ketone	268		270
31	Copper & compounds	233		230
32	Ethanol	194		190
33	Cobalt & compounds	168		170
34	Cumene (1-methylethylbenzene)	138		140
35	Ethylene oxide	100		100
36	Nickel & compounds	104		100
37	Ethyl acetate	94		94
38	Hydrogen sulfide	32		32
39	Mercury & compounds	24	7.4	31
40	Cadmium & compounds	30		30
41	Arsenic & compounds	22	2.3	25
42	Antimony & compounds	19		19
43	Chromium (VI) compounds	1.8	16	18
44	Chloroform (trichloromethane)	6.7		6.7
45	Selenium & compounds	3.4		3.4
46	Chromium (III) compounds	3.1		3.1
47	Nickel carbonyl		1.9	1.9
48	Hydrochloric acid	0.56		0.56
49	Biphenyl (1,1'-biphenyl)	0.43		0.43
50	Cyanide (inorganic) compounds	0.039		0.039
51	Beryllium & compounds	0.035		0.035
52	1,2-Dichloroethane	0.032		0.032
53	Carbon disulfide	0.0020		0.0020
54	Di-(2-Ethylhexyl) phthalate (DEHP)	0.0011		0.0011
55	Phenol	0.00025		0.00025
56	Acrylic acid	0.000027		0.000027

† Total emissions to 2 significant figures

Table 43 Percentage contribution by source to the total emission of NPI substances in the Barossa airshed

BAROSSA AIRSHED (TOTAL)	MOBILE SOURCES (%)		AREA BASED SOURCES (%)											SUB-THRESHOLD FACILITIES (%)		Reporting Facilities 1999-2000 (%)	
	Motor vehicles	OTHER MOBILE	Architectural surface coatings	Cutback Bitumen	Domestic/ Commercial solvents/ aerosols	Dry Cleaning	Gaseous fuel burning (domestic)	Lawn Mowing	Motor Vehicle Refinishing	Paved Roads	Print Shops / Graphic Arts	Service stations	Solid fuel burning (domestic)	TOTAL AREA BASED	Fuel Combustion		Solvent Use
<b>NPI substance %</b>																	
Acetaldehyde	12.4	-	0.2	-	-	-	-	-	-	-	-	-	86.7	86.7	-	-	0.7
Acetone	13.5	-	-	-	-	-	-	-	-	-	-	-	80.5	86.5	-	-	
Acrylic acid		-	-	-	-	-	-	-	-	-	-	-	100.0	100.0	-	-	
Ammonia (total)	100.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Antimony & compounds		-	0.7	-	-	-	-	-	96.7	-	-	2.6	99.3	99.3	<0.1	<0.1	
Arsenic & compounds		-	<0.1	-	-	-	<0.1	87.2	87.2	-	1.4	88.6	88.6	88.6	2.0	2.0	9.4
Benzene	60.0	-	0.1	-	-	-	<0.1	<0.1	<0.1	11.1	1.7	26.9	39.7	39.7	<0.1	<0.1	
Beryllium & compounds		-	-	-	-	-	<0.1	<0.1	<0.1	-	-	14.2	14.2	14.2	85.8	85.8	
Biphenyl (1,1'-biphenyl)		-	-	-	-	-	-	-	100.0	-	-	-	100.0	100.0	-	-	
1,3-Butadiene (vinyl ethylene)	74.6	-	0.7	-	-	-	9.3	9.3	-	-	-	15.4	24.7	24.7	-	-	
Cadmium & compounds		-	0.2	-	-	-	<0.1	89.8	89.8	-	-	0.8	90.5	90.5	9.3	9.3	
Carbon disulfide		-	-	-	-	-	-	-	-	-	-	100.0	100.0	100.0	-	-	
Carbon monoxide	68.7	-	0.1	-	-	-	<0.1	<0.1	<0.1	3.9	20.2	20.2	24.1	24.1	4.9	4.9	2.1
Chloroform (trichloromethane)		-	-	-	-	-	-	-	100.0	-	-	-	100.0	100.0	-	-	
Chromium (III) compounds		-	0.2	-	-	-	8.4	15.6	-	-	-	-	24.0	24.0	75.8	75.8	
Chromium (VI) compounds		-	<0.1	-	-	-	0.6	1.1	-	-	-	2.5	4.2	4.2	5.8	5.8	90.0
Cobalt & compounds		-	<0.1	-	-	-	0.8	0.4	98.6	-	-	<0.1	99.8	99.8	0.1	0.1	
Copper & compounds		-	<0.1	-	-	-	<0.1	0.3	98.7	-	-	-	99.0	99.0	0.9	0.9	
Cumene (1-methylethylbenzene)		-	-	-	-	-	-	-	74.5	-	25.5	-	100.0	100.0	-	-	
Cyanide (inorganic) compounds		-	-	-	-	-	-	-	-	-	-	100.0	100.0	100.0	-	-	
Cyclohexane	6.6	-	-	-	-	-	<0.1	1.0	0.2	0.3	0.3	-	90.5	90.5	2.9	2.9	
1,2-Dichloroethane		-	-	-	-	-	-	-	100.0	-	-	-	100.0	100.0	-	-	
Dichloromethane		-	-	-	-	-	-	-	37.9	-	-	<0.1	100.0	100.0	-	-	
Ethanol		-	-	-	-	-	-	-	100.0	-	-	-	100.0	100.0	-	-	
2-Ethoxyethanol acetate		-	-	-	-	-	-	-	-	-	-	-	100.0	100.0	-	-	
Ethyl acetate		-	-	-	-	-	-	-	100.0	-	-	-	100.0	100.0	-	-	
Ethylbenzene	88.0	-	<0.1	-	-	-	11.0	0.2	0.1	0.3	0.4	<0.1	12.0	12.0	<0.1	<0.1	
Ethylene glycol (1,2-ethanediol)		-	-	-	-	-	-	-	27.2	72.8	-	-	100.0	100.0	-	-	
Ethylene oxide		-	-	-	-	-	-	-	100.0	-	-	-	100.0	100.0	-	-	

Table 43 (cont) Percentage contribution by source to the emissions of NPI substances in the Barossa airshed

BAROSSA AIRSHED (TOTAL)	MOBILE SOURCES (%)		AREA BASED SOURCES (%)											SUB-THRESHOLD FACILITIES (%)			Reporting Facilities 1999-2000 (%)	
	Motor vehicles	OTHER MOBILE	Cutback Bitumen	Architectural surface coatings	Domestic/ Commercial solvents/ aerosols	Dry Cleaning	Gaseous fuel burning (domestic)	Lawn Mowing	Motor Vehicle Refinishing	Paved Roads	Print Shops / Graphic Arts	Service stations	Solid fuel burning (domestic)	TOTAL AREA BASED	Fuel Combustion	Solvent Use		TOTAL SUB-THRESHOLD
<b>NPI substance %</b>																		
Di-(2-Ethylhexyl) phthalate (DEHP)	-	-	-	-	<0.1	100.0	100.0	100.0	0.3	0.3	<0.1	<0.1	<0.1	99.7	<0.1	<0.1	<0.1	99.7
Fluoride compounds	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Formaldehyde (methyl aldehyde)	30.0	0.4	30.0	0.4	<0.1	67.5	68.9	1.4	<0.1	<0.1	<0.1	<0.1	<0.1	68.9	0.6	0.6	0.6	0.6
n-Hexane	34.1	0.1	34.1	0.1	<0.1	3.1	41.2	0.9	<0.1	<0.1	0.3	<0.1	<0.1	41.2	24.5	24.5	24.5	24.5
Hydrochloric acid	-	-	-	-	-	2.1	2.1	-	-	-	-	-	-	2.1	97.9	97.9	97.9	97.9
Hydrogen sulfide	100.0	-	100.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lead & compounds	34.1	<0.1	34.1	<0.1	<0.1	64.0	64.4	0.5	<0.1	<0.1	<0.1	<0.1	<0.1	64.4	<0.1	<0.1	<0.1	1.3
Manganese & compounds	-	<0.1	-	<0.1	<0.1	99.7	99.9	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	99.9	<0.1	<0.1	<0.1	<0.1
Mercury & compounds	-	<0.1	-	<0.1	<0.1	73.9	73.9	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	73.9	2.1	2.1	2.1	23.9
Methanol	-	-	-	-	-	79.1	100.0	-	-	-	-	-	-	100.0	-	-	-	-
Methyl ethyl ketone	-	-	-	-	-	40.3	100.0	-	-	-	7.6	52.1	100.0	100.0	-	-	-	-
Methyl isobutyl ketone	-	-	-	-	-	19.0	100.0	-	-	-	8.6	100.0	100.0	100.0	-	-	-	-
Nickel & compounds	-	<0.1	-	<0.1	<0.1	93.7	94.7	0.6	0.3	0.6	93.7	<0.1	<0.1	94.7	5.2	5.2	5.2	5.2
Nickel carbonyl	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0
Oxides of nitrogen	23.0	2.1	23.0	2.1	0.1	<0.1	0.7	<0.1	0.1	<0.1	<0.1	0.6	0.7	0.7	13.5	13.5	13.5	60.7
Particulate matter < 10 µm	0.7	<0.1	0.7	<0.1	<0.1	17.4	22.6	<0.1	<0.1	<0.1	17.4	5.2	22.6	22.6	1.2	1.2	1.2	75.3
Phenol	-	-	-	-	-	-	100.0	-	-	-	-	100.0	100.0	100.0	-	-	-	-
Polycyclic aromatic hydrocarbons	19.1	0.4	19.1	0.4	<0.1	4.8	80.3	4.8	<0.1	<0.1	<0.1	75.2	80.3	80.3	<0.1	<0.1	<0.1	0.1
Selenium & compounds	-	0.1	-	0.1	10.7	84.5	98.1	-	10.7	-	84.5	3.0	98.1	98.1	1.8	1.8	1.8	1.8
Styrene (ethenylbenzene)	69.5	0.2	69.5	0.2	<0.1	4.4	30.5	4.4	<0.1	<0.1	<0.1	26.0	30.5	30.5	-	-	-	-
Sulfur dioxide	51.1	6.5	51.1	6.5	<0.1	0.5	8.2	0.5	<0.1	<0.1	0.5	7.7	8.2	8.2	3.8	3.8	3.8	30.4
Tetrachloroethylene	-	-	-	-	-	21.3	100.0	-	-	-	-	<0.1	100.0	100.0	-	-	-	-
Toluene (methylbenzene)	68.1	<0.1	68.1	<0.1	<0.1	8.2	31.9	8.2	<0.1	<0.1	8.2	7.9	31.9	31.9	<0.1	<0.1	<0.1	<0.1
Total volatile organic compounds	40.9	0.2	40.9	0.2	<0.1	5.3	57.0	5.3	<0.1	<0.1	5.3	30.1	57.0	57.0	1.6	0.2	1.8	<0.1
Trichloroethylene	-	-	-	-	-	0.2	0.2	-	-	-	-	-	0.2	0.2	99.8	99.8	99.8	99.8
Xylenes (individual or mixed isomers)	79.4	<0.1	79.4	<0.1	<0.1	3.6	20.5	8.2	<0.1	<0.1	3.6	4.6	20.5	20.5	<0.1	<0.1	<0.1	<0.1
Zinc and compounds	-	<0.1	-	<0.1	<0.1	92.2	94.9	<0.1	<0.1	<0.1	92.2	2.7	94.9	94.9	5.0	5.0	5.0	5.0
TOTAL SUBSTANCE COUNT (N)	20	27	20	27	2	24	23	9	12	1	10	36	53	53	29	2	30	13

(-) source not available in airshed

Table 44 Total emissions of NPI substances in the Port Lincoln airshed

NPI substance	Aggregated emissions TOTAL (kg/yr)	Industry reported (1999-2000) TOTAL (kg/yr)	TOTAL (kg/yr) <sup>†</sup>
1	Carbon monoxide	2,201,640	2,200,000
2	Total volatile organic compounds	589,937	620,000
3	Oxides of nitrogen	247,625	250,000
4	Particulate matter < 10 µm	219,055	220,000
5	Sulfur dioxide	46,526	47,000
6	Toluene (methylbenzene)	32,712	33,000
7	Formaldehyde (methyl aldehyde)	24,535	25,000
8	Xylenes (individual or mixed isomers)	22,183	22,000
9	Acetaldehyde	18,448	18,000
10	Benzene	16,018	17,000
11	Acetone	14,947	15,000
12	n-Hexane	8,997	9,400
13	Cyclohexane	5,972	6,000
14	Methanol	4,950	5,000
15	Ethylbenzene	3,041	3,100
16	Polycyclic aromatic hydrocarbons	2,401	2,400
17	1,3-Butadiene (vinyl ethylene)	2,255	2,300
18	Ammonia (total)	2,131	2,100
19	Trichloroethylene	1,303	1,300
20	Tetrachloroethylene	986	990
21	Lead & compounds	860	860
22	Methyl ethyl ketone	713	710
23	Ethylene glycol (1,2-ethanediol)	706	710
24	Styrene (ethenylbenzene)	678	680
25	Dichloromethane	619	620
26	Zinc and compounds	547	550
27	Manganese & compounds	540	540
28	2-Ethoxyethanol acetate	348	350
29	Methyl isobutyl ketone	226	230
30	Ethanol	165	170
31	Ethylene oxide	112	110
32	Copper & compounds	78	90
33	Cumene (1-methylethylbenzene)	84	84
34	Ethyl acetate	82	82
35	Chromium (VI) compounds	78	78
36	Nickel & compounds	75	75
37	Cobalt & compounds	71	71
38	Arsenic & compounds	34	34
39	Chromium (III) compounds	17	17
40	Hydrogen sulfide	16	16
41	Cadmium & compounds	13	13
42	Mercury & compounds	11.0	11.0
43	Phenol	9.6	9.6
44	Antimony & compounds	7.9	7.9
45	Chloroform (trichloromethane)	5.5	5.5
46	Fluoride compounds	2.1	2.1
47	Selenium & compounds	2.0	2.0
48	Hydrochloric acid	0.66	0.66
49	Beryllium & compounds	0.41	0.41
50	1,2-Dibromoethane		0.30
51	Biphenyl (1,1'-biphenyl)	0.21	0.21
52	Cyanide (inorganic) compounds	0.034	0.034
53	1,2-Dichloroethane	0.026	0.026
54	Carbon disulfide	0.0018	0.0018
55	Di-(2-Ethylhexyl) phthalate (DEHP)	0.0010	0.0010
56	Acrylic acid	0.000022	0.000022

† Total emissions to 2 significant figures



Table 43 (cont) Percentage contribution by source to the emissions of NPI substances in the Port Lincoln airshed

PORT LINCOLN AIRSHED (TOTAL)	MOBILE SOURCES (%)		AREA BASED SOURCES (%)												SUB-THRESHOLD FACILITIES (%)			Reporting Facilities 1999-2000 (%)						
	Motor vehicles	OTHER MOBILE	Architectural surface coatings	Cutback Bitumen	Domestic/ Commercial solvents/ aerosols	Dry Cleaning	Gaseous fuel burning (domestic)	Lawn Mowing	Motor Vehicle Refinishing	Paved Roads	Print Shops / Graphic Arts	Service stations	Solid fuel burning (domestic)	TOTAL AREA BASED	Fuel Combustion	Solvent Use	TOTAL SUB-THRESHOLD							
<b>NPI substance %</b>																								
Di-(2-Ethylhexyl) phthalate (DEHP)														100.0	100.0									
Fluoride compounds										3.7				93.1	96.8	3.2		3.2						
Formaldehyde (methyl aldehyde)	16.0	2.1	0.1	0.6	1.2	4.0				<0.1	2.8			77.1	79.9	<0.1								
n-Hexane	27.6	<0.1	0.4	0.9	1.4					5.1	1.7			<0.1	67.1	<0.1			3.8					
Hydrochloric acid	100.0									1.5					1.5	98.5								
Hydrogen sulfide																								
Lead & compounds	30.2	2.4	<0.1	0.1	<0.1	2.5				<0.1	1.2			0.1	67.2	<0.1								
Manganese & compounds			<0.1	<0.1	<0.1					<0.1	0.2			0.2	100.0	<0.1								
Mercury & compounds			<0.1	0.1	0.1									<0.1	99.8	<0.1								
Methanol										78.8				21.2	100.0									
Methyl ethyl ketone										39.3				73.0	100.0									
Methyl isobutyl ketone										18.6				7.4	100.0									
Nickel & compounds		2.9	<0.1	<0.1	33.1	36.1					1.5			61.7	63.6	0.2			0.2					
Oxides of nitrogen	67.9	0.6	3.5	<0.1	21.4	25.4					0.8			3.8	4.8	1.8								
Particulate matter < 10 µm	2.1	1.9	<0.1	<0.1	2.6	4.5					<0.1			32.4	93.2	<0.1								
Phenol		100.0				100.0								<0.1										
Polycyclic aromatic hydrocarbons	9.5	1.5	0.1	0.4	<0.1	2.0					9.2			79.1	88.5	<0.1								
Selenium & compounds			<0.1		12.3	12.3								4.5	87.6	<0.1								
Styrene (ethenylbenzene)	47.7	2.1	0.8	<0.1	2.9						12.1			37.2	49.3									
Sulfur dioxide	11.2	0.2	0.8	<0.1	81.7	82.7					0.3			3.9	4.2	1.9								
Tetrachloroethylene										18.6	81.4			<0.1	100.0									
Toluene (methylbenzene)	43.8	<0.1	<0.1	1.8	0.3	2.1					21.2			10.5	52.3	<0.1			1.8					
Total volatile organic compounds	23.6	0.5	<0.1	0.8	0.5	1.8					<0.1			37.3	69.9	<0.1	0.2	0.2	4.4					
Trichloroethylene										0.2				0.2			99.8	99.8						
Xylenes (individual or mixed isomers)	56.9	<0.1	<0.1	0.8	0.2	1.0				4.9	23.2			7.1	41.2	<0.1			0.7					
Zinc and compounds			<0.1	<0.1	0.1	0.1					0.2			5.0	99.8	<0.1								
TOTAL SUBSTANCE COUNT (N)	20	22	27	23	30	32				20	2	19	23	9	12	1	10	2	29	53	36	2	30	10

Table 46 Total emissions of NPI substances in the Riverland airshed

NPI substance		Aggregated emissions TOTAL (kg/yr)	Industry reported (1999-2000) TOTAL (kg/yr)	TOTAL (kg/yr†)
1	Carbon monoxide	5,566,215	1,000	5,600,000
2	Total volatile organic compounds	1,442,457	22,500	1,500,000
3	Oxides of nitrogen	638,428	3,400	640,000
4	Particulate matter < 10 µm	324,743	93	320,000
5	Toluene (methylbenzene)	94,435	314	95,000
6	Sulfur dioxide	23,415	22,006	45,000
7	Xylenes (individual or mixed isomers)	56,906	83	57,000
8	Formaldehyde (methyl aldehyde)	56,887		57,000
9	Acetaldehyde	43,751		44,000
10	Benzene	40,346	300	41,000
11	Acetone	31,114		31,000
12	n-Hexane	22,445	320	23,000
13	Cyclohexane	12,599	22	13,000
14	Methanol	10,620		11,000
15	Ethylbenzene	8,239	12	8,300
16	1,3-Butadiene (vinyl ethylene)	6,529	0.4	6,500
17	Ammonia (total)	5,933		5,900
18	Polycyclic aromatic hydrocarbons	5,218	1	5,200
19	Tetrachloroethylene	3,140		3,100
20	Trichloroethylene	2,106		2,100
21	Lead & compounds	1,705		1,700
22	Styrene (ethenylbenzene)	1,578		1,600
23	Ethylene glycol (1,2-ethanediol)	1,510		1,500
24	Methyl ethyl ketone	1,490		1,500
25	Dichloromethane	1,150		1,200
26	Zinc and compounds	884		880
27	2-Ethoxyethanol acetate	750		750
28	Manganese & compounds	690		690
29	Methyl isobutyl ketone	477		480
30	Ethanol	346		350
31	Cumene (1-methylethylbenzene)	215	2.2	220
32	Ethylene oxide	180		180
33	Ethyl acetate	160		160
34	Copper & compounds	140		140
35	Cobalt & compounds	104		100
36	Nickel & compounds	61		61
37	Hydrogen sulfide	36		36
38	Cadmium & compounds	17		17
39	Mercury & compounds	14		14
40	Arsenic & compounds	14		14
41	Chloroform (trichloromethane)	12		12
42	Antimony & compounds	12		12
43	Fluoride compounds	4.4		4.4
44	Selenium & compounds	2.6		2.6
45	Chromium (VI) compounds	1.5	0.21	1.7
46	Chromium (III) compounds	1.6		1.6
47	Biphenyl (1,1'-biphenyl)	0.64		0.64
48	Hydrochloric acid	0.64		0.64
49	1,2-Dibromoethane		0.10	0.10
50	Cyanide (inorganic) compounds	0.070		0.070
51	1,2-Dichloroethane	0.055		0.055
52	Beryllium & compounds	0.011		0.011
53	Carbon disulfide	0.0036		0.0036
54	Di-(2-Ethylhexyl) phthalate (DEHP)	0.0020		0.0020
55	Phenol	0.00045		0.00045
56	Acrylic acid	0.000047		0.000047

† Total emissions to 2 significant figures

Table 47 Percentage contribution by source to the total emission of NPI substances in the Riverland airshed

RIVERLAND AIRSHED (TOTAL)	MOBILE SOURCES (%)				AREA BASED SOURCES (%)										SUB-THRESHOLD FACILITIES (%)		Reporting Facilities 1999-2000 (%)		
	Motor vehicles	OTHER MOBILE				Architectural surface coatings	Cutback Bitumen	Domestic/ Commercial solvents/ aerosols	Dry Cleaning	Gaseous fuel burning (domestic)	Lawn Mowing	Motor Vehicle Refinishing	Paved Roads	Print Shops / Graphic Arts	Service stations	Solid fuel burning (domestic)		TOTAL AREA BASED	Fuel Combustion
<b>NPI substance %</b>																			
Acetaldehyde	8.0	-	<0.1	6.6	3.0	9.6									82.3	82.3			
Acetone	10.0	-	-	-	-	-	5.8				0.5				83.7	90.0			
Acrylic acid		-	-	-	-	-	100.0									100.0			
Ammonia (total)	100.0	-	-	-	-	-													
Antimony & compounds		-	0.1			0.1					92.4				7.4	99.8	<0.1		<0.1
Arsenic & compounds		-	<0.1			<0.1					95.3				4.4	99.7	0.3		0.3
Benzene	39.8	-	<0.1	13.4	6.1	19.6	<0.1	<0.1	11.2	1.7					26.9	39.9	<0.1	<0.1	0.7
Beryllium & compounds		-	-	-	-	-									77.3	77.3	22.7		22.7
Biphenyl (1,1'-biphenyl)		-	-	-	-	-	100.0									100.0			
1,3-Butadiene (vinyl ethylene)	46.6	-	<0.1	20.4	9.3	29.7			8.8						14.9	23.7			<0.1
Cadmium & compounds		-	<0.1			<0.1					96.2				2.3	98.6	1.4		1.4
Carbon disulfide		-	<0.1	8.4	3.7	12.1			5.0						100.0	100.0	0.3		<0.1
Carbon monoxide	55.8	-	<0.1												26.7	31.7			0.3
Chloroform (trichloromethane)		-	-	-	-	-										100.0			
Chromium (III) compounds		-	<0.1	5.4	2.2	7.7			51.8							80.2	12.1		12.1
Chromium (VI) compounds		-	<0.1	2.2	0.9	3.1			20.9						47.1	79.2	5.1		5.1
Cobalt & compounds		-	<0.1	0.1	<0.1	0.2			1.2						0.1	99.8	<0.1		<0.1
Copper & compounds		-	<0.1	<0.1	<0.1	0.1			0.9							99.7	0.1		0.1
Cumene (1-methylethylbenzene)		-	-	-	-	-	70.4			28.6						99.0			1.0
Cyanide (inorganic) compounds		-	-	-	-	-									100.0	100.0			
Cyclohexane	4.6	-	<0.1						1.1						0.3	95.1	0.2		0.2
1,2-Dibromoethane		-	-	-	-	-													100.0
1,2-Dichloroethane		-	-	-	-	-													
Dichloromethane		-	-	-	-	-	62.6								<0.1	100.0			
Ethanol		-	-	-	-	-	100.0									100.0			
2-Ethoxyethanol acetate		-	-	-	-	-	100.0									100.0			
Ethyl acetate		-	-	-	-	-										100.0			
Ethylbenzene	66.6	-	<0.1	13.2	5.7	18.9			13.2						<0.1	14.3	<0.1		<0.1
Ethylene glycol (1,2-ethanediol)		-	-	-	-	-	27.2									100.0			
Ethylene oxide		-	-	-	-	-	100.0									100.0			

Table 47 (cont) Percentage contribution by source to the emissions of NPI substances in the Riverland airshed

RIVERLAND AIRSHED (TOTAL)	MOBILE SOURCES (%)				AREA BASED SOURCES (%)												SUB-THRESHOLD FACILITIES (%)			Reporting Facilities 1999-2000 (%)	
	Motor vehicles	OTHER MOBILE			Architectural surface coatings	Cutback Bitumen	Domestic/ Commercial solvents/ aerosols	Dry Cleaning	Gaseous fuel burning (domestic)	Lawn Mowing	Motor Vehicle Refinishing	Paved Roads	Print Shops / Graphic Arts	Service stations	Solid fuel burning (domestic)	TOTAL AREA BASED	Fuel Combustion	Solvent Use	TOTAL: SUB-THRESHOLD FACILITIES (%)		
<b>NPI substance %</b>																					
Di-(2-Ethylhexyl) phthalate (DEHP)																100.0	100.0				
Fluoride compounds																94.7	98.5	1.5	1.5		
Formaldehyde (methyl aldehyde)	20.6	<0.1	7.6	3.5	11.1											66.8	68.3	<0.1	<0.1		
n-Hexane	31.7	<0.1	5.2	2.4	7.6											<0.1	57.7	1.7	1.7	1.4	
Hydrochloric acid																	3.3	3.3	96.7		
Hydrogen sulfide	100.0																				
Lead & compounds	48.3	<0.1	2.8	<0.1	2.9																
Manganese & compounds		<0.1	<0.1	<0.1	<0.1																
Mercury & compounds		<0.1	<0.1	<0.1	<0.1																
Methanol																					
Methyl ethyl ketone																					
Methyl isobutyl ketone																					
Nickel & compounds		<0.1	0.2	<0.1	0.3																
Oxides of nitrogen	90.3	0.9	0.5	<0.1	1.4																
Particulate matter < 10 µm	4.7	<0.1	<0.1	<0.1	0.1																
Phenol																					
Polycyclic aromatic hydrocarbons	12.2	<0.1	5.7	2.5	8.3																
Selenium & compounds		<0.1	<0.1	<0.1	<0.1																
Styrene (ethenylbenzene)	51.5		8.9	3.9	12.8																
Sulfur dioxide	38.8	0.5	1.5	0.4	2.4																
Tetrachloroethylene																					
Toluene (methylbenzene)	42.9	<0.1	17.8	8.2	26.0																
Total volatile organic compounds	27.8	<0.1	9.6	4.2	13.8																
Trichloroethylene																					
Xylenes (individual or mixed isomers)	62.1	<0.1	9.0	4.2	13.2																
Zinc and compounds		<0.1	<0.1	<0.1	<0.1																
TOTAL SUBSTANCE COUNT (N)	20	27	23	23	28	13	10	20	2	24	23	9	12	1	10	36	53	29	2	30	16

Table 48 Total emissions of NPI substances in the South East airshed

NPI substance		Aggregated emissions TOTAL (kg/yr)	Industry reported (1999-2000) TOTAL (kg/yr)	TOTAL (kg/yr†)
1	Carbon monoxide	10,003,038	2,518,690	13,000,000
2	Oxides of nitrogen	2,507,604	381,400	2,900,000
3	Total volatile organic compounds	2,108,955	35,300	2,100,000
4	Particulate matter < 10 µm	669,264	448,880	1,100,000
5	Sulfur dioxide	40,674	215,380	260,000
6	Methanol	15,200	117,000	130,000
7	Toluene (methylbenzene)	123,036	256	120,000
8	Xylenes (individual or mixed isomers)	89,576	65	90,000
9	Formaldehyde (methyl aldehyde)	82,000		82,000
10	n-Hexane	59,900	280	60,000
11	Acetaldehyde	59,917		60,000
12	Benzene	55,505	258	56,000
13	Acetone	47,608		48,000
14	Cyclohexane	19,526	17	20,000
15	Ethylbenzene	12,433	10	12,000
16	Ammonia (total)	11,477		11,000
17	Polycyclic aromatic hydrocarbons	7,472	2,464	9,900
18	1,3-Butadiene (vinyl ethylene)	8,378		8,400
19	Lead & compounds	3,187	41	3,200
20	Trichloroethylene	2,808		2,800
21	Styrene (ethenylbenzene)	2,426		2,400
22	Methyl ethyl ketone	2,230		2,200
23	Ethylene glycol (1,2-ethanediol)	2,190		2,200
24	Zinc and compounds	2,059		2,100
25	Tetrachloroethylene	1,890		1,900
26	Dichloromethane	1,630		1,600
27	Manganese & compounds	1,305		1,300
28	2-Ethoxyethanol acetate	1,080		1,100
29	Methyl isobutyl ketone	690		690
30	Ethanol	500		500
31	Cumene (1-methylethylbenzene)	377	1.2	380
32	Copper & compounds	277	10	290
33	Ethylene oxide	260		260
34	Ethyl acetate	240		240
35	Cobalt & compounds	196	2.0	200
36	Nickel & compounds	148	2.0	150
37	Arsenic & compounds	52	40.9	93
38	Fluoride compounds	6.6	85	92
39	Chromium (VI) compounds	79	7.3	86
40	Hydrogen sulfide	70		70
41	Cadmium & compounds	51	3.0	54
42	Chromium (III) compounds	32	3.1	35
43	Mercury & compounds	30	0.61	31
44	Antimony & compounds	22		22
45	Chloroform (trichloromethane)	17		17
46	Selenium & compounds	4.8		5.0
47	Nickel subsulfide		4.2	4.2
48	Phenol	2.9		2.9
49	Nickel carbonyl		2.0	2.0
50	Hydrochloric acid	1.4		1.4
51	Biphenyl (1,1'-biphenyl)	1.20790481		1.2
52	Beryllium & compounds	0.19		0.19
53	Cyanide (inorganic) compounds	0.10		0.10
54	1,2-Dichloroethane	0.080		0.080
55	Carbon disulfide	0.0054		0.0054
56	Di-(2-Ethylhexyl) phthalate (DEHP)	0.0030		0.0030
57	Polychlorinated dioxins and furans		0.0018	0.0018
58	Acrylic acid	0.000068		0.000068

† Total emissions to 2 significant figures

Table 49 Percentage contribution by source to the total emission of NPI substances in the South East airshed

SOUTH EAST AIRSHED (TOTAL)	MOBILE SOURCES (%)				AREA BASED SOURCES (%)											SUB-THRESHOLD FACILITIES (%)			Reporting Facilities 1999-2000 (%)		
	Motor vehicles	Aeroplanes	Railways	OTHER MOBILE	TOTAL OTHER MOBILE	Architectural surface coatings	Cutback Bitumen	Domestic/ Commercial solvents/ aerosols	Dry Cleaning	Gaseous fuel burning (domestic)	Lawn Mowing	Motor Vehicle Refinishing	Paved Roads	Print Shops / Graphic Arts	Service stations	Solid fuel burning (domestic)	TOTAL AREA BASED	Fuel Combustion		Solvent Use	TOTAL: SUB-THRESHOLD
<b>NPI substance %</b>																					
Acetaldehyde	11.4	<0.1	0.6	<0.1	0.6	5.5										87.9	87.9				
Acetone	12.8	<0.1					100.0				0.4					81.2	87.1				
Acrylic acid								100.0									100.0				
Ammonia (total)	100.0																				
Antimony & compounds				<0.1								94.1				5.8	99.9				
Arsenic & compounds		25.2	<0.1	<0.1	25.2				<0.1			26.4				1.0	27.3			3.2	44.2
Benzene	55.6	<0.1	1.2	0.1	1.3	0.1			<0.1	12.1					1.8	28.5	42.5			<0.1	0.5
Beryllium & compounds				2.3	2.3				0.2						6.7	6.9	90.8			90.8	
Biphenyl (1,1'-biphenyl)							100.0										100.0				
1,3-Butadiene (vinyl ethylene)	69.6	0.3	1.9	0.2	2.4				0.1	10.2		57.8			17.8	28.0				31.3	5.6
Cadmium & compounds		4.1	<0.1	<0.1	4.1										100.0	100.0					
Carbon disulfide									<0.1	3.3					17.5	20.8				9.6	20.0
Carbon monoxide	48.5	0.5	0.5	<0.1	0.9												100.0				
Chloroform (trichloromethane)																					
Chromium (III) compounds		46.2	<0.1	<0.1	46.2				2.1	3.4						5.5	39.5			39.5	8.8
Chromium (VI) compounds		82.0	<0.1	<0.1	82.0				0.4	0.6					1.4	2.4				7.1	8.5
Cobalt & compounds			<0.1	<0.1					1.8	0.9					95.6	98.4				0.6	1.0
Copper & compounds			<0.1	<0.1					<0.1	0.6					91.3	91.9				4.5	3.5
Cumene (1-methylethylbenzene)															23.5	99.7					0.3
Cyanide (inorganic) compounds																100.0	100.0				
Cyclohexane	5.7								<0.1	1.1	0.2				0.3	87.5				6.7	0.1
1,2-Dichloroethane																100.0					
Dichloromethane															<0.1	100.0					
Ethanol																100.0					
2-Ethoxyethanol acetate																100.0					
Ethyl acetate																100.0					
Ethylbenzene	84.9	<0.1	1.0	0.1	1.1				0.2	0.3	100.0				0.5	<0.1	13.9			<0.1	0.1
Ethylene glycol (1,2-ethanediol)																	100.0				
Ethylene oxide																	100.0				

Table 49 (cont) Percentage contribution by source to the emissions of NPI substances in the South East airshed

SOUTH EAST AIRSHED (TOTAL)	MOBILE SOURCES (%)													AREA BASED SOURCES (%)											SUB-THRESHOLD FACILITIES (%)			Reporting Facilities 1999-2000 (%)
	Motor vehicles				OTHER MOBILE									TOTAL AREA BASED											Fuel Combustion	Solvent Use	TOTAL: SUB-THRESHOLD	
NPI substance %	Aeroplanes	Railways	Recreational boating	Shipping	TOTAL OTHER MOBILE	Architectural surface coatings	Domestic/ Commercial solvents/ aerosols Cutback Bitumen	Dry Cleaning	Gaseous fuel burning (domestic)	Lawn Mowing	Motor Vehicle Refinishing	Paved Roads	Print Shops / Graphic Arts	Service stations	Solid fuel burning (domestic)	TOTAL AREA BASED	Fuel Combustion	Solvent Use	TOTAL: SUB-THRESHOLD	Reporting Facilities 1999-2000 (%)								
Di-(2-Ethylhexyl) phthalate (DEHP)															100.0	100.0	0.2	0.2	0.2	92.8								
Fluoride compounds							0.3								6.8	7.0	0.2	0.2	0.2	92.8								
Formaldehyde (methyl aldehyde)	0.2		0.6	<0.1	0.8		<0.1	<0.1	<0.1	1.4					68.8	70.2	1.4	1.4	1.4	0.5								
n-Hexane	23.0		0.2	<0.1	0.2	27.9	<0.1	0.2	0.7	0.7		0.3		<0.1	31.5	31.5	44.7	44.7	44.7	0.5								
Hydrochloric acid							2.2									2.2	97.8	97.8	97.8									
Hydrogen sulfide	100.0																											
Lead & compounds	49.0		0.1	<0.1	0.9			<0.1	0.8	0.8	47.7	<0.1			0.1	48.6	0.2	0.2	0.2	1.3								
Manganese & compounds			<0.1	<0.1				<0.1	0.1	0.1	99.1	<0.1			0.3	99.6	0.4	0.4	0.4									
Mercury & compounds			<0.1	<0.1				<0.1	<0.1	<0.1	85.2	<0.1			<0.1	85.2	12.8	12.8	12.8	2.0								
Methanol						2.4	9.1									11.5				88.5								
Methyl ethyl ketone						72.5	39.0			7.2					53.8	100.0												
Methyl isobutyl ketone							18.8			8.7						100.0												
Nickel & compounds	1.5		<0.1	<0.1	1.5			0.7	1.2	1.2	73.8				0.1	75.8	21.3	21.3	21.3	1.3								
Nickel carbonyl																				100.0								
Nickel subsulfide																				100.0								
Oxides of nitrogen	33.5		<0.1	<0.1				0.4	<0.1	<0.1					1.0	1.4	51.8	51.8	51.8	13.2								
Particulate matter < 10 µm	2.5	0.4	<0.1	<0.1	0.4			<0.1	0.3	0.3	27.9				18.8	46.9	10.0	10.0	10.0	40.1								
Phenol	100.0				100.0										<0.1													
Polychlorinated dioxins and furans																				100.0								
Polycyclic aromatic hydrocarbons	12.3	0.1	0.4	<0.1	0.5		0.2	<0.1	3.6	3.6					58.4	62.2	0.1	0.1	0.1	24.8								
Selenium & compounds								19.7			67.3				5.6	92.6	7.4	7.4	7.4									
Styrene (ethenylbenzene)	64.8	0.2	0.7	<0.1	0.9		<0.1		4.9	4.9					29.3	34.2												
Sulfur dioxide	12.3	<0.1	<0.1	<0.1					0.1	0.1					2.1	2.2	1.3	1.3	1.3	84.1								
Tetrachloroethylene							25.9	74.1							<0.1	100.0												
Toluene (methylbenzene)	63.2	<0.1	1.6	0.2	1.8	3.5	<0.1	<0.1	8.9	6.9					8.9	34.8	<0.1	<0.1	<0.1	0.2								
Total volatile organic compounds	36.5	<0.1	0.8	<0.1	0.8	4.8	0.3	<0.1	5.6	1.0		0.9	2.8	32.2	56.9	56.9	3.8	0.1	4.0	1.6								
Trichloroethylene							0.3									0.3	99.7	99.7	99.7									
Xylenes (individual or mixed isomers)	75.9	<0.1	0.7	<0.1	0.7	2.4	0.1	<0.1	9.3	1.8		0.4	5.4	23.3	78.9	78.9	<0.1	<0.1	<0.1	0.1								
Zinc and compounds			<0.1	<0.1				0.1	<0.1	<0.1	74.0			4.9	78.9	78.9	21.0	21.0	21.0									
TOTAL SUBSTANCE COUNT (N)	20	22	0	23	29	31	13	2	24	23	9	12	1	10	36	53	29	2	30	27								

Table 50 Total emissions of NPI substances in the Spencer Gulf airshed

NPI substance	Aggregated emissions TOTAL (kg/yr)	Industry reported (1999-2000) TOTAL (kg/yr)	TOTAL (kg/yr†)	
1	Carbon monoxide	7,631,626	99,519,000	110,000,000
2	Sulfur dioxide	290,622	60,571,000	61,000,000
3	Oxides of nitrogen	1,305,641	18,997,000	20,000,000
4	Particulate matter < 10 µm	572,057	4,007,500	4,600,000
5	Total volatile organic compounds	2,443,507	15,160	2,500,000
6	Toluene (methylbenzene)	131,264	5,308	140,000
7	Formaldehyde (methyl aldehyde)	106,695		110,000
8	Benzene	65,907	28,227	94,000
9	Acetaldehyde	85,985		86,000
10	Xylenes (individual or mixed isomers)	79,331	2,372	82,000
11	Acetone	65,676		66,000
12	Fluoride compounds	10	58,463	58,000
13	n-Hexane	37,048	219	37,000
14	Lead & compounds	1,766	28,151	30,000
15	Cyclohexane	26,307	22	26,000
16	Methanol	22,700		23,000
17	Polycyclic aromatic hydrocarbons	10,606	2,513	13,000
18	Ethylbenzene	10,704	8.6	11,000
19	1,3-Butadiene (vinyl ethylene)	9,051	0.20	9,100
20	Ammonia (total)	5,676		5,700
21	Methyl ethyl ketone	3,240		3,200
22	Trichloroethylene	3,212		3,200
23	Ethylene glycol (1,2-ethanediol)	3,160		3,200
24	Tetrachloroethylene	2,910		2,900
25	Dichloromethane	2,410		2,400
26	Styrene (ethenylbenzene)	2,354		2,400
27	Arsenic & compounds	64	1,638	1,700
28	2-Ethoxyethanol acetate	1,540		1,500
29	Zinc and compounds	1,027		1,000
30	Methyl isobutyl ketone	997		1,000
31	Manganese & compounds	735		730
32	Ethanol	720		720
33	Ethylene oxide	380		380
34	Cumene (1-methylethylbenzene)	291	3.1	290
35	Ethyl acetate	350		350
36	Nickel & compounds	235		230
37	Chromium (VI) compounds	144	64.442	210
38	Cobalt & compounds	118	41	160
39	Copper & compounds	155		150
40	Cadmium & compounds	24	103.95	130
41	Chromium (III) compounds	38		38
42	Hydrogen sulfide	34		34
43	Mercury & compounds	15	14.75	30
44	Chloroform (trichloromethane)	25		25
45	Antimony & compounds	16		16
46	Phenol	15		15
47	Selenium & compounds	5.1		5.1
48	Beryllium & compounds	2.3		2.3
49	Hydrochloric acid	1.6		1.6
50	Biphenyl (1,1'-biphenyl)	0.68		0.68
51	Cyanide (inorganic) compounds	0.15		0.15
52	1,2-Dichloroethane	0.12		0.12
53	1,2-Dibromoethane		0.10	0.10
54	Carbon disulfide	0.0080		0.0080
55	Di-(2-Ethylhexyl) phthalate (DEHP)	0.0045		0.0045
56	Acrylic acid	0.000099		0.000099

† Total emissions to 2 significant figure

Table 51 Percentage contribution by source to the total emission of NPI substances in the Spencer Gulf airshed

SPENCER GULF AIRSHED (TOTAL)	MOBILE SOURCES (%)				AREA BASED SOURCES (%)												SUB-THRESHOLD FACILITIES (%)		Reporting Facilities 1999-2000 (%)
	Motor vehicles	OTHER MOBILE				TOTAL AREA BASED												TOTAL SUB-THRESHOLD	
NPI substance %		Aeroplanes	Railways	Recreational boating	Shipping	Architectural surface coatings	Cutback Bitumen	Domestic/ Commercial solvents/ aerosols	Dry Cleaning	Gaseous fuel burning (domestic)	Lawn Mowing	Motor Vehicle Refinishing	Paved Roads	Print Shops / Graphic Arts	Service stations	Solid fuel burning (domestic)	Fuel Combustion	Solvent Use	
Acetaldehyde	4.1	0.3	0.4	1.0	2.1	3.8										92.1	92.1		
Acetone	4.7	0.2				0.2	6.0					0.4				88.6	95.0		
Acrylic acid							100.0										100.0		
Ammonia (total)																			
Antimony & compounds			5.0	7.0	12.0								75.1			12.7	87.8	0.1	0.1
Arsenic & compounds		2.7	<0.1	0.2	2.9				<0.1				0.8			<0.1	0.8	<0.1	96.2
Benzene	16.6	0.1	0.2	1.8	3.2	5.3			<0.1	20.1					1.5	26.5	48.1	<0.1	29.9
Beryllium & compounds				99.0	99.0				<0.1						0.8	0.8	0.2	0.2	
Biphenyl (1,1'-biphenyl)							100.0										100.0		
1,3-Butadiene (vinyl ethylene)	32.4	1.2	1.8	4.6	9.5	17.2				26.3						24.1	50.4		0.0
Cadmium & compounds		3.4	0.3	0.6	4.3				<0.1				13.5			0.7	14.2	0.3	81.2
Carbon disulfide																100.0	100.0		
Carbon monoxide	2.7	0.1	<0.1	0.1	0.3	0.5			<0.1	0.8					3.1	3.9	<0.1	<0.1	92.8
Chloroform (trichloromethane)																	100.0		
Chromium (III) compounds		84.4	<0.1	<0.1	2.1	86.5			2.8	9.7							12.5	0.9	
Chromium (VI) compounds		67.1	<0.1	<0.1	0.1	67.2			0.2	0.7						0.8	1.7	<0.1	31.0
Cobalt & compounds			<0.1	<0.1	1.3	1.3			3.2	3.3						0.2	72.9	<0.1	25.7
Copper & compounds			0.1	<0.1	1.6	1.7			0.1	3.4							98.1	0.2	
Cumene (1-methylethylbenzene)															44.2		98.9		1.1
Cyanide (inorganic) compounds																100.0	100.0		
Cyclohexane	2.1				<0.1				<0.1	2.2	0.2				0.3		97.6	0.1	0.1
1,2-Dibromoethane																			100.0
1,2-Dichloroethane																<0.1	100.0		
Dichloromethane																	100.0		
Ethanol																	100.0		
2-Ethoxyethanol acetate																	100.0		
Ethyl acetate																	100.0		
Ethylbenzene	49.4	<0.1	<0.1	3.1	5.0	8.1				40.5	0.4				0.8	<0.1	42.3	<0.1	0.1
Ethylene glycol (1,2-ethanediol)																	100.0		
Ethylene oxide																	100.0		

Table 51 (cont) Percentage contribution by source to the emissions of NPI substances in the Spencer Gulf airshed

SPENCER GULF AIRSHED (TOTAL)	MOBILE SOURCES (%)				AREA BASED SOURCES (%)												SUB-THRESHOLD FACILITIES (%)		Reporting Facilities 1999-2000 (%)		
	Motor vehicles	OTHER MOBILE				Architectural surface coatings	Cutback Bitumen	Domestic/ Commercial solvents/ aerosols	Dry Cleaning	Gaseous fuel burning (domestic)	Lawn Mowing	Motor Vehicle Refinishing	Paved Roads	Print Shops / Graphic Arts	Service stations	Solid fuel burning (domestic)	TOTAL AREA BASED	Fuel Combustion		Solvent Use	TOTAL SUB-THRESHOLD
NPI substance %		Aeroplanes	Railways	Recreational boating	Shipping	TOTAL OTHER MOBILE															
Di-(2-Ethylhexyl) phthalate (DEHP)																100.0	100.0				
Fluoride compounds																<0.1					100.0
Formaldehyde (methyl aldehyde)	10.8	0.9	0.9	1.3	3.2	6.2										<0.1					
n-Hexane	18.7	0.4	0.4	1.0	2.2	3.6										66.8	75.4	1.8			0.6
Hydrochloric acid																2.8	2.8	97.2			
Hydrogen sulfide	100.0																				
Lead & compounds	2.7	0.2	<0.1	<0.1	<0.1	0.2										<0.1	3.1	<0.1			94.0
Manganese & compounds			<0.1	<0.1	<0.1											98.4	99.9	<0.1			
Mercury & compounds			0.5	0.3	0.8											49.1	49.1	0.3			49.7
Methanol																79.3	100.0				
Methyl ethyl ketone																40.1	100.0				
Methyl isobutyl ketone																19.1	100.0				
Nickel & compounds																7.4	26.4	0.1			0.5
Oxides of nitrogen	3.1	<0.1	1.2	<0.1	1.6	2.8										0.7	0.1	0.2			
Particulate matter < 10 µm	0.3	0.2	0.1	<0.1	0.8	1.1										<0.1	0.2	7.0			93.6
Phenol		100.0				100.0															
Polycyclic aromatic hydrocarbons	4.6	0.5	0.6	0.7	1.1	2.9										<0.1	73.2	<0.1			19.2
Selenium & compounds			0.5		27.5	28.0										28.0	35.8	8.1			0.2
Styrene (ethenylbenzene)	32.9	1.0	0.4	1.7	3.3	5.8										<0.1	61.3	0.1			
Sulfur dioxide	<0.1	<0.1	<0.1	<0.1	0.4	0.4															
Tetrachloroethylene																24.4	75.6	<0.1			99.5
Toluene (methylbenzene)	28.7	<0.1	0.1	3.9	6.4	10.4										8.0	57.0	0.9			3.9
Total volatile organic compounds	15.9	0.3	0.4	1.7	3.3	5.7										11.4	77.5	0.6	0.1		0.6
Trichloroethylene																0.4	0.4			99.6	
Xylenes (individual or mixed isomers)	41.7	<0.1	<0.1	2.0	3.3	5.3										6.2	50.0	0.6	0.1		2.9
Zinc and compounds			0.2	<0.1	0.4	0.6										0.3	98.4	82.9			1.0
TOTAL SUBSTANCE COUNT (N)	20	22	27	23	30	32										13	53	2	2	29	22
																10	36	10	1	12	30
																1	1	1	1	2	30

### 5.1.2 Spatial distribution of emissions

The distribution of total VOC emissions presented in this section exemplifies the spatial distribution surrogates of the four broad aggregate source category types—motor vehicles, other mobile, area-based and sub-threshold facilities within each airshed studied.

Total VOCs emitted by all aggregate sources, with the exception of paved roads, are an example of the spatial distribution of surrogates common to a range of sources within each airshed. These include VKT, road networks, housing distributions, population distributions, industry distributions, shipping channels or flight paths. Although these spatial distribution surrogates used to apportion total emissions are similar for other NPI substances, the quantity of emissions from each source type will vary.

The Adelaide airshed VOC emissions derived from motor vehicles and other mobile sources are presented in Figure 12 and Figure 13 respectively. Motor vehicle VOC emissions were assigned to the airshed according to the distribution of the road network and the relative VKT on each road type. In Figure 13, the distribution of VOC emissions from other mobile sources, which includes aircraft, railways, recreational boating, shipping and commercial boating, represents the distribution surrogates relative to each source such as flight tracks, railway tracks, coast and shipping channels respectively. Figure 14 represents emissions of VOCs derived from a range of area-based sources that were generally distributed among grid squares in proportion to the relative population or housing density. The distribution of VOC emissions from sub-threshold facilities, presented in Figure 15, was attributed to areas within the airshed zoned as industrial to light commercial.

From these distribution maps the similarity in distribution of area-based source emissions and motor vehicle emissions is clearly evident. Further, the above-mentioned spatial distribution maps indicate the cumulative contribution of each source category to the total inventory emissions estimate, since most sources can coexist in the 1 km square grids.

The principles of spatial distribution of emissions within the regional airsheds is similar to those described for the Adelaide airshed and therefore these are not presented in this report; they can be viewed on the Internet NPI database<sup>1</sup>. The spatial resolution of the major regional airsheds was to 5 km grid squares; this further increases the overlap between sources and the corresponding emission contributions. Minor regional airshed grids, representing the regional townships, provide for greater resolution of emissions, especially those relating to area-based, population distribution surrogates, and are therefore based on 1 km square grids.

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<sup>1</sup> [www.npi.ea.gov.au](http://www.npi.ea.gov.au)



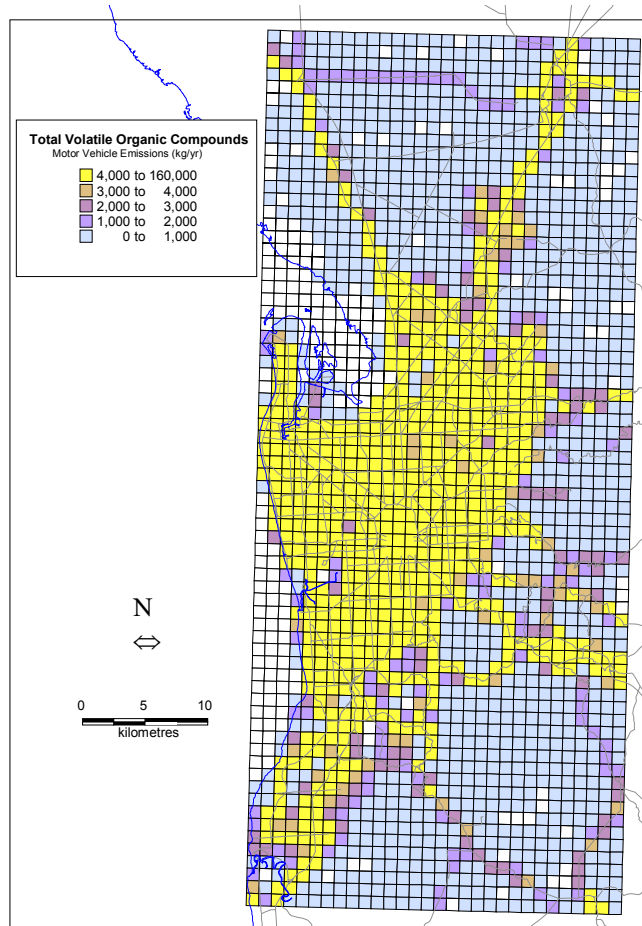


Figure 12 Adelaide airshed—motor vehicle VOC emissions

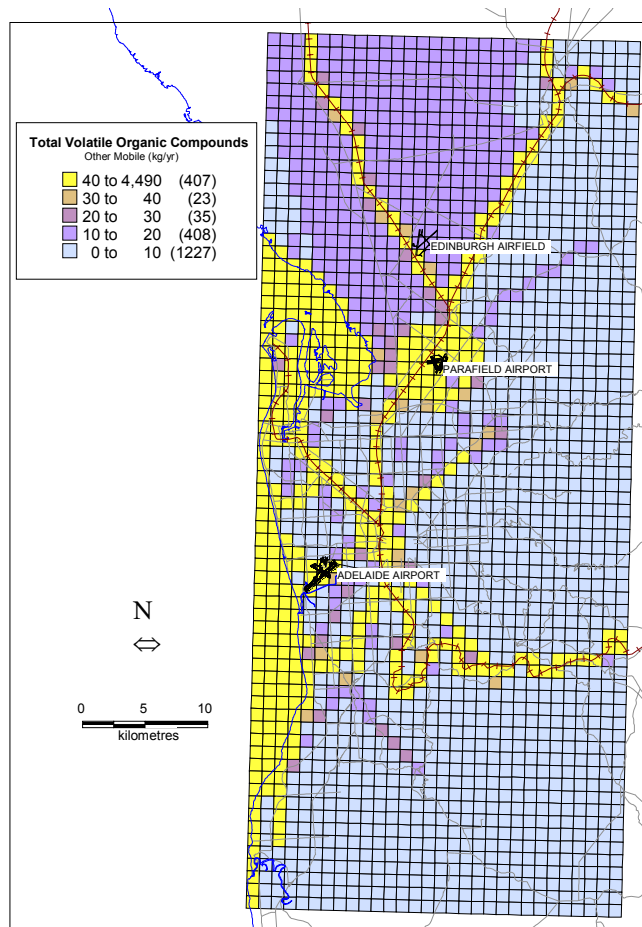


Figure 13 Adelaide airshed—other mobile VOC emissions

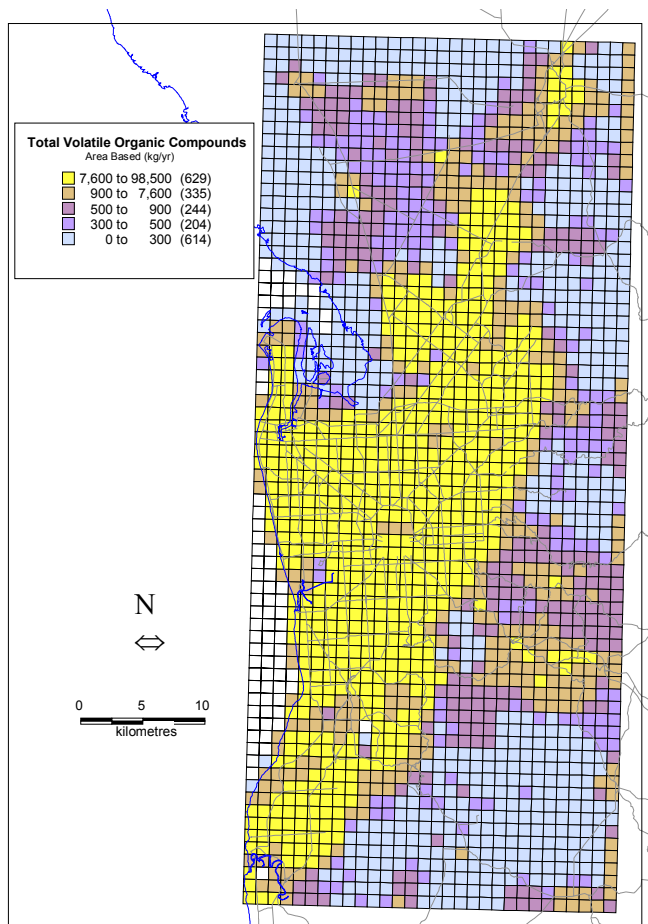


Figure 14 Adelaide airshed—area-based VOC emissions

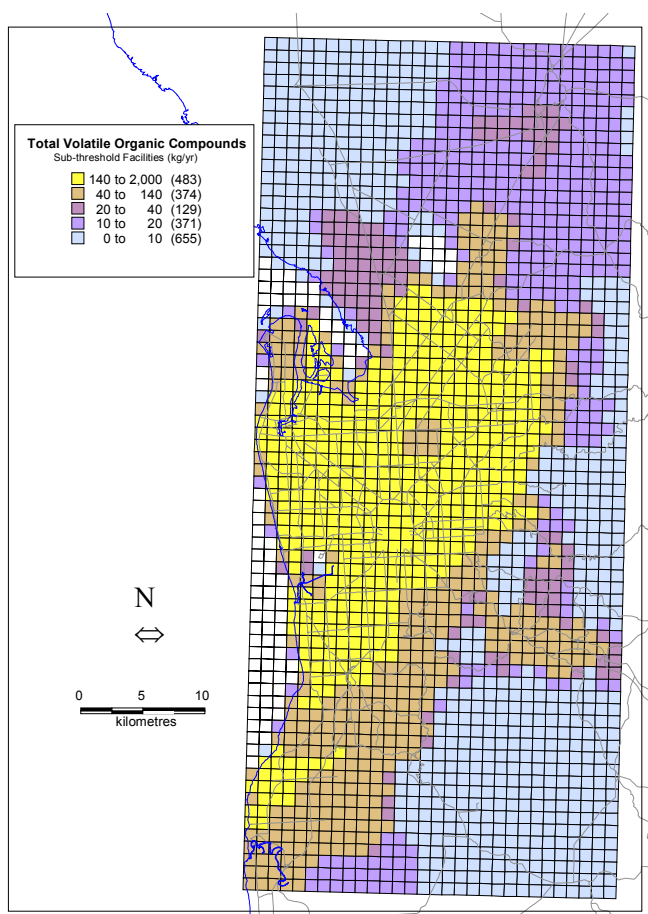


Figure 15 Adelaide airshed—sub-threshold facilities VOC emissions

### 5.1.3 NPI emission comparisons between emission sources

Emissions of NPI substances ranged over up to 11 orders of magnitude from CO to acrylic acid. The emissions of CO were identified as the highest in each airshed, followed by total volatile organic compounds, NO<sub>x</sub>, PM10 and SO<sub>2</sub>. The order of these substances, in terms of magnitude of substance emitted, varied between airsheds as a result of the dominance of individual sources. For comparative purposes, these contributing sources were grouped according to the following five categories:

- *Mobile – motor vehicles*: includes emissions from all passenger vehicles, four-wheel drives, light vehicles, rigid trucks, articulated trucks, buses, motor cycles and other vehicles.
- *Mobile – other*: includes aircraft and watercraft operating within the airshed. Watercraft include ships, commercial boats and recreational boats.
- *Area-based*: includes emissions from domestic and commercial activities as well as activities associated with road traffic such as cutback bitumen and paved roads.
- *Sub-threshold facilities*: includes emissions from fuel combustion and solvent use by those facilities which were below the reporting threshold.
- *Industry-reported*: includes emissions reported by industries operating above the NPI thresholds. This data is valid for the 1999–2000 reporting year and is used in place of the preliminary 1998–99 data since it includes a more representative sample of the reporting facilities.

In Table 52 the contribution by these five source categories is presented in terms of the percentage of occurrences where each source was the single largest contributor to the emission of NPI substances in an airshed, relative to the number of NPI substances estimated for that source. For example, for motor vehicles in the Adelaide airshed, '60%(20)' means that 60% of the 20 substances emitted by that source were the single largest contributors to the total amount emitted of that substance. This standardisation was necessary to account for the variation in the number of substances emitted by each source.

On a percentage basis and depending on the airshed, more than half of the substances emitted from area-based sources were identified as the largest contributors to the total emissions in all airsheds (Table 52). Motor vehicles were consistently the most dominant single source category, contributing between 25% and 60% of the emitted substances as the single largest contributor to the total emissions in each airshed. The dominance of industry emissions was most seen in the Barossa and Spencer Gulf airsheds, where the combined sources sub-threshold and reporting facilities collectively contributed to largest proportion with more than 40% of the substances emitted by them.

Table 52 Percentage of occurrences where the source was the single largest contributor †

	Adelaide airshed	Barossa airshed	Port Lincoln airshed	Riverland airshed	South East airshed	Spencer Gulf airshed
Source category	% (N)	% (N)	% (N)	% (N)	% (N)	% (N)
Mobile – motor vehicles	60% (20)	45% (20)	40% (20)	50% (20)	45% (20)	25% (20)
Mobile – other	16% (32)	0% (27)	16% (32)	0% (28)	10% (31)	16% (32)
Area based	57% (53)	72% (53)	74% (53)	79% (53)	64% (53)	66% (53)
Sub-threshold facilities	3% (30)	13% (30)	10% (30)	7% (30)	17% (30)	7% (30)
Industry reported 1999-2000	23% (48)	38% (13)	10% (13)	13% (16)	26% (27)	41% (22)

† relative to the number of substances emitted by source

(N) number of substances estimated in each source category

The contribution by each source type identified in Table 52 is further compared by airshed in Figure 16, which again demonstrates the dominance of motor vehicle emissions in the Adelaide airshed and area-based emissions in each of the regional airsheds. Within motor vehicles, passenger vehicles were responsible for over 50% of the total emissions estimated. However, a number of substances were dominated by contributions from the diesel fuelled vehicle fleet<sup>7</sup>. For those substances where the area-based source was identified as the largest contributor, the contribution by the subcategory sources is examined in Figure 17. The dominance of the single subcategory source type 'paved roads' was identified in each airshed. While solvent emissions from architectural surface coatings, domestic and commercial solvents and dry cleaning facilities, collectively make up between 43% and 52% of the contributions in each airshed.

Selected substances emitted by the three main source types, mobile, area-based and industry sources, were compared. The area-based source was unchanged from that described previously. However, the sources mobile and industry were constructed by combining mobile—motor vehicles with mobile—other, and sub-threshold with reporting facilities respectively. NPI substances selected for these comparisons include CO, NO<sub>x</sub>, PM<sub>10</sub>, SO<sub>2</sub>, total VOCs, benzene-toluene-ethylbenzene-xylene (BTEX) compounds and metallic compounds. These substances categorise the complete NPI substance list, as well as individually being significant air pollutants that are monitored by air programs such as the Air NEPM or the Air Toxics Program. BTEX compounds are one group of substances currently being investigated by the Living Cities Air Toxics program. NPI substances included in the group metallic compounds include all those with metalloid properties.

The comparison of percentages of substances emitted within each source shown in Figure 18 indicates a similar profile for mobile and area-based sources in the Adelaide and combined regional airsheds. Industry emissions show the greatest variations in substances emitted in the two airsheds. CO was the dominant substance emitted from all sources except industry in the Adelaide airshed, where NO<sub>x</sub> was dominant. SO<sub>2</sub> was a major industry emission in both airsheds.

Further comparison between the three sources and their relative contribution to the total emission of each of the selected substances (Figure 19) indicates the difference in contribution between the Adelaide and combined regional airsheds (Figure 20). Comparisons for the five major regional airsheds—Barossa, Port Lincoln, Riverland, South East and Spencer Gulf—are presented in Figure 21 to Figure 25. The profiles of the relative contributions presented in the combined regional airshed closely reflect those identified in Figure 25 of the Spencer Gulf airshed. This indicates the significant contribution of this airshed to the total regional emissions and in particular the dominance of industry emissions of CO, NO<sub>x</sub>, PM<sub>10</sub>, SO<sub>2</sub> and metallic compounds on the overall regional totals.

The largest emitters of CO, NO<sub>x</sub> and BTEX compounds in the Adelaide airshed and some of the regional airsheds were mobile sources. Industry emissions of the selected substances were found to vary between airsheds, with the most dominant sources located in the Adelaide, Barossa, South East and Spencer Gulf airsheds. Emissions of SO<sub>2</sub> in the Adelaide airshed were mostly due to industry and mobile sources; however, the relative contributions of these two sources in the regional airsheds varied significantly, with industry contributions significantly outweighing mobile in the Spencer Gulf airshed. Area-based sources were still the largest source of PM<sub>10</sub>, VOC and metallic compounds in all airsheds except the Barossa and Spencer Gulf.

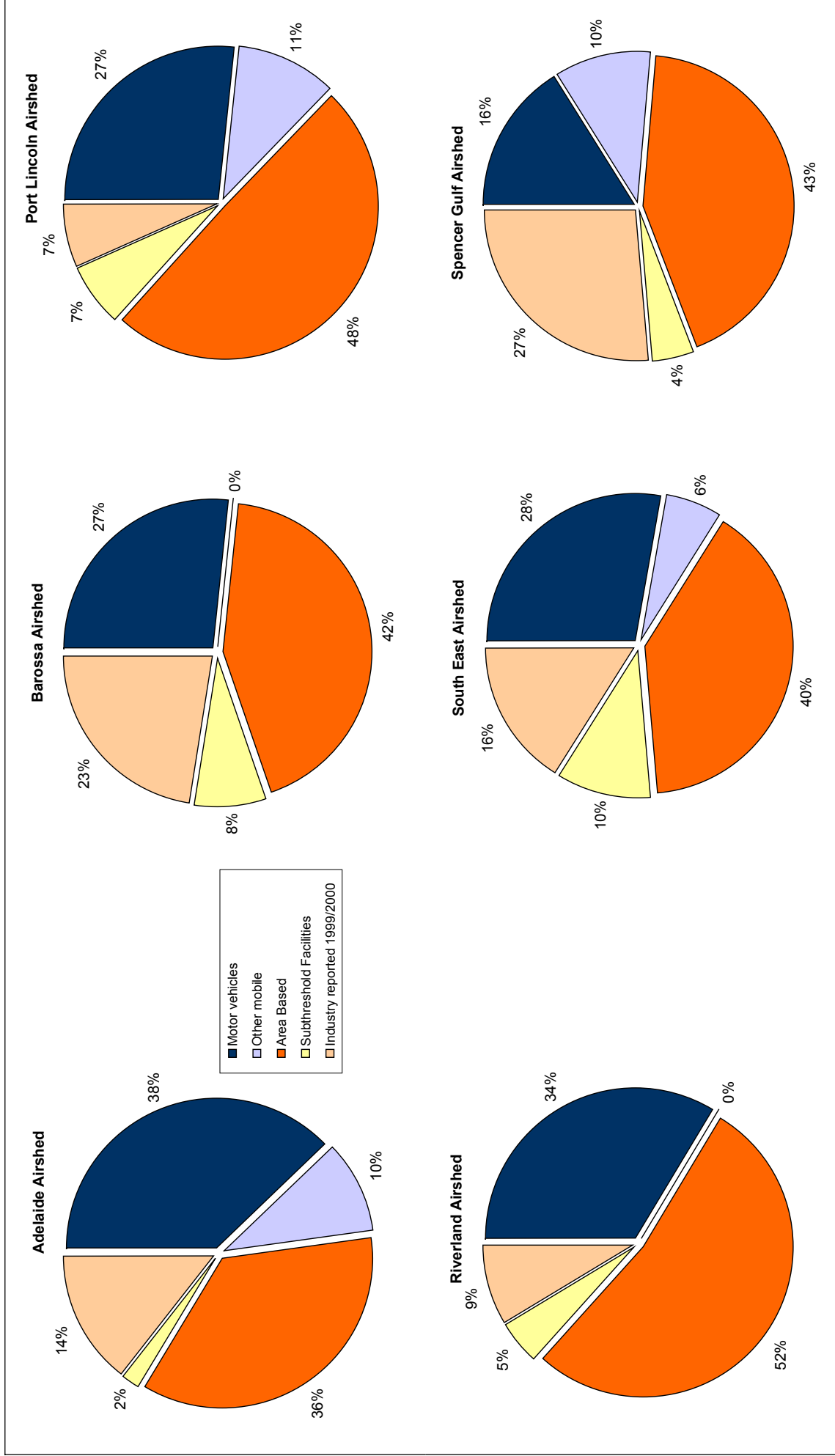
In summary, mobile sources were the dominant source of NPI substance emissions in the Adelaide airshed, particularly for CO, NO<sub>x</sub> and BTEX. Area-based sources were the dominant source of PM<sub>10</sub>, VOC and metallic compound emissions in the Adelaide and regional airsheds. The contribution from industry in the Adelaide airshed was significantly less than identified in the regional airsheds. Mobile and area-based sources were the dominant source of NPI substances in

the Port Lincoln and Riverland airsheds. The contribution from industry in the emission of NO<sub>x</sub> and PM<sub>10</sub> substances was high in the Barossa airshed and SO<sub>2</sub> in South East airsheds. However, the highest contribution by industrial facilities was identified in the Spencer Gulf airsheds, for the total emission estimates of CO, NO<sub>x</sub>, PM<sub>10</sub>, SO<sub>2</sub> and metallic compounds.

#### 5.1.4 NPI emission comparisons between airsheds

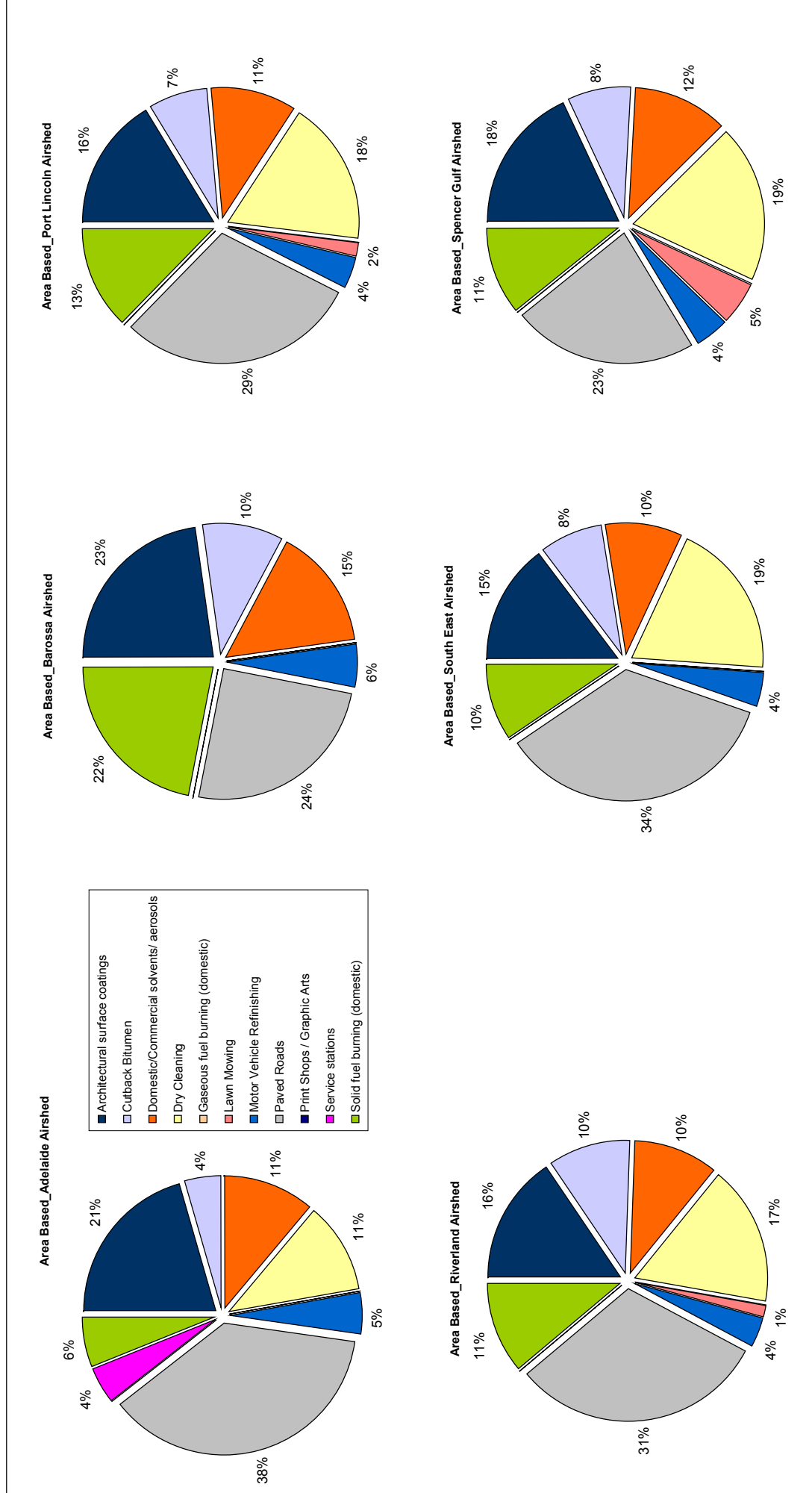
NPI air emissions for the South Australian airsheds have not been compared with those of other jurisdictions in this report. Early comparisons with the Perth NPI Emissions Study<sup>2</sup> showed Perth emissions to be within the range of emissions estimated for the six South Australian airsheds, including the Adelaide airshed, although variations of the annual emissions loads were found to be relatively large. The authors identified the need to standardise estimation methodologies, recommending the use of standard methodologies such as the NPI Aggregate EET manuals produced by Environment Australia. This move would eliminate some variation and allow emission differentials due to local data and the level of activity to be analysed. However, small variations in emissions will also be due to the assumptions made in deriving local data, which remains a limiting factor for some aggregate emission sources even with the use of the NPI EET manuals. A comparison of the assumptions made by jurisdictions may help identify the significance of this limitation.

This section graphically compares total emissions estimated for selected substances in the Adelaide and the regional airsheds (Figure 26). Bars, on a logarithmic scale, represent total emissions in each airshed on a per-capita basis to standardise for differences in population related activities. Emissions per capita for the Adelaide, Port Lincoln, Riverland and South East airsheds were of similar magnitude. However, estimates identified for the Barossa and Spencer Gulf airsheds were significantly higher than other airsheds. Similarity between the Adelaide and all regional airsheds was most evident for VOC, BTEX and metallic compounds that were mostly related to area-based and mobile-motor vehicle sources. The observed differences in emission estimates for some airsheds indicate the dominance of industry sources. In the absence of industry dominance, there is a close agreement in the per-capita emissions between the regional airsheds and the Adelaide airshed, suggesting the possibility of transposing data to other regions of the State on a population basis. However, inventory estimates must be validated against actual monitoring data to confirm these findings.



† where the source was the single largest contributor relative to the number of substances emitted

Figure 16 Comparisons of emission sources based on the relative percentage of occurrence in each airshed†



† where the source was the single largest contributor relative to the number of substances emitted

Figure 17 Comparison of individual source emissions within the area-based source category†

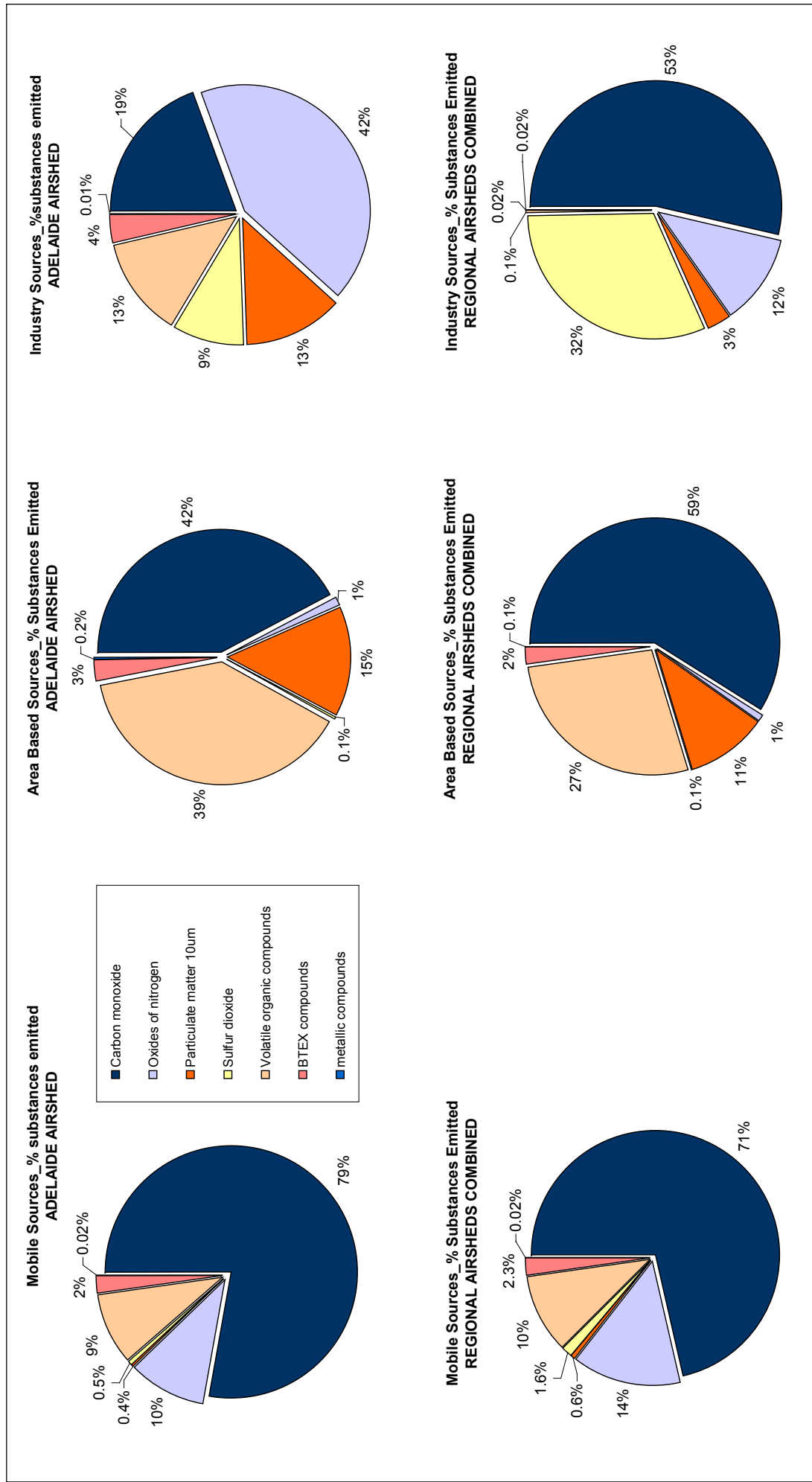


Figure 18 Comparison of substances emitted by the three main source category types: mobile, area-based and industry

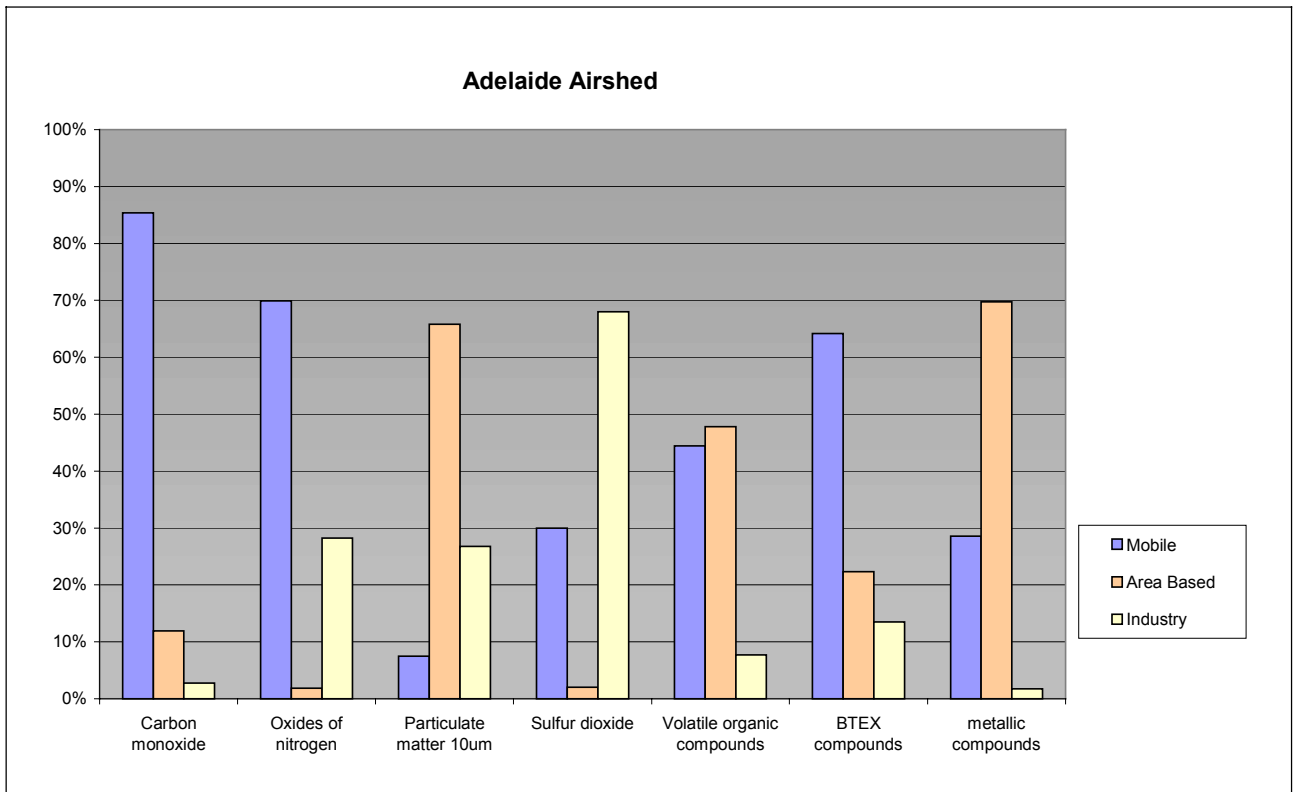


Figure 19 Comparison of NPI substance emissions by source in the Adelaide airshed

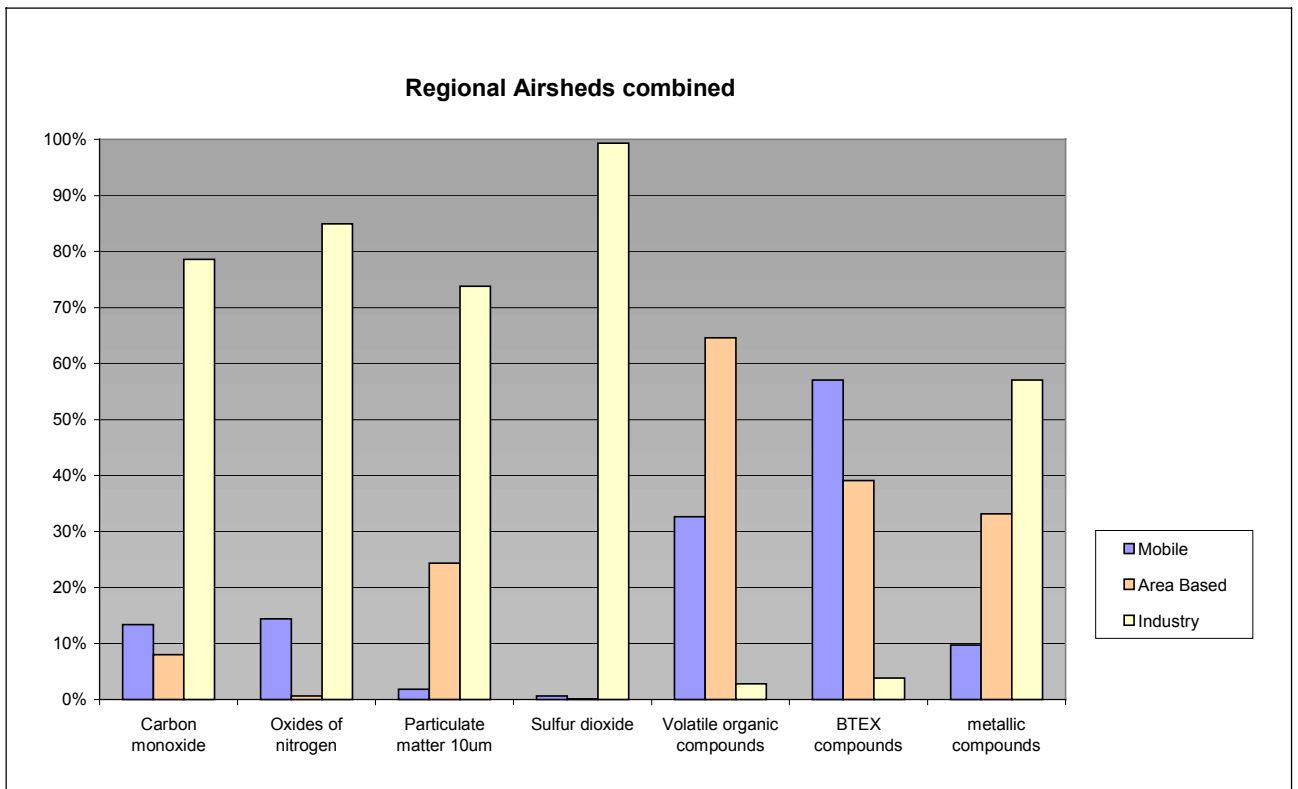


Figure 20 Comparison of NPI substance emissions by source in all regional airsheds combined

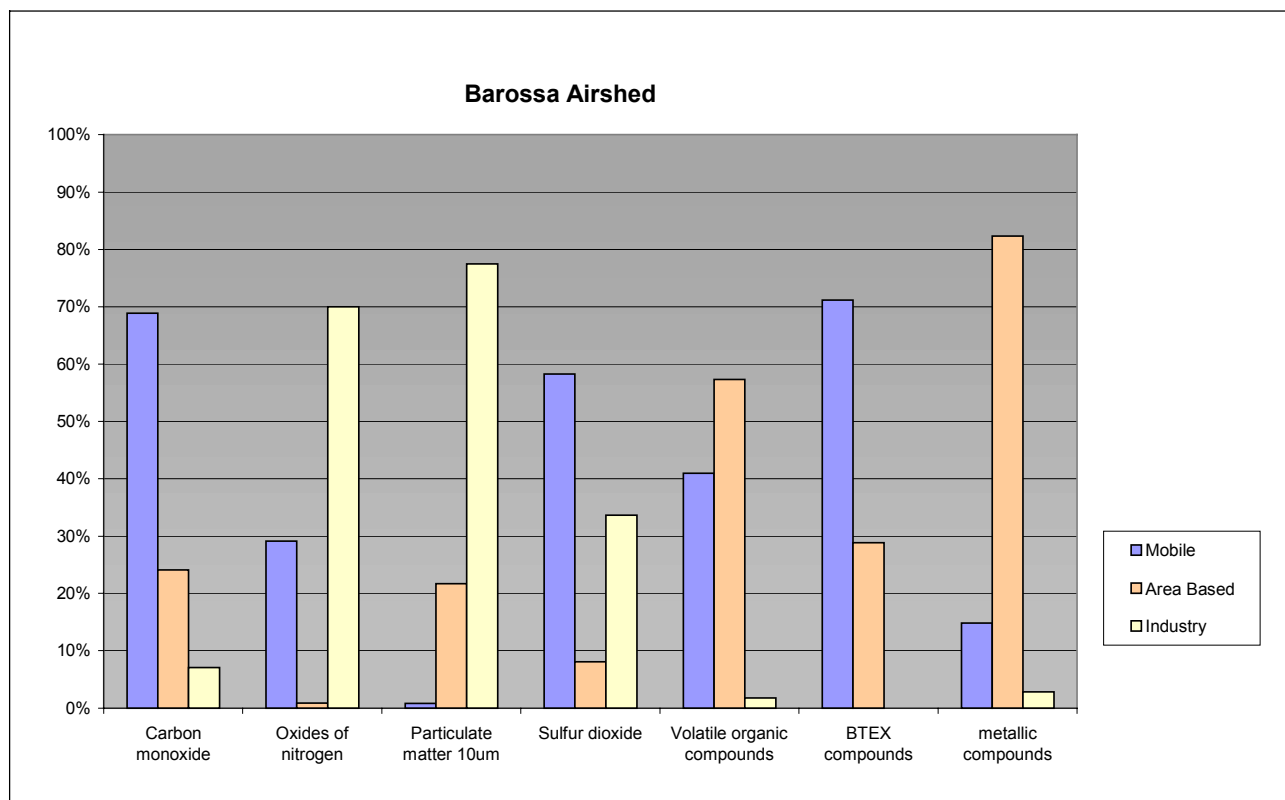


Figure 21 Comparison of NPI substance emissions by source in the Barossa airshed

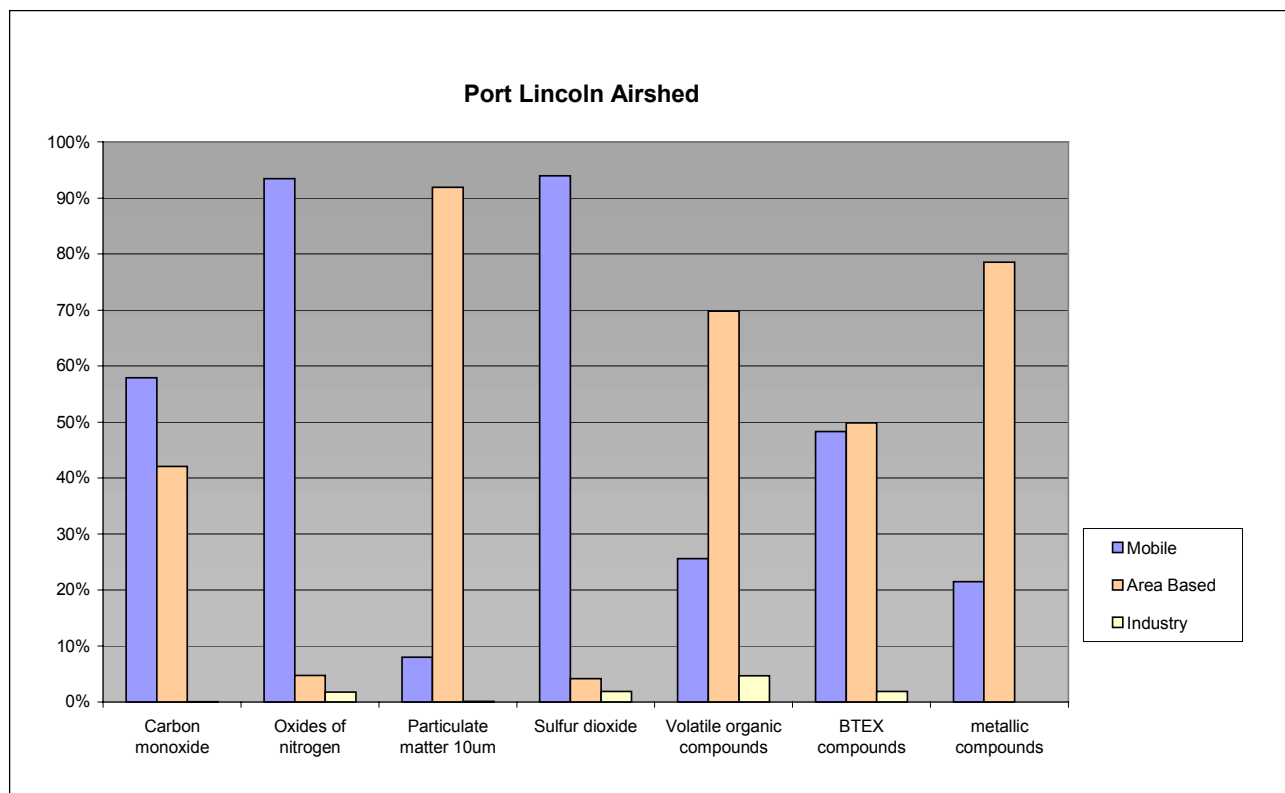


Figure 22 Comparison of NPI substance emissions by source in the Port Lincoln airshed

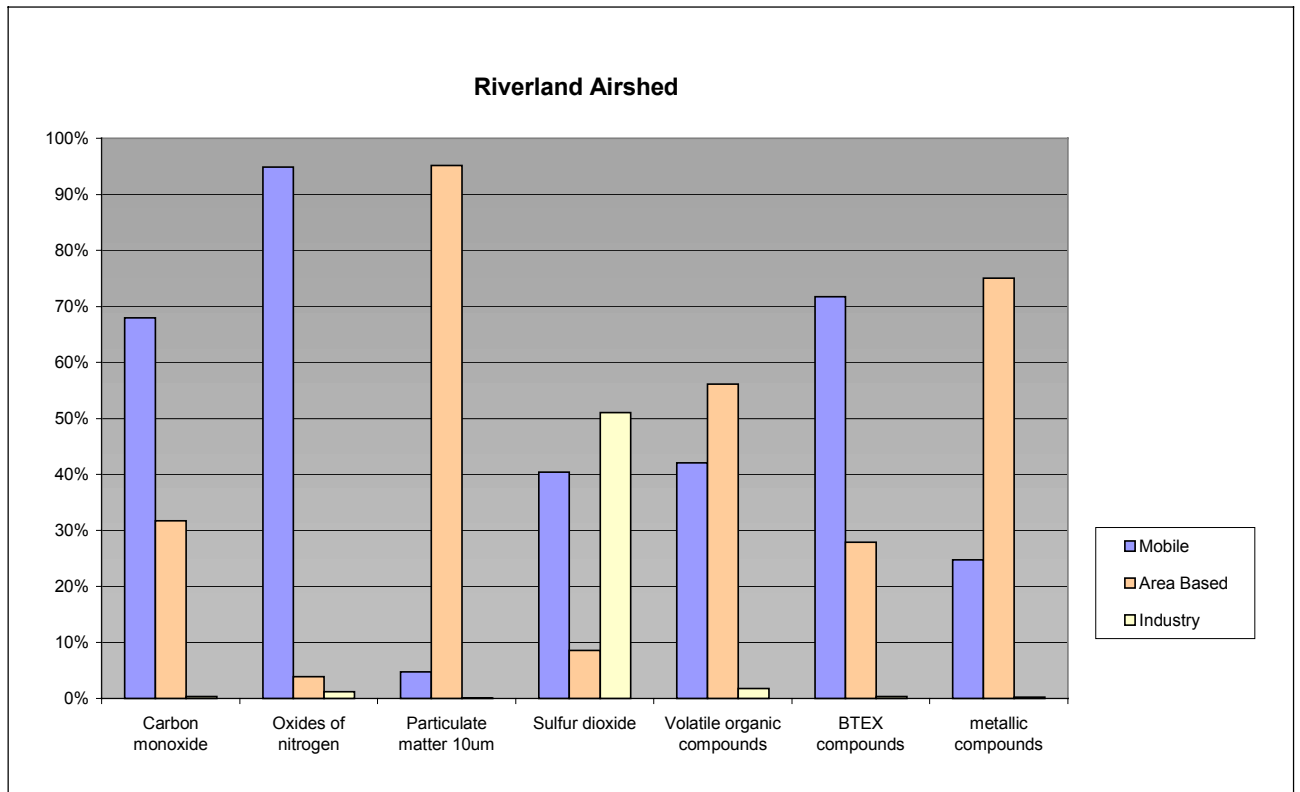


Figure 23 Comparison of NPI substance emissions by source in the Riverland airshed

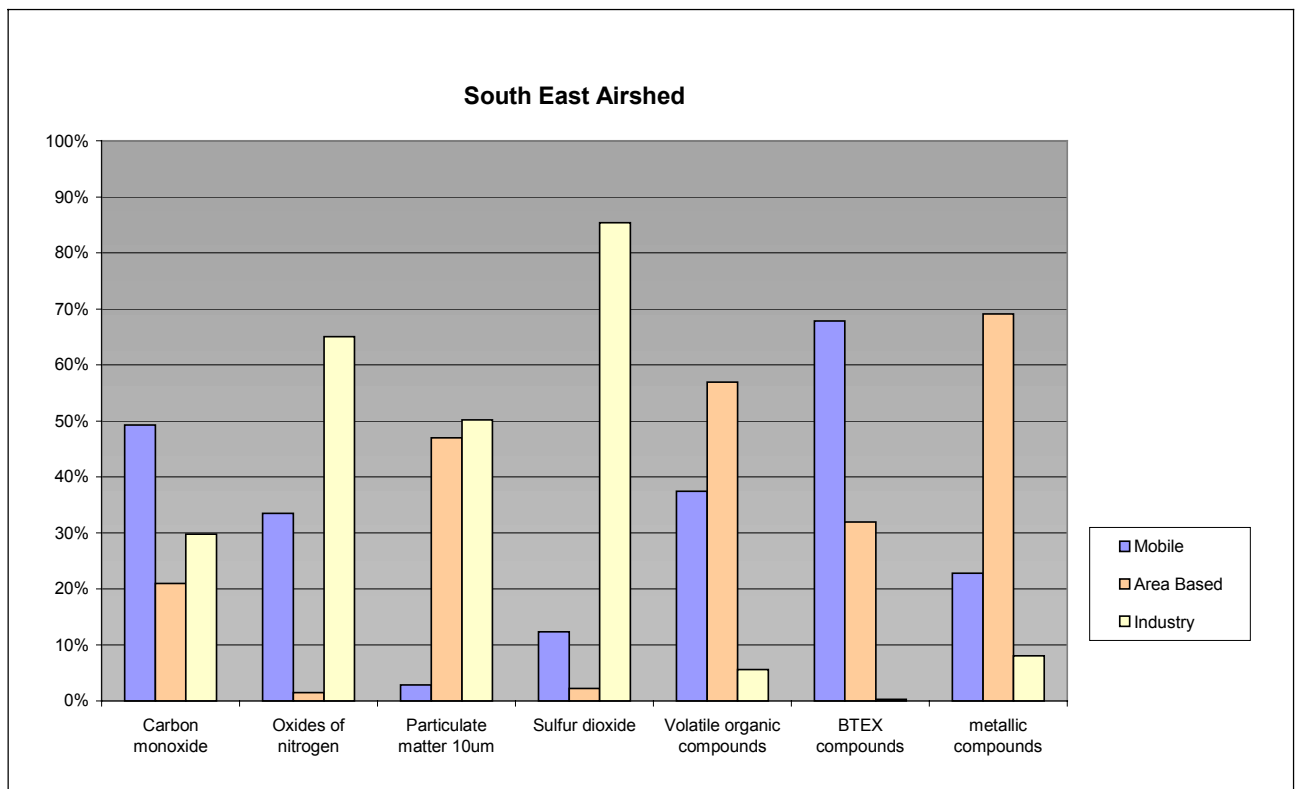


Figure 24 Comparison of NPI substance emissions by source in the South East airshed

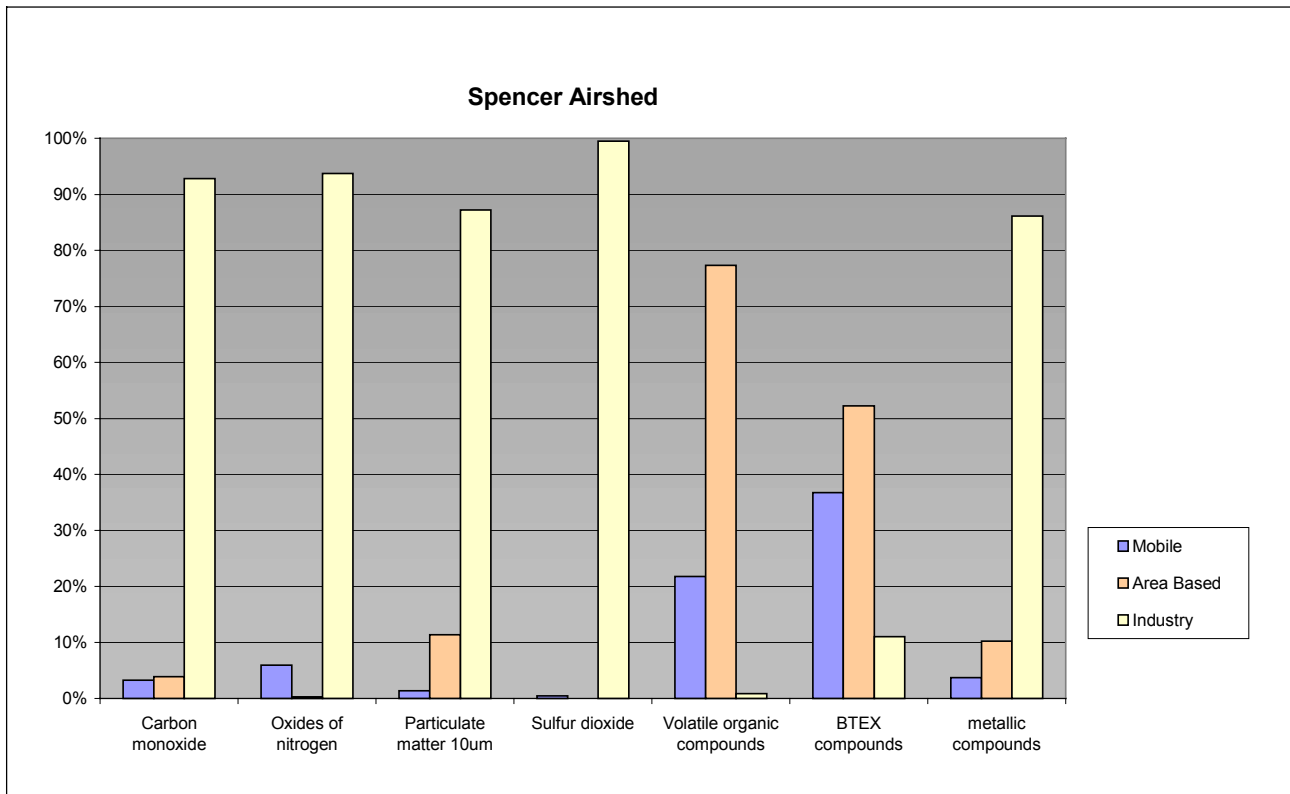


Figure 25 Comparison of NPI substance emissions by source in the Spencer airshed

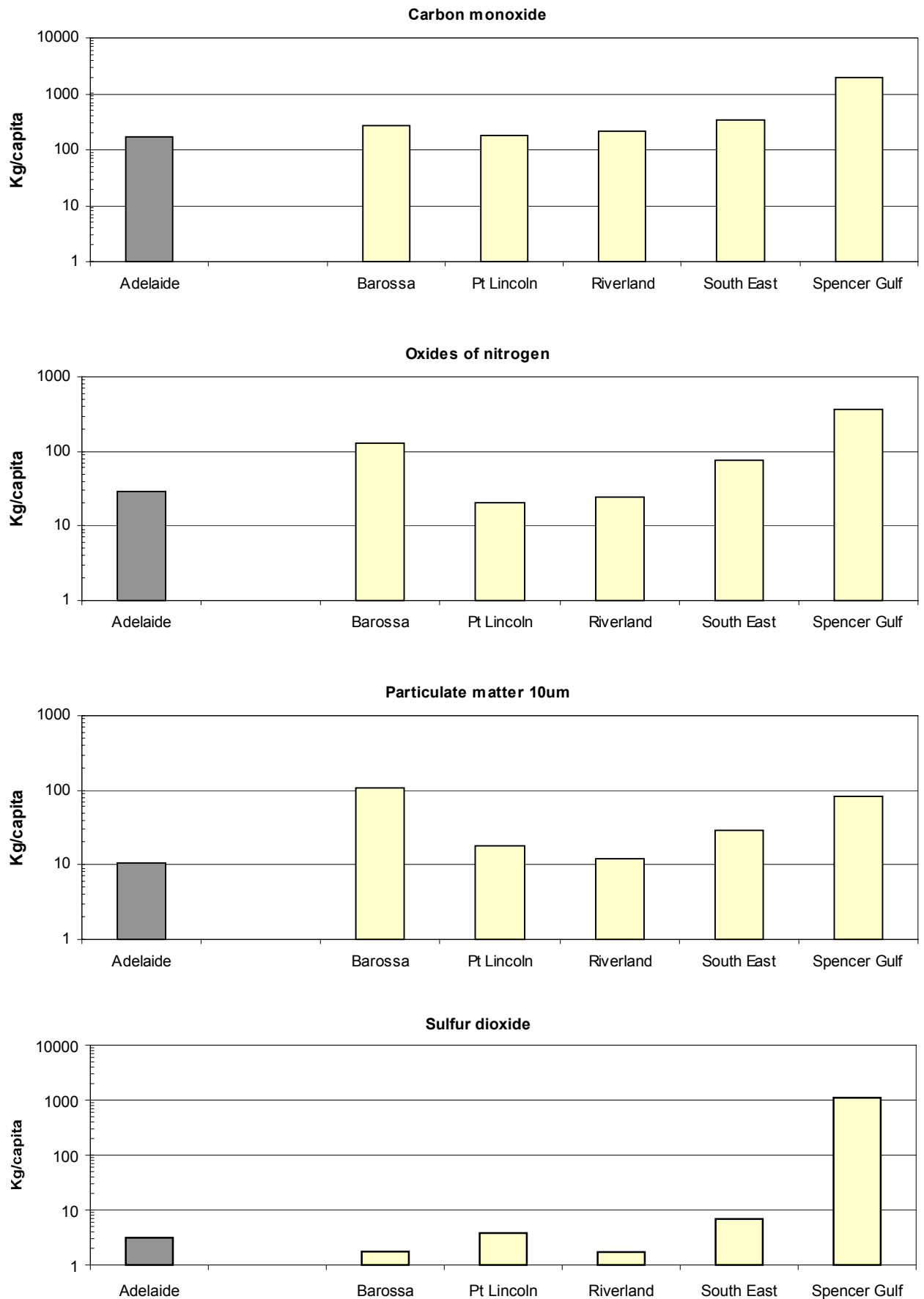


Figure 26 Annual airshed emissions of selected NPI substances, in kilograms per capita

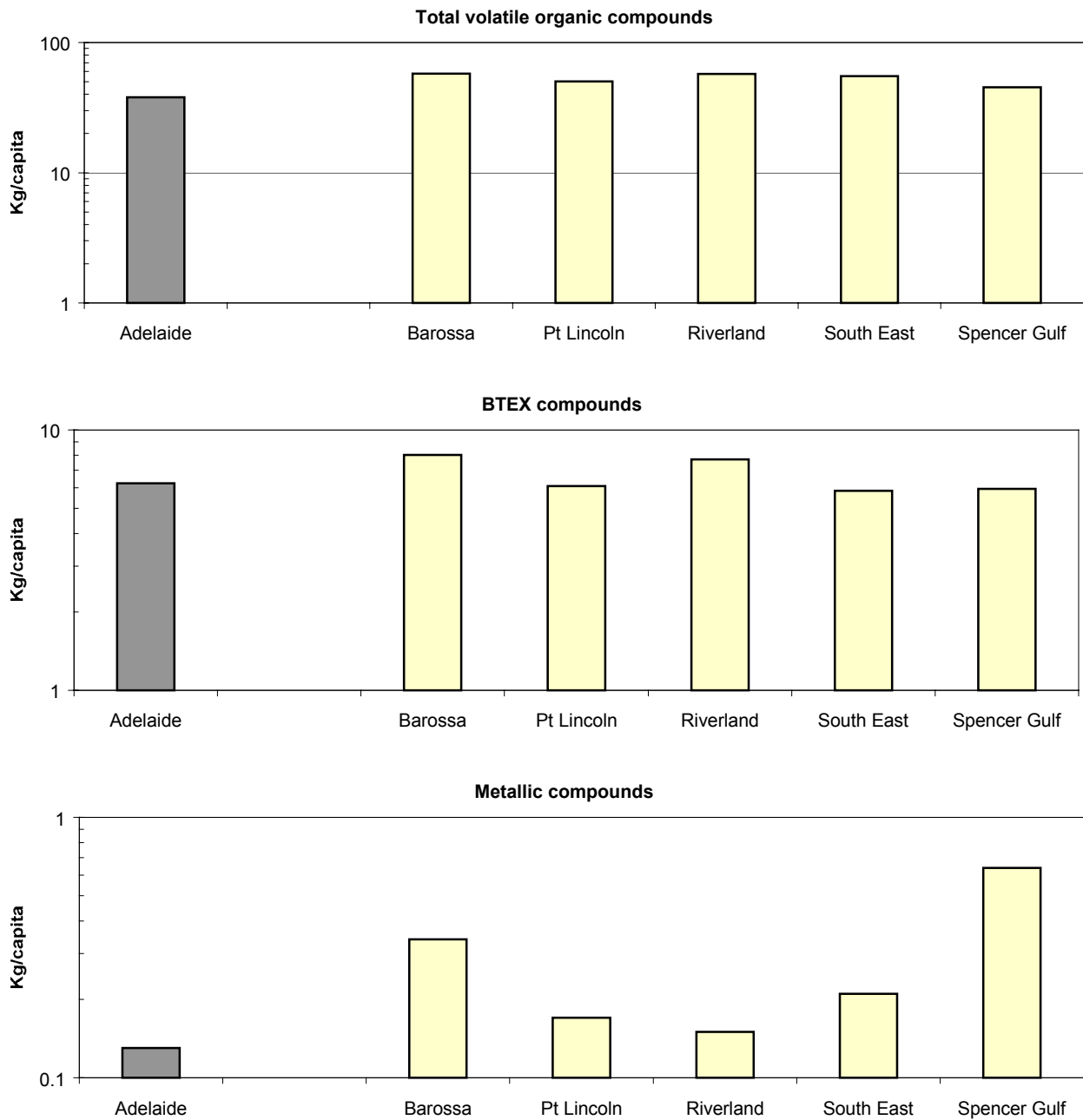


Figure 26 (cont) Annual airshed emissions of selected NPI substances, in kilograms per capita

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