

10 Canterbury Region

10.1 Monitoring sites and methods

Details of the eleven ambient air quality PM₁₀ monitoring sites within the Canterbury region are shown in Table 10.1. All sites meet the neighbourhood residential criteria and the main monitoring method used is the TEOM. Other monitoring methods used in Canterbury include a beta attenuation monitor at the St Albans Packer Street monitoring site in Christchurch from 1989 to 1993 and from 1996. This analyser was operated in conjunction with a TEOM for a number of years allowing an assessment of the relationship between the two methods at that site. Additional monitoring using a high-volume sampler at the same site was also carried out during 1997 to provide three-way comparison of the monitoring methods (Foster, 1998).

Table 10.1: Ambient air quality monitoring sites for PM₁₀ in Canterbury

Area	Location	Duration	Site classification	Monitoring method
Christchurch	St Albans – Coles Place	From 1998	Residential neighbourhood	TEOM
Christchurch	St Albans – Packer Street	1989–1993	Residential neighbourhood	BAM
Christchurch	St Albans – Packer Street	From 1994	Residential neighbourhood	TEOM
Christchurch	Opawa – Mary McLean Place	From July 1996 to June 1999	Industrial neighbourhood	BAM (1996) TEOM
Christchurch	Hornby – South Hornby School	From June 1995 to December 1998	Residential neighbourhood	TEOM
Christchurch	Beckenham – 66 Colombo Street	From June 1995 to March 1997	Residential neighbourhood	TEOM
Kaiapoi	41A Peraki Street	From April 2001	Residential neighbourhood	TEOM
Timaru	Timaru Main School	From Jan 1997	Residential neighbourhood	TEOM
Ashburton*	Ashburton Domain	December 1997– December 1998	Residential neighbourhood	TEOM
Ashburton	14 Cambridge Street	March 1999 to December 2000	Residential neighbourhood	TEOM
Rangiora	St Joseph's School	January 1999 to December 2000	Residential neighbourhood	TEOM

* This site was discontinued because of the impact of nearby trees on windflow.

10.2 PM₁₀ concentrations

Table 10.2 shows the results of PM₁₀ monitoring carried out in the Canterbury region based on a fixed monitoring period from 9 am to 9 am. Results in Table 10.2 indicate the guideline value for PM₁₀ is exceeded on around 20–30% of the winter days per year. The main monitoring method for PM₁₀ is the TEOM (Table 10.1). Data from co-located sampling methods in 1997 indicates that the TEOM in Christchurch measures about 20–30% less PM₁₀ than the high volume sampling method when pollution levels are elevated. Consequently most of the PM₁₀ data reported for Canterbury are likely to underestimate PM₁₀ concentrations relative to the high volume sampling method specified in the MfE ambient air quality guidelines (MfE and MoH, 2002).

Monitoring results show 24-hour average guideline value exceedences in all of the urban centres where air quality monitoring has been carried out. Christchurch has recorded the highest PM₁₀ concentrations measured in the region with a maximum 24-hour average concentration of 283 µgm⁻³. In Timaru maximum concentrations in the order of 100 µgm⁻³ are common with slightly lower maximums recorded in the other urban towns. Annual average PM₁₀ concentrations range from around 18 to 23 µgm⁻³.

Extrapolations of the measured number of guideline value exceedences show that if monitoring was undertaken every day during the winter months, it is likely that more exceedences of the guideline value may have occurred. This is shown in Table 10.2 as the equivalent number of days the guideline value may have been exceeded.

Figures 10.1 to 10.3 show the percentage of measured PM₁₀ concentrations in urban areas of Canterbury within the air quality categories. Although annual fluctuations in PM₁₀ concentrations are apparent, the data does not indicate any long-term trends in PM₁₀ concentrations in Christchurch or Timaru. Some apparent variations in PM₁₀ concentrations in Christchurch from the early to late 1990s is likely to reflect differences in monitoring methods rather than trends in PM₁₀ concentrations.

Table 10.2: Summary of PM₁₀ concentrations at ambient monitoring sites in Canterbury

Area	24-hour maximum	24-hour 99.5 percentile	Annual average	% days monitored	Days > 50 µgm ⁻³	% of winter days guideline was exceeded
St Albans Packe Street 1994	283	192	n/a ¹	61%	19 measured 23 equivalent ²	18%
St Albans Packe Street 1995	161	116	21	96%	31 measured 33 equivalent ²	26%
St Albans Packe Street 1996	139	102	21	96%	28 measured 30 equivalent ²	24%
St Albans Packe Street 1997	211	173	22	95%	27 measured 31 equivalent ²	25%
St Albans Packe Street 1998	155	127	23	99%	27 measured	22%
St Albans Packe Street 1999	152	139	23	97%	27 measured	22%
St Albans Packe Street 2000	96	84	18	67%	9 measured 18 equivalent ²	15%
St Albans Packe Street 2001	129	122	22	46%	13 measured 31 equivalent ²	25%

Area	24-hour maximum	24-hour 99.5 percentile	Annual average	% days monitored	Days > 50 μgm^{-3}	% of winter days guideline was exceeded
St Albans Coles Place 1998	83	82	n/a ¹	38%	2 measured 12 equivalent ²	10%
St Albans Coles Place 1999	158	140	23	99%	31 measured	25%
St Albans Coles Place 2000	154	105	19	100%	21 measured	17%
St Albans Coles Place 2001	183	130	23	93%	39 measured 40 equivalent ²	32%
Beckenham 1995	81	54	16	50%	3 measured 4 equivalent ²	3%
Beckenham 1996	106	81	15	99%	8 measured	7%
Hornby 1995	71	60	19	51%	3 measured 6 equivalent ²	5%
Hornby 1996	75	51	16	99%	2 measured	2%
Hornby 1997	80	64	22	98%	13 measured 13 equivalent ²	11%
Hornby 1998	75	64	22	87%	13 measured 13 equivalent ²	11%
Opawa 1995	137	134	n/a	41%	28 measured 44 equivalent ²	36%
Opawa 1996	148	140	n/a	29%	23 measured 49 equivalent ²	40%
Opawa 1997	150	108	22	85%	22 measured 18 equivalent ²	15%
Opawa 1998	196	97	23	98%	21 measured	17%
Timaru 1997	95	70	23	79%	21 measured 23 equivalent ²	18%
Timaru 1998	89	80	25	77%	27 measured	22%
Timaru 1999	108	77	23	99%	32 measured	26%
Timaru 2000	111	94	23	100%	31 measured	25%
Timaru 2001	100	92	23	100%	29 measured	24%
Ashburton 1999	67	55	18	98%	5 measured	4%
Ashburton 2000	72	56	18	99%	4 measured	4%
Rangiora 1999	57	54	15	85%	4 measured	3%
Rangiora 2000	74	55	14	100%	3 measured	2%
Kaiapoi 2001	97	87	23	78%	25 measured	20%

Note: Guideline value exceedences are highlighted in bold.

- 1 Annual averages were not calculated because of seasonal bias in the data,
- 2 This is an estimate of the number of days PM₁₀ concentrations may have exceeded the guideline value if monitoring had been carried out on all days during winter (May to August inclusive). It is extrapolated from the number of measured exceedences and the number of days when monitoring did occur.

Figure 10.1: Percentage of measured 24-hour average PM₁₀ concentrations within air quality categories at St Albans, Christchurch

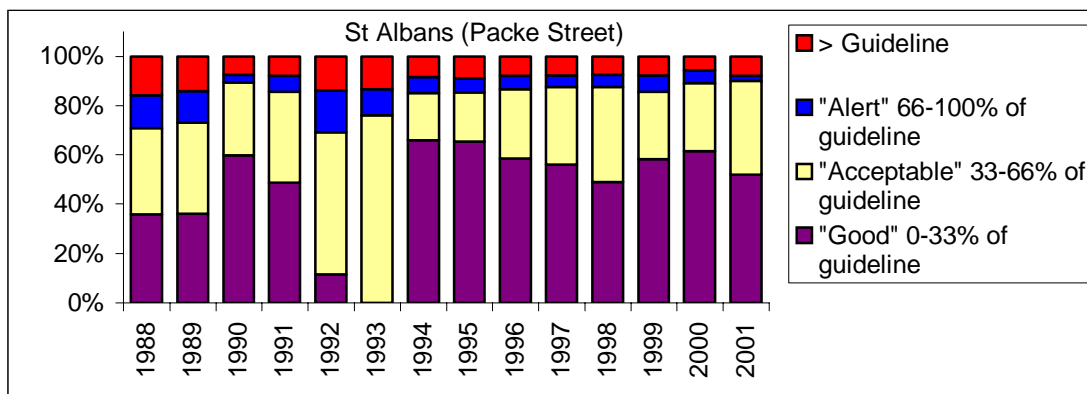


Figure 10.2: Percentage of measured 24-hour average PM₁₀ concentrations within air quality categories in Timaru

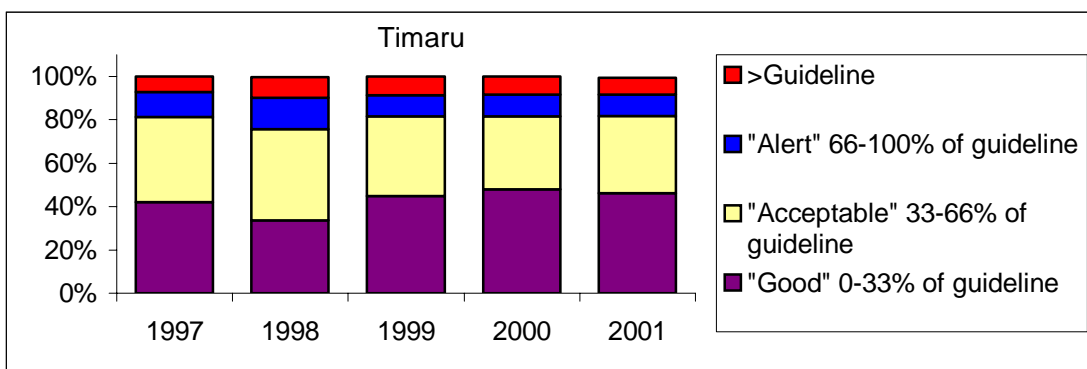
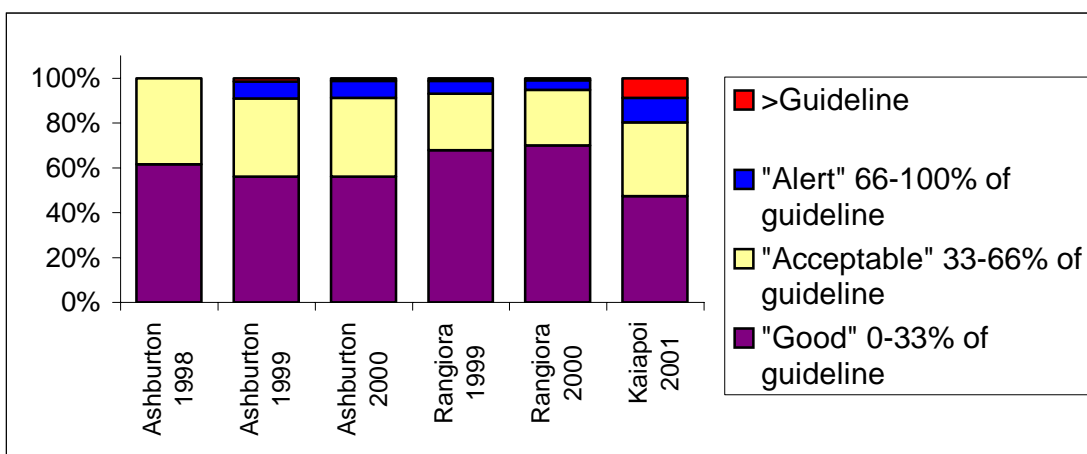


Figure 10.3: Percentage of measured 24-hour average PM₁₀ concentrations within air quality categories in Ashburton, Rangiora and Kaiapoi



11 West Coast and Southland Regions

Limited monitoring of PM₁₀ has been carried out in the West Coast and Southland regions. However, some smoke monitoring has been carried out in Greymouth in 1994 and 1995, in Reefton in 1995 and in Invercargill in 1983, 1985, 1986 and from 1990 to 1997. Smoke monitoring has also been carried out in the Southland areas of Winton and Wyndham in 1974, in Bluff in 1985 and in Maitua in 1996 and 1997. A monitoring strategy to measure PM₁₀ concentrations in urban areas on the West Coast is underway with initial monitoring in Greymouth during 2001. The Southland region is currently preparing a monitoring strategy to assess concentrations of PM₁₀ within the region. Monitoring for PM₁₀ in that region is scheduled to commence during winter 2003.

11.1 Monitoring sites and methods

Details of the ambient air quality PM₁₀ monitoring site in Greymouth are shown in Table 11.1. This is a residential neighbourhood site that measures concentrations of PM₁₀ using high-volume gravimetric sampling.

Table 11.1: Ambient air quality monitoring site for PM₁₀ in the West Coast region

Area	Location	Duration	Site classification	Monitoring method
Greymouth	49 Palmerston Street	May–August 2001	Residential neighbourhood	High-volume sampler
Westport	Derby Street	31 May – 3 September 2002	Residential neighbourhood	High-volume sampler

11.2 PM₁₀ concentrations

Figure 11.1 shows that concentrations of PM₁₀ measured in Greymouth during 2001 did not exceed the ambient air quality guideline values on any of the 21 sampling days during the winter monitoring period. The maximum measured 24-hour average PM₁₀ concentration of 46 µgm⁻³ is within the alert air quality category.

Concentrations of PM₁₀ measured in Greymouth during 2001 did not exceed the ambient air quality guideline values on any of the 21 sampling days during the winter monitoring period. The maximum measured 24-hour average PM₁₀ concentration of 46 µgm⁻³ is within the alert category. In Westport, the ambient air quality guideline value was breached on around 9% of the days monitored (Figure 11.1). Summary statistics for both monitoring sites are shown in Table 11.2.

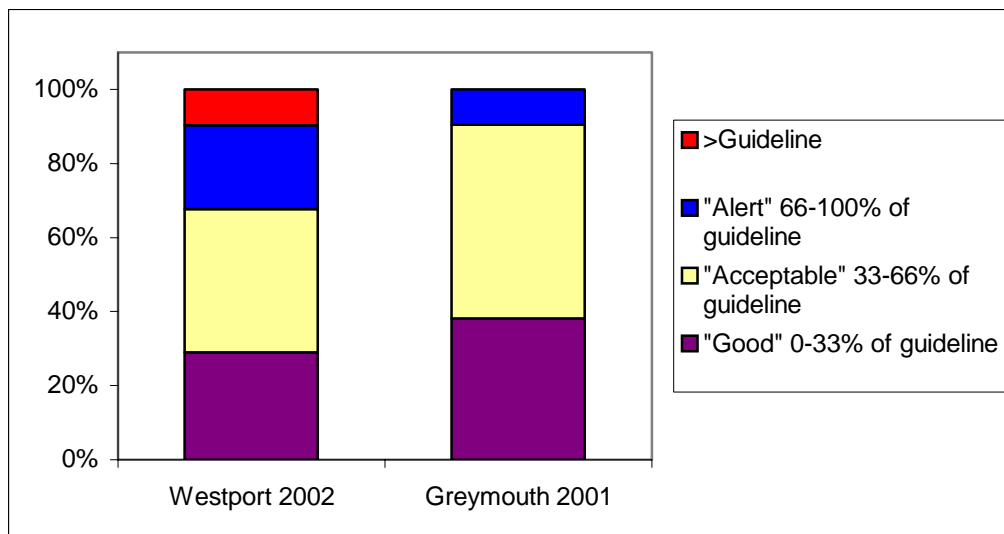
Table 11.2 includes an indication of the number of days PM₁₀ concentrations exceeded the 24-hour average PM₁₀ guideline value of 50 µgm⁻³. For Westport, this shows the number of exceedences that were measured and an estimate of the number that may have been measured if monitoring had been carried out on all days. This estimate is shown in the table as the equivalent number of exceedences.

Table 11.2: Summary of PM₁₀ concentrations at ambient monitoring sites in Greymouth and Westport

Area	24-hour maximum	24-hour 99.5 percentile	Annual average	% of days monitored	Days > 50 µgm ⁻³	% of winter days guideline was exceeded
Greymouth	46	45	n/a	6%	0	0%
Westport	56	55.4	n/a	8%	3 measured 12 equivalent*	9%

* This is an estimate of the number of days PM₁₀ concentrations may have exceeded the guideline value if monitoring had been carried out on all days during winter (May to August inclusive). It is extrapolated from the number of measured exceedences and the number of days when monitoring did occur.

Figure 11.1: Percentage of measured 24-hour average PM₁₀ concentrations within air quality categories in Westport (2002) and Greymouth (2001)



12 Otago Region

Air quality monitoring for PM₁₀ in the Otago region has been carried out by the Otago Regional Council since 1997. A variety of gravimetric methods have been used including both low and high-volume sampling. Concentrations of PM₁₀ have been measured in nine urban centres.

12.1 Monitoring sites and methods

Details of the 13 ambient air quality PM₁₀ monitoring sites within the Otago region are shown in Table 12.1. The sites are mainly residential neighbourhood and use either high volume gravimetric sampling or the low volume mini-vol samplers.

Table 12.1: Ambient air quality monitoring sites for PM₁₀ in the Otago region

Area	Location	Duration	Site classification	Monitoring method
Oamaru	Harlich	June–August 1998	Residential neighbourhood	Mini-volume sampler
Alexandra	Ventry Street	From April 1997–September 1998	Residential neighbourhood	Mini-volume sampler
Alexandra	Ventry Street	From April 1998 onwards	Residential neighbourhood	High-volume sampler
Cromwell	30 Ray Street	June–August 1999 and June–August 2001	Residential neighbourhood	Mini-volume sampler
Dunedin	Albany Street	From January 1997	Residential neighbourhood	High-volume sampler
Dunedin	North Road North East Valley	From January 1997	Residential neighbourhood	High-volume sampler
Mosgiel	Church Street	June–August 1998 and June 2000–September 2001	Residential neighbourhood	Mini-volume sampler
Mosgiel	Factory Road	From June 2000	Residential neighbourhood	High-volume sampler
Milton	Union SH1	June–September 1999	Residential neighbourhood	Mini-volume sampler
Balclutha	Cnr Lanark and Paisley	June–September 1997 and June–September 2000	Residential neighbourhood	Mini-volume sampler
Arrowtown	Bush Creek Road	July–September 1999	Residential neighbourhood	Mini-volume sampler
Queenstown	Camp and Shotover	June–August 1999	Commercial/residential	Mini-volume sampler
Dunedin Green Island	Irmo	June–September 1997, June–August 2000, July–August 2001	Residential neighbourhood	Mini-volume sampler

12.2 PM₁₀ concentrations

Concentrations of PM₁₀ are of concern in many of the urban centres where air quality monitoring has been carried out in Otago. In particular, guideline value exceedences are observed in Alexandra on around 40–65% of the days monitored during the months May to August inclusive (Table 12.2). Other areas also experience regular guideline value exceedences during the winter months. Annual average PM₁₀ concentrations in excess of the ambient air quality guidelines are also likely for a number of areas within the Otago region. However, the limited number of samples collected each year precludes a detailed assessment of annual average concentrations in most areas. Estimates of annual average PM₁₀ concentrations in Alexandra indicate breaches of the guideline value during both 1999 and 2000.

Table 12.2 also shows an estimate of the number of days that the guideline values may have been exceeded if monitoring had been carried out on all days. This is referred to in the table as the ‘equivalent’ number of exceedences.

Figure 12.1 shows 24-hour average PM₁₀ concentrations are regularly within the alert and action air quality categories for most areas. With the exception of the Alexandra and Dunedin North monitoring sites, data represent winter monitoring only.

Table 12.2: Summary of PM₁₀ concentrations at ambient monitoring sites in Otago

Area	Maximum	99.5 percentile	Annual average	% days monitored	Days > 50 µgm ⁻³	% of winter days guideline was exceeded
Oamaru 1998	61	59	n/a	4%	1 measured 8 equivalent ¹	7%
Alexandra 1997	178	168	n/a	7%	12 measured 78 equivalent ¹	63%
Alexandra 1998	134	129	n/a	9%	8 measured 66 equivalent ¹	53%
Alexandra 1999	87	84	22	17%	9 measured 53 equivalent ¹	43%
Alexandra 2000	108	105	23	16%	9 measured 55 equivalent ¹	45%
Alexandra 2001	193	173	n/a	13%	9 measured 65 equivalent ¹	53%
Cromwell 1999	73	73	n/a	4%	5 measured 38 equivalent ¹	31%
South Dunedin 1998	84	83	n/a	4%	2 measured 18 equivalent ¹	14%
South Dunedin 2001	55	55	n/a	4%	2 measured 15 equivalent ¹	13%
Dunedin North 1997	72	67	19	15%	2 measured 12 equivalent ¹	10%
Dunedin North 1998	88	82	18	16%	4 measured 25 equivalent ¹	20%
Dunedin North 1999	51	50	18	16%	1 measured 6 equivalent ¹	5%
Dunedin North 2000	57	52	14	16%	1 measured 6 equivalent ¹	5%

Area	Maximum	99.5 percentile	Annual average	% days monitored	Days > 50 μgm^{-3}	% of winter days guideline was exceeded
Dunedin North 2001	41	39	15	15%	0	
Mosgiel 1998	95	95	n/a	4%	5 measured 44 equivalent ¹	36%
Mosgiel 2000	70	67	n/a	9%	1 measured 8 equivalent ¹	7%
Mosgiel 2001	60	59	n/a	10%	2 measured 14 equivalent ¹	11%
Mosgiel 2001 (hi-vol)	49.9	49	n/a	8%	0	
Milton 1999	57	57	n/a	5%	2 measured 19 equivalent ¹	15%
Balclutha 1997	54	53	n/a	5%	1 measured 8 equivalent ¹	6%
Arrowtown 1999	55	55	n/a	2%	1 measured 18 equivalent ¹	14%
Queenstown 1999	36	35	n/a	4%	0	
Green Island 1997	65	65	n/a	6%	2 measured 15 equivalent ¹	13%
Green Island 2000	107	107	n/a	4%	2 measured 16 equivalent ¹	13%
Green Island 2001	58	57	n/a	2%	1 measured 14 equivalent ¹	11%
East Taieri 1997	22	21	n/a	3%	0	

Note: Guideline value exceedences are highlighted in bold.

1 This is an estimate of the number of days PM₁₀ concentrations may have exceeded the guideline value if monitoring had been carried out on all days during winter (May to August inclusive). It is extrapolated from the number of measured exceedences and the number of days when monitoring did occur.

Figure 12.1: Percentage of measured 24-hour average PM₁₀ concentrations within air quality categories in Otago

