



Summary of Annual PM₁₀ Concentrations in New Zealand: Update

**M. Sherman
G. Fisher**

Prepared for
Foundation for Research Science and Technology Programme “Keeping
Our Air Clean”

30 June 2005

Endpoint
Box 37 656
Parnell
Auckland, New Zealand

phone: 09 368 5971
fax: 09 368 5972
mob : 021 364 964
e-mail: g.fisher@endpoint.co.nz

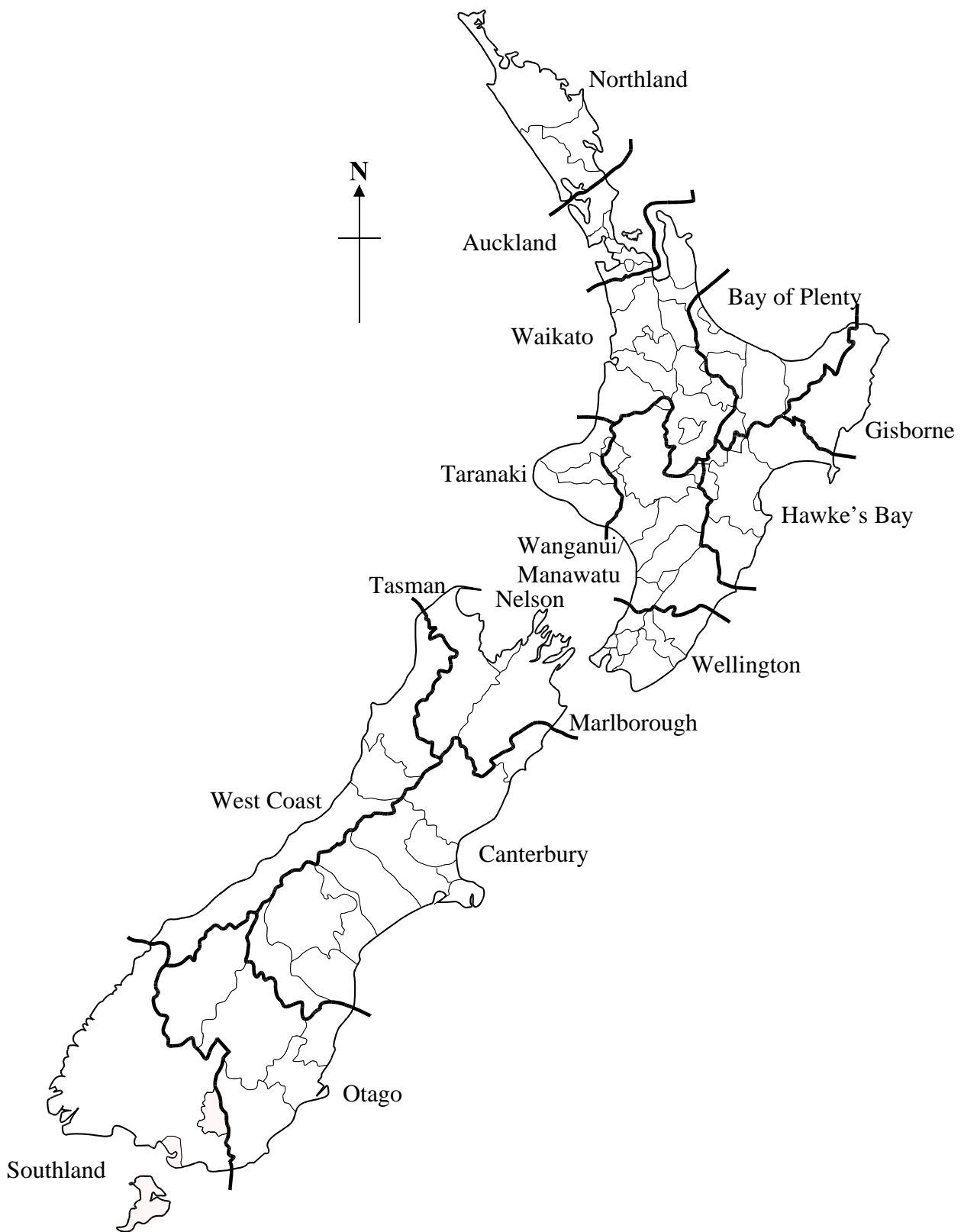


Figure 1. Regional Councils and Territorial Local Authorities that conduct PM₁₀ monitoring.

Introduction

This document provides annual averages of PM₁₀ for sites around New Zealand. The data were obtained from the various regional councils upon request. A few councils provided no information, possibly because no PM₁₀ monitoring occurs, and are not represented here. Site information is provided and grid references were listed when possible.

Purpose

The data was gathered in order to compare empirical measurement with modelling data. The focus is on recent averages as most pre-2002 data can be found in the 2003 Ministry for the Environment, Air Quality Technical Report No. 40: "Monitoring of PM₁₀ in New Zealand".

Methodology

Monitoring methods for PM₁₀ vary. Different instruments are used, with different sampling frequencies. These are noted in the tables. Much of the variability caused by such differences is averaged out in the annual averages, but some monitoring results should be treated with caution (eg the Grimm results may not be comparable with HiVols etc).

Data

Only annual averages are tabulated.

Results

Summary results are given in the list of tables below:-

1. Northland

Annual averages for Northland (µg/m³)

Site	Sampling method	Grid Ref	2000	2001	2002	2003
Whangarei city	Hi-Vol	1719750E 6045595N	22.4	24.2	na	na
Kaitaia	Grimm	1624553E 6116400N				12.6

2. Auckland

Site information

Site name	street address	suburb	city/district	grid reference NZ map grid		general site characteristics
Henderson (Lincoln Rd)	70 Lincoln Rd	Henderson	Waitakere	2655570	6480255	Urban
Khyber Pass	269 Khyber Pass Rd	Newmarket	Auckland	2668258	6480203	Urban
Queen St	155 Queen St	Auckland	Auckland	2667852	6482270	Urban
Takapuna (Westlake)	2 Wairau Rd	Takapuna	North Shore	2666510	6489778	Urban
Manurewa South Primary	31 McKean Ave	Manurewa	Manukau	2678994	6461501	Urban
Manurewa West Primary	39 Tawa Crescent	Manurewa	Manukau	2678260	6462365	Urban
Mt Eden (Kelly St)	17 Kelly St	Mt Eden	Auckland	2667325	6479718	Urban
Glen Eden Intermediate	23 Kaurilands Rd	Glen Eden	Waitakere	2657605	6474078	Urban
Penrose (ACI)	766 Great S Rd	Penrose	Auckland	2672269	6475230	Industrial

Additional site data

Site name	height (m)	micro met characteristics
Henderson (Lincoln Rd)	<20	Surrounding area is flat
Khyber Pass	80	Buildings on the southern side of Khyber Pass will shield the intakes from southern flow. The buildings upon the southern side and the valley nature of the road may result in some canyon effect
Queen St	15	Pollutants are likely to be entrained within the urban canyon formed by the tall buildings on either side of the Queen St during calm conditions. Wind flows are also likely to be channelled along this corridor.
Takapuna (Westlake)	20	This site is relatively well exposed to winds from all directions. However the hills to the south will influence flow condition from this direction and channel N and S wind flows.
Mt Eden (Kelly St)	70	Hilly; Mt Eden (summit 198m) 2km to SSE. Surrounding buildings may cause localised turbulence.
Penrose (ACI)	20	Surrounding buildings to the NE, E and SE will shield the monitor and introduce turbulence.

Annual averages for Auckland ($\mu\text{g}/\text{m}^3$)

	1994	1995	1996	1997	1998	1999	2000	2001	2002
Penrose ACI (Hi-Vol)	23.7	24.8	25.0	25.3	23.5	24.5	19.4	17.8	
Penrose ACI (Partisol)									19.4
Penrose ACI (TEOM)								21.5	20.0
Takapuna (TEOM)		17.5		18.3	18.0	16.6			
Takapuna (Hi Vol)				19.2	15.4	14.9	14.1	14.1	
Takapuna (Partisol)									17.4
Mt Eden (Partisol)				16.1	20.6	20.3	18.1	15.1	14.1
Khyber Pass (Partisol)					30.0	27.4	27.6	23.0	21.9
Henderson (Partisol)						21.4	17.4	18.8	15.8
Queen St (Partisol)						26.7	25.7	21.9	21.4
Henderson (MiniVol)								15.7	11.4
Glen Eden (MiniVol)								14.5	11.7
Manurewa S (MiniVol)									12.1
Manurewa W (MiniVol)									12.3

3. Waikato

Annual averages for Waikato ($\mu\text{g}/\text{m}^3$)

Site Name	Address	Method & freq.	grid reference NZ map grid		'98	'99	'00	'01	'02	'03	'04
Hamilton	Peachgrove Rd	TEOM, continuous	NZMS 260 Sheet S14:127-777		15	16	15	15	15	15	17
Tokoroa	Billah St	BAM, continuous	2760460	6327315				27	24		31
Taupo	Gillies Ave	Partisol, 1 in 3	2778316	6274682						18	17
Te Kuiti	Queen St	BAM continuous	2699326	6316254	16					18	18

4. Bay of Plenty

Annual averages for Bay of Plenty ($\mu\text{g}/\text{m}^3$)

Town	Location	1997	1998	1999	2000	2001	2002	2003
Tauranga	Otumoetai Road	15.2	14.4	13.4	13.3	11.8	12.6	12.4
Rotorua	Pererika Street	11.3	16.3	16.4	14.4	13.9	14.3	15.1
Rotorua	corner of Fenton and Amohau St		29.7	25.9	26.7			
Tauranga	Marsh Street				21.2	21.7	21.6	24.0
Opotiki	Church Street						16.0	13.5
Pongakawa		13.3	12.1	11.2	13.1	11.5	10.0	8.1
Whakatane	Quay Street	21.9	19.2	14.1	14.7	13.5	14.1	12.3

5. Taranaki

New Plymouth Central, GPS 2603227-6237811

Summary of PM₁₀ results (2003)

All results in $\mu\text{g}/\text{m}^3$	Mean	Median	Minimum	Maximum	95%ile
Full set of results (58 samples)	12.0	12.4	0.6	30.9	24.6 (1)
'Corrected' set of results excluding possible road works interference (53 samples)	10.7	11.5	0.6	24.6	19 (2)
Full set of samples collected with on-shore wind* (16 samples)	15.8	16.1	7.1	30.9	25.9 (3)
Full set of samples collected with off-shore wind* (42 samples)	9.0	10.4	0.6	23.7	21.1 (4)

6. Gisborne

Monitoring method: high-volume, 1 day in 6.

Site classification: residential neighborhood

Location: MET station on Oates St (hasn't got a street address as such).

NZMG ref: 2943 743, 6270 667

Annual averages for Gisborne ($\mu\text{g}/\text{m}^3$)

	'93	'94	'95	'96	'97	'98	'99	'00	'01	'02	'03	'04
Gisborne	11.36	8.62	7.74	9.38	9.35	12.27	8.37	7.34	9.28	6.84	9.1	6.69

7. Hawke's Bay

Annual averages for Hawke's Bay ($\mu\text{g}/\text{m}^3$)

Site	Grid ref	2001	2002	2003	2004	2005
Nelson Park		10.6	10.6	12.2	12.4	
St Johns	2843425, 6180381			16.4	16.7	10.3

8. Wanganui/Manawatu

No data available

9. Wellington

Annual averages for Wellington ($\mu\text{g}/\text{m}^3$)

Location	Elevation (m)	Grid Ref		Instrument	2000	2001	2002	2003	2004
Upper Hutt	40	2681464	6006446	TEOM	14.0	14.2	14.5	14.7	13.7
Masterton A	100	2732770	6024885	Hi-vol				18.5	13.6
Masterton B	100	2732770	6024885	TEOM				16.3	15.0
Wellington Central	10	2658477	5988791	B-Gauge					17.4
Lower Hutt	15	2671059	2671059	TEOM			14.5	14.0	15.0
Wainuiomata	80	2673668	5991398	Hi-vol		13.2	10.7	11.1	11.1
Rural Otaki	17	2691005	6046390	Hi-vol					

10. Marlborough

Site information

Town	Street address	Grid Ref		Additional site info
Blenheim	106 Middle Renwick Road, Blenheim	2588216	5966056	Located in an enclosed paved area adjacent to residential and light industrial zones - no major emission sources. Adjacent to SH6. Number of vehicles per day is 10,000. Wairau River is 7km to the N
Redwoodtown	65A Weld Street, Blenheim	2589778	5964026	Located within bowling club greens area. Greens extending 80 metres to south. Within 2 metres of a fence to the north with 40 metres of paved carpark extending to the north beyond the fence. Some vegetation along fenceline. Weld Street traffic 3,000 vehicles per day.

Annual averages for Marlborough ($\mu\text{g}/\text{m}^3$)

	2000	2001	2002	2003	2004	2005 (to July)
Blenheim	19.1	17.7	16.6	16.9	12.9	16.0
Redwoodtown				30.6	24.4	7.4

11. Nelson

Annual average for Nelson ($\mu\text{g}/\text{m}^3$)

Site	Address	Grid Ref#	2001	2002	2003	2004	2005 (up to May)
Swift Suzuki	117 St Vincent St.		42.0	31.3	39.6	33.2	15.8

12. Tasman

No data available.

13. West Coast

No data available.

14. Southland

No data available.

15. Canterbury

Monitoring sites at Canterbury towns

Site	Street Address	Map reference	Monitoring from	until
Kaikoura	95 Torquay St	O31: 6642-6611 (2566426; 5866111)	March 2002	February 2003
Kaiapoi	Kaiapoi Pump House, 41A Peraki St	M5: 8182- 5807 (2481828; 5758072)	March 2001	Ongoing
Washdyke	13 Washdyke Flat Road	J39: 6942-4859	April 2001	March 2002
Timaru	Timaru Main School, Grey Rd	K39: 7030-4387 (2370303; 5643870)	January 1997	Ongoing
Waimate	Waimate Stadium, Michael St	J40:5552-0617 (2355526; 5606170)	March 2002	December 2003
Geraldine	Huffey Street		March 2003	December 2004

Monitoring sites in Christchurch suburbs

Site	Street Address	Map reference	Monitoring from	until
Aranui	250 Pages Rd		June 2002	January 2004
Hoon Hay	51 McCarthy St	M36: 7704-3801 (2477048; 5738019)	February 2002	March 2004
St Albans Coles Place	21 Coles Pl	M35:8037-4400 (2480370; 5744005)	August 1998	Ongoing

Annual averages for Canterbury ($\mu\text{g}/\text{m}^3$)

Site	1999	2000	2001	2002	2003	2004
St Albans Coles Place				20	21	
St Albans Coles Place (adjusted)	28	23	29	24	25	24
Aranui					22	
Hoon Hay				19	18	
Kaikoura				21		
Kaiapoi			23	19	21	
Geraldine					17	
Timaru				20	24	
Waimate				15	17	

All measurements made with TEOM. Adjusted values are 2005 corrections for TEOM heating.

16. Otago

Annual averages for Otago ($\mu\text{g}/\text{m}^3$)

Town	Grid (1:50)	Location	'97	'98	'99	'00	'01	'02	'03	'04
Alexandra	G42:26174476	65 Ventry St			22	26	30	24	37	34
Mosgiel	I44:04667842	Industrial Estate					17*	19	22	27
North East Valley	I44:81308160	North Rd	19	18	18	14	14	14	16	13
Albany St	I44:17107920	Albany St	24	23	27	21	24	21	22	20

HiVol Samplers except * (combined MiniVol and HiVol data)