MARLBOROUGH DISTRICT COUNCIL

Annual Air Quality Monitoring Report – Blenheim 2011

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Executive Summary

The main air contaminant of concern in urban areas of New Zealand is PM_{10} (particles in the air less than 10 microns in diameter). In 2011, air quality monitoring of PM_{10} in Marlborough was carried out at the main air quality monitoring site in Blenheim, which is situated in Redwoodtown, and at the historical PM_{10} monitoring site in Middle Renwick Road (MRR). The methods of monitoring were a Met One Beta Attenuation Monitor (BAM) at the Redwoodtown site and a gravimetric high volume sampler at Middle Renwick Road.

Concentrations of PM_{10} were compared to the National Environmental Standard for Air Quality (NES) of 50 µg m^{-3} (24-hour average) and to the Ministry for the Environment's air quality guidelines and indicator categories. Comparisons are made with historical data to determine the likelihood of trends in concentrations.

In 2011 concentrations of PM_{10} exceeded 50 µg m^{-3} (24-hour average) on six occasions at the Redwoodtown air quality monitoring site, resulting in five breaches of the NES. This represents the greatest number of breaches since 2006. The maximum measured concentration was 82 µg m^{-3} and represents the highest 24-hour average concentration recorded at the site since monitoring commenced in 2000. The second highest PM_{10} concentration was 80 µg m^{-3} and is significant in that it is higher than the 66 µg m^{-3} previously used to determine the reductions required in PM_{10} concentrations to meet the NES.

An evaluation of trends in PM_{10} concentrations in Blenheim until 2011 was indicative of a decrease since 2005. However, the higher concentrations measured during 2011 negate any perceived change and indicate that significant reductions are required to meet the NES for PM_{10} in Blenheim.

The annual average PM_{10} concentration for the Bowling Club site was 16 µg m^{-3} and is less than the annual average guideline for PM_{10} of 20 µg m^{-3}.

The maximum PM_{10} concentration measured at the MRR site was 35 µg m^{-3} for 2011 and is similar to other recent years. Concentrations of PM_{10} in excess of the NES are not common at this site. Previously exceedences of 50 µg m^{-3} have occurred in 2000, 2003 and 2008. The annual average PM_{10} concentrations estimated for MRR for 2010 was 10 µg m^{-3}. An evaluation of trends at the MRR site suggests a decrease of around 30% in annual average PM_{10} concentrations at this site since 2000.

Contents

List of Figures

List of Tables

1. Introduction

The main air contaminant of concern in Marlborough and in all urban areas of New Zealand is PM_{10} - particles in the air less than 10 microns in diameter. In 2011 PM_{10} concentrations were measured at the Redwoodtown Bowling Club and a site at 106 Middle Renwick Road (MRR).

Historical air quality monitoring for Marlborough includes monitoring of PM_{10} at the MRR monitoring site, intermittent monitoring of PM_{10} at the Redwoodtown Bowling Club site, survey PM_{10} monitoring in Renwick during 2000 and 2002, monitoring for PM_{10} in Picton during 2008 and 2009, visibility surveys and passive sampling for nitrogen oxides and sulphur oxides. From 2007 to early 2008, PM_{10} concentrations were measured at the Croquet Club in Redwoodtown in addition to the main monitoring site at the Bowling Club. A site on Brooklyn Street in Redwoodtown was temporarily used to measure PM_{10} concentrations during 2004.

In 2004 the Ministry for the Environment introduced National Environmental Standards (NES) for ambient air quality (MfE, 2004). Table 1.1 shows the contaminant, the concentration, averaging period and allowable exceedances as required by the NES. The NES for PM_{10} is set at 50 µg m^{-3} with one allowable exceedence per year. Compliance with this target is required by 2016 in Blenheim. All other areas in Marlborough must remain compliant with the NES.

Air quality monitoring data in other urban areas of New Zealand indicates that it would seem unlikely that concentrations of NES contaminants other than PM_{10} would be in breach in Blenheim. Concentrations of other contaminants even in large urban areas are typically within the NES and guideline concentrations. Because emissions of other contaminants in Blenheim are far lower than large urban areas such as Christchurch, it would seem unlikely that concentrations of other key urban air pollutants would be in breach of the NES or air quality guidelines. The exception to this may be benzo(a)pyrene concentrations, which appear to occur well in excess of guideline concentrations in Christchurch.

The Ministry for the Environment also provides guidelines for ambient air quality (MfE, 2002). Table 1.2 shows the ambient air quality guidelines and Table 1.3 details the air quality indicator categories to assist in the presentation and management of air quality in New Zealand. Air quality monitoring data in this report are presented relative to air quality guidelines and these indicator categories. These categories provide a useful perspective on the overall air quality and provide a valuable tool for evaluating trends in concentrations over time.

Table 1.1: National Environmental Standards for ambient air quality (MfE, 2004)

Contaminant	NES values		
	Concentration	Averaging Period	Allowable exceedances per year
Carbon monoxide	10 mg m^{-3}	8-hour	1
Particles (PM_{10})	50 µg m^{-3}	24-hour	1
Nitrogen dioxide	200 µg m^{-3}	1-hour	9
Sulphur dioxide [b]	350 µg m^{-3}	1-hour	9
Sulphur dioxide [b]	570 µg m^{-3}	1-hour	0
Ozone	150 µg m^{-3}	1-hour	0

Table 1.2: Ambient air quality guidelines for New Zealand (MfE, 2002)

Contaminant	2002 guideline values	
	Concentration[a]	Averaging Period
Carbon monoxide	30 mg m^{-3} 10 mg m^{-3}	1-hour 8-hour
Particles (PM_{10})	50 µg m^{-3} 20 µg m^{-3}	24-hour Annual
Nitrogen dioxide	200 µg m^{-3} 100 µg m^{-3}	1-hour 24-hour
Sulphur dioxide [b]	350 µg m^{-3} 120 µg m^{-3}	1-hour 24-hour
Ozone	150 µg m^{-3} 100 µg m^{-3}	1-hour 8-hour
Hydrogen sulphide [c]	7 µg m^{-3}	1-hour
Lead [d]	0.2 µg m^{-3} (lead content of PM_{10})	3-month moving, calculated monthly
Benzene (year 2002) Benzene (year 2010)	10 µg m^{-3} 3.6 µg m^{-3}	Annual Annual
1,3-Butadiene	2.4 µg m^{-3}	Annual
Formaldehyde	100 µg m^{-3}	30-minutes
Acetaldehyde	30 µg m^{-3}	Annual
Benzo(a)pyrene	0.0003 µg m^{-3}	Annual
Mercury (inorganic) d Mercury (organic)	0.33 µg m^{-3} 0.13 µg m^{-3}	Annual Annual
Chromium VI d Chromium metal and chromium III	0.0011 µg m^{-3} 0.11 µg m^{-3}	Annual Annual
Arsenic (inorganic) d Arsine	0.0055 µg m^{-3} 0.055 µg m^{-3}	Annual Annual

Notes:

[a] All values apply to the gas measured at standard conditions of temperature (0° C) and pressure (1 atmosphere).
[b] The sulphur dioxide guideline values do not apply to sulphur acid mist.

[c] The hydrogen sulphide value is based on odour nuisance and may be unsuitable for use in geothermal areas.
[d] The guideline values for metals are for inhalation exposure only; they do not include exposure from other routes such as ingestion. These other routes should be considered in assessments where appropriate.

Table 1.3: Environmental Performance Indicator categories for air quality (MfE, 2002)

Category	Value relative to guideline	Comment
Excellent	Less than 10% of the guideline	Of little concern: if maximum values are less than a tenth of the guideline, average values are likely to be much less
Good	Between 10% and 33% of the guideline	Peak measurements in this range are unlikely to affect air quality
Acceptable	Between 33% and 66% of the guideline	A broad category, where maximum values might be of concern in some sensitive locations but generally they are at a level which does not warrant urgent action
Alert	Between 66% and 100% of the guideline	This is a warning level, which can lead to exceedances if trends are not curbed
Action	More than 100% of the guideline	Exceedances of the guideline are a cause for concern and warrant action, particularly if they occur on a regular basis

In 2005 an emission inventory was undertaken in Blenheim to determine the sources of PM_{10} and other contaminant emissions (Wilton, 2005b). The results of the survey indicated that domestic home heating was the main source of PM_{10} emissions, contributing to around 85% of the daily wintertime PM_{10} (Wilton, 2005b). Motor vehicles contributed to 7% of PM_{10} emissions, outdoor burning contributed to 6% and industry contributed to 2% of total wintertime emissions.

2. Methodology

Two air quality monitoring methods were used to measure PM_{10} concentrations in Marlborough. At the Redwoodtown Bowling Club site in Blenheim, a Met One beta attenuation monitor (BAM) was used. This method is NES compliant and provides continuous hourly average PM_{10} concentrations.

At the MMR site a gravimetric high-volume sampler, a method compliant with the MfE (2002) reference method specifications, was used. High-volume sampling was carried out on a one day in three sampling regime with samples collected over a 24-hour period from midnight to midnight. Although compliant in terms of the principles of operation, the high volume sampler is difficult to operate continuously because of the requirement for filter change at midnight. Consequently this method as used at the MMR site was not compliant with the NES.

Meteorological data, including wind speed, wind direction were obtained from a NIWA site on the outskirts of Blenheim. Ambient temperature data was collected at the Bowling Club site in Redwoodtown.

2.1. Air quality monitoring sites

There are two permanent air quality monitoring sites in Blenheim, the Redwoodtown Bowling Club site and the Middle Renwick Road (MRR) site. Figure 2.1 shows the MRR site, which provides a historical record of PM_{10} in Blenheim and is located to the north-west of Blenheim, the Redwoodtown Bowling Club site which has been operational since 2002, and the metrological monitoring site.

In 2007 a site at the Croquet Club was established for the purposes of evaluating the relationship between Brooklyn Street area PM_{10} and PM_{10} concentrations measured at the Bowling Club. This was considered important because PM_{10} concentrations of the magnitude measured during 2004 at Brooklyn Street had not been measured at the Bowling Club and because the reductions required in PM_{10} concentrations in Blenheim had been dependent on the Brooklyn Street results. The results from work

undertaken in 2007 and reported in the '2007 Air Quality Monitoring Report' (Wilton, 2008) indicated that the Brooklyn Street site was likely to be affected by localised sources of PM_{10} and should not be used for air quality management purposes. Details of the Croquet Club site are outlined in '2008 Air Quality Monitoring Report' (Wilton and Baynes, 2009).

Figure 2.1: Location of air quality sites and metrological site in Blenheim for 2009

2.1.1. Middle Renwick Road (MRR) monitoring site

The MRR air quality monitoring site was established in 2000 at the back yard area of a Council site at 106 Middle Renwick Road. An aerial picture of the MMR site and its surrounds are shown in Figure 2.2, and Figure 2.3 shows the high volume sampler located at the MRR monitoring site. Table 2.1 provides site details for the site.

Figure 2.2: Aerial photo of the MRR air quality monitoring site (note: red dot depicts monitoring site). The site has been redeveloped since this photo was taken (as shown below)

Figure 2.3: PM_{10} monitor at the MRR air monitoring site

Table 2.1: Site summary details for the MRR air quality monitoring site.

Site name	Blenheim – 106 Middle Renwick Road
Site contact details	Marlborough District Council
Description of site	Open grassed area
Site category	Residential neighbourhood
Purpose of site and sources	To measure ambient air concentrations of PM_{10} at the historical air quality monitoring site in Blenheim. Main source during the winter months is solid fuel burning for domestic heating.
Proposed duration of monitoring	Ongoing
Contaminants monitored	PM_{10}
Site co-ordinates	E 1678180 N 5404326 (NZTM)
Date of site installation	January 2000
Meteorological characteristics of area	Low wind speeds occur regularly during the winter months. Temperature inversions are likely.
Sample frequency	One day in three from May 2005 One day in six prior to this during the summer and one day in three during the winter.
Inlet height	1.5 metres
Averaging period	24-hour

2.1.2. Redwoodtown – Bowling Club Monitoring Site

In 2011 air quality monitoring took place at the main air quality monitoring site at the Blenheim Bowling Club on Weld Street in Redwoodtown. Figures 2.4 and 2.5 show the surrounding area and the location of the monitoring site within the Bowling Club grounds. Summary site details are given in Table 2.2.

Figure 2.4: Aerial photo of the Redwoodtown – Bowling Club air quality monitoring site (note: red dot depicts monitoring site).

Figure 2.5: PM_{10} monitor at the Redwoodtown – Bowling Club air quality monitoring site.

Table 2.2: Site summary details for the Redwoodtown – Bowling Club air quality monitoring site.

Site name	Redwoodtown – Bowling Club
Site contact details	Marlborough District Council
Description of site	The site is located at the Blenheim Bowling Club, which is to the south-east of central Blenheim. The surrounding area includes a bowling green, gravel petanque area and paved areas.
Site category	Residential neighbourhood
Purpose of site and sources	To measure worst-case ambient air concentrations of PM_{10} in Blenheim. The main source during the winter months is solid fuel burning for domestic heating. The site is downwind of a large residential area for meteorological conditions conducive to poor air quality.
Proposed duration of monitoring	Ongoing
Contaminants monitored	PM_{10}
Site co-ordinates	E 1679764, N 5402324 (NZTM)
Date of site installation	Monitoring from 2000-2003. Permanent site since 2005.
Meteorological characteristics of area	Low wind speeds occur regularly during the winter months. Temperature inversions are likely.
Sample frequency	Hourly
Inlet height	1.5 metres
Averaging period	24-hour

2.2. Quality assurance

Marlborough District Council staff operated the high volume PM_{10} samplers, including filter changing.

Flow calibrations were carried out every month, normally during the morning. From Januray to June 2011 filters were couriered to Environmental Laboratories Services (ELS) Ltd, who undertook filter weighing in accordance with the New Zealand and Australia standard for high volume sampling. ELS Ltd hold IANZ accreditation, for high volume PM_{10} sampling. From July to December 2011 filters were couriered to Hills Laboratories Ltd, who undertook filter weighing in accordance with the New Zealand and Australia standard for high volume sampling. Hills Labs Ltd hold IANZ accreditation, for high volume PM_{10} sampling. Transportation of filters occurs at the end of each month, with filters stored and transported in snaplock bags at ambient temperature.

Operation of the BAM is also carried out by MDC staff. Hourly data is recorded by the instrument and logged by an iQuest iRIS 320 datalogger. Results are telemeted hourly to MDC and stored in the hydrotel database.

3. Air quality monitoring in Blenheim

3.1. PM_{10} concentrations at the MRR site

Daily average PM_{10} concentrations measured at the MRR site during 2011 are shown in Figure 3.1. The maximum measured 24-hour average PM_{10} concentration was 35 µg m^{-3} and was measured on 3 July. Concentrations of PM_{10} have exceeded 50 µg m^{-3} at this site on only a few years. In 2008 the maximum concentration recorded was 51 µg m^{-3}. The only other years that concentrations above 50 µg m^{-3} have been recorded at this site are 2000 (56 µg m^{-3}) and 2003 (75 µg m^{-3}).

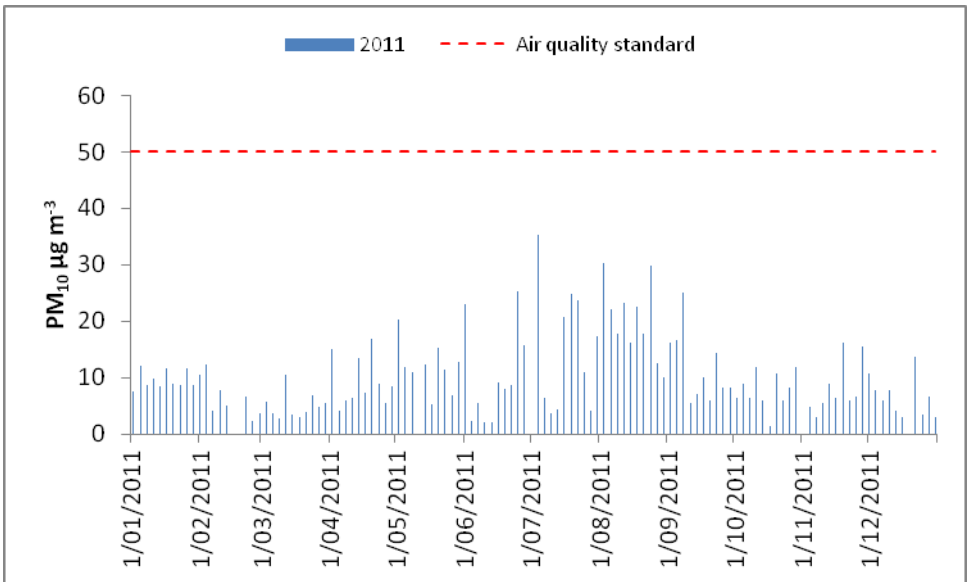

Figure 3.1: Daily winter PM_{10} concentrations measured at the MRR site during 2011.

Figure 3.2 shows changes in PM_{10} concentrations relative to MfE air quality indicator categories (shown in Table 1.3) at the MRR site from 2000 to 2011. 99% of the PM_{10} concentrations measured in 2011 were less than 66% of the air quality guideline, that is, within the "acceptable" and "good" air quality categories. Monthly variations in PM_{10} concentrations compared to air quality indicators for 2011 are shown in Figure 3.3. No data are reported for April, October and November because there was not enough monitoring conducted during these months to report a monthly average concentration, at least 75% of data is required for monthly reporting. Figure 3.4 shows the number of days when the NES was exceeded, the maximum concentration and the second highest concentration for 2011 and for previous years.

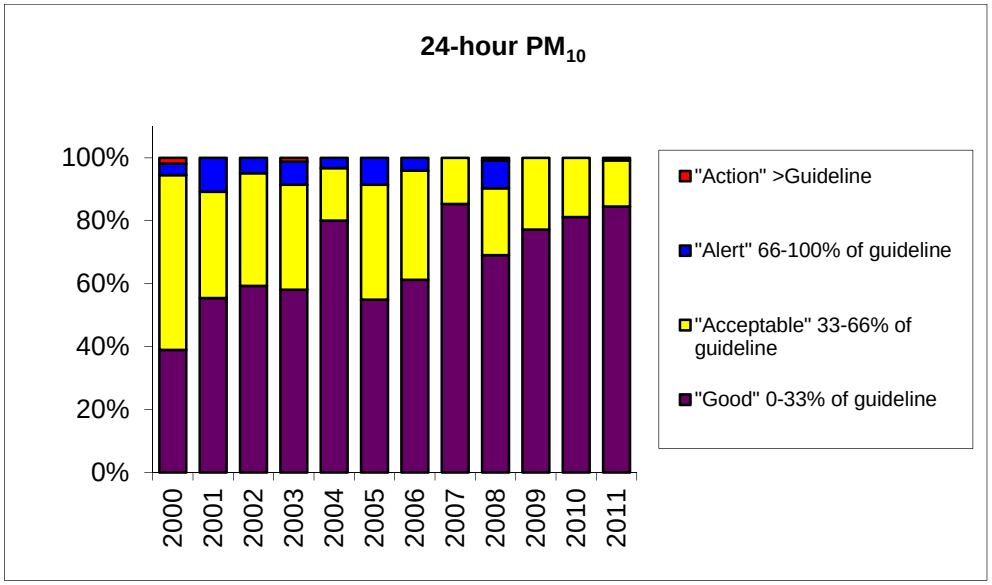

Figure 3.2: Comparison of PM_{10} concentrations measured at the MRR site from 2000 to 2011 to air quality indicator categories.

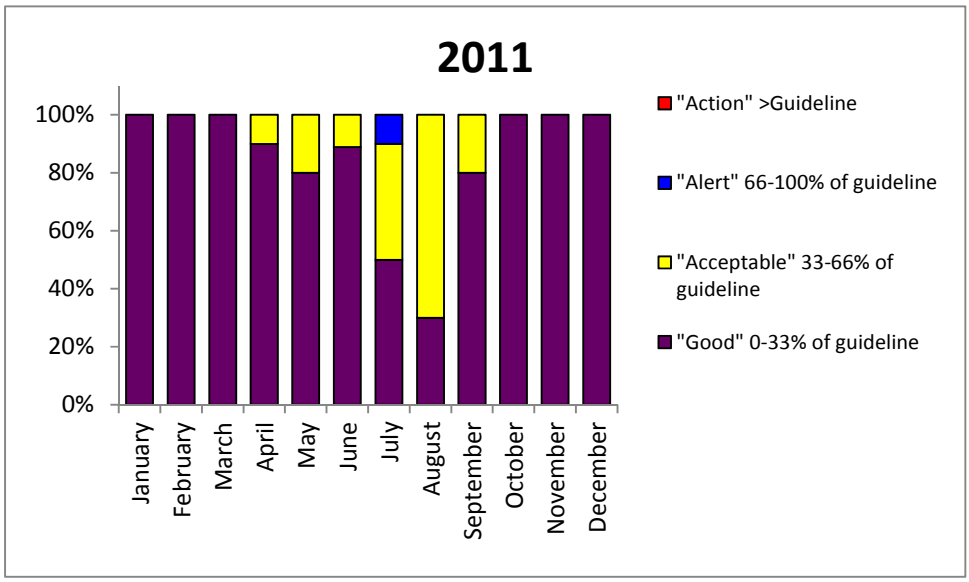

Figure 3.3: Comparison of daily PM_{10} concentrations each month during 2011 to air quality indicator categories at the MRR site.

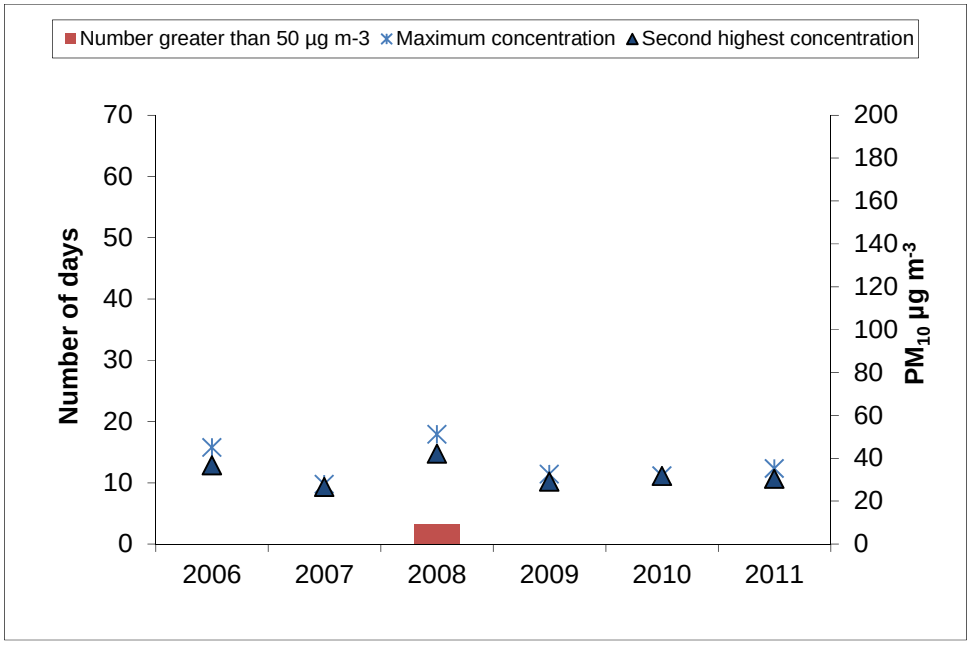

Figure 3.4: Number of days when the NES was exceeded, the maximum concentration and the second highest concentration from 2006 to 2011 at the MRR site.

The estimated annual average PM_{10} concentration for the MRR site for 2011 is 10 µg m^{-3}. This is lower than previous annual average PM_{10} concentrations for this site which are typically 12-14 µg m^{-3}. The highest annual average concentration for this site was 18 µg m^{-3} and was measured in 2000. Figure 3.5 shows a decrease in annual average PM_{10} concentrations at the MMR monitoring site of around 30% since 2000. The Ministry for the Environments annual average PM_{10} guideline is 20 µg m^{-3}. There is currently no NES for annual average PM_{10} concentrations.

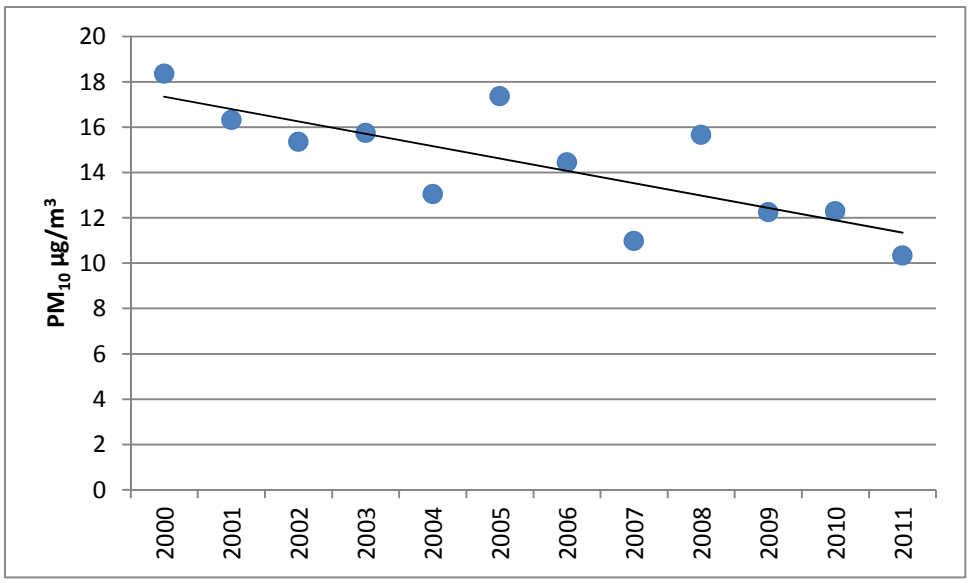

Figure 3.5: Annual average concentrations for the MRR site.

Table 3.1: Summary of PM_{10} concentrations measured at the MRR monitoring site from 2000 to 2011

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
"Good" 0-33% of guideline	39%	55%	59%	58%	80%	55%	61%	85%	69%	77%	81%	84%
"Acceptable" 33-66% of guideline	56%	34%	36%	33%	17%	37%	35%	15%	21%	23%	19%	15%
"Alert" 66-100% of guideline	4%	11%	5%	7%	3%	9%	4%	0%	8%	0%	0%	1%
“Action” >Guideline	2%	0%	0%	1%	0%	0%	0%	0%	1%	0%	0%	0%
Percentage of valid data	15%	20%	22%	22%	16%	25%	33%	32%	31%	32%	29%	32%
Annual average (µg m^{-3})	18	16	15	16	13	17	14	11	16	12	12	10
Measured PM_{10} concentrations above 50 µg m^{-3}	1	-	-	1	-	-	0	0	1	0	0	0
Extrapolated PM_{10} concentrations above 50 µg m^{-3}									3	0	0	0
99.7 %ile concentration (µg m^{-3})	53	46	40	67	46	47	42	27	48	31	32	4
Annual maximum (µg m^{-3})	56	48	41	75	49	49	45	28	51	32	32	35
Number of records	54	74	81	81	60	93	121	116	113	118	106	116

3.2. PM_{10} concentrations at Redwoodtown – Bowling Club

Six exceedences of 50 µg m^{-3} were measured at the Redwoodtown air quality monitoring site during 2011 (Figure 3.6). As the NES allows one exceedence of 50 µg m^{-3} per year, five breaches of the NES occurred in Blenheim during 2011. This represents the greatest number of NES breaches recorded at the site since 2006 when a similar number were measured. The Blenheim airshed was compliant with the NES during 2009 but prior to this it had been non-compliant since the NES was introduced.

The highest PM_{10} concentration during 2011 occurred on 2 July and reached 82 µg m^{-3}. This represents the highest 24-hour average PM_{10} concentrations measured since the introduction of the NES in 2005. The second highest concentration measured during 2011 was also extremely high at 80 µg m^{-3} and has significance because it represents a new high point from which concentrations need to be reduced in order to meet the NES. Prior to this measurement a concentration of 62 µg m^{-3} had been used to estimate reductions required in PM_{10}.

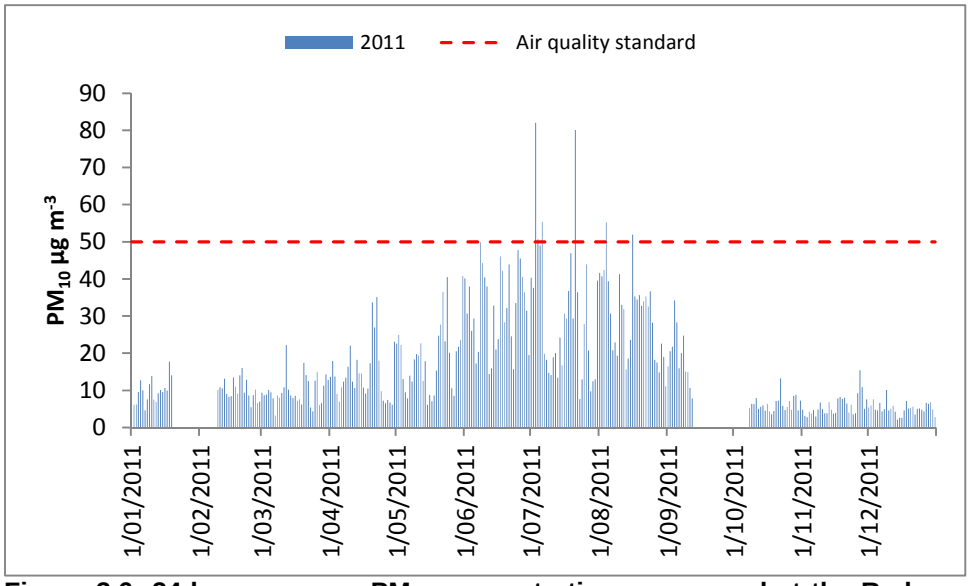

Figure 3.6: 24-hour average PM_{10} concentrations measured at the Redwoodtown – Bowling Club site during 2011.

Figure 3.7 compares daily PM_{10} concentrations measured from 2006 to 2011 to the MfE air quality indicator categories (shown in Table 1.3). The proportion of PM_{10} concentrations within the "good" air quality category is similar to other years. However, the proportion of concentrations within the "alert" or "action" categories (greater than 66% of the guideline) is slightly higher than for other years at 15%. This compares with 7% in 2010 11% and 9% in 2008 and 2009 and 7% in 2007.

Monthly variations in the distribution of PM_{10} concentrations for 2011 are shown in Figure 3.8. All guideline breaches were measured during July and August. No data are reported for January, February or September because more than 25% of data for each month are missing. The current GPG (Good Practice Guide) states that at least 75% of data is required for monthly averages.

Figure 3.9 shows the number of days when the NES was exceeded, the maximum concentration and the second highest concentration for 2011 and for previous years. The maximum and second highest concentrations indicate an increase relative to previous years. It is important to note, that this comparison does not take into account year to year variations in the impact of meteorology. This issue is examined further in section 4 of this report.

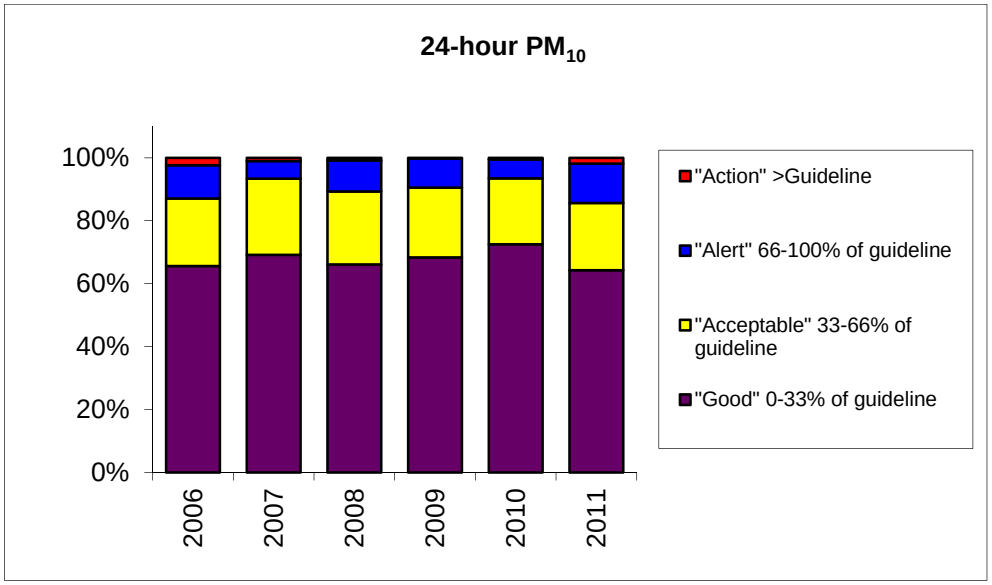

Figure 3.7: Comparison of PM_{10} concentrations measured at Redwoodtown – Bowling Club site during 2006 to 2011 to air quality indicator categories.

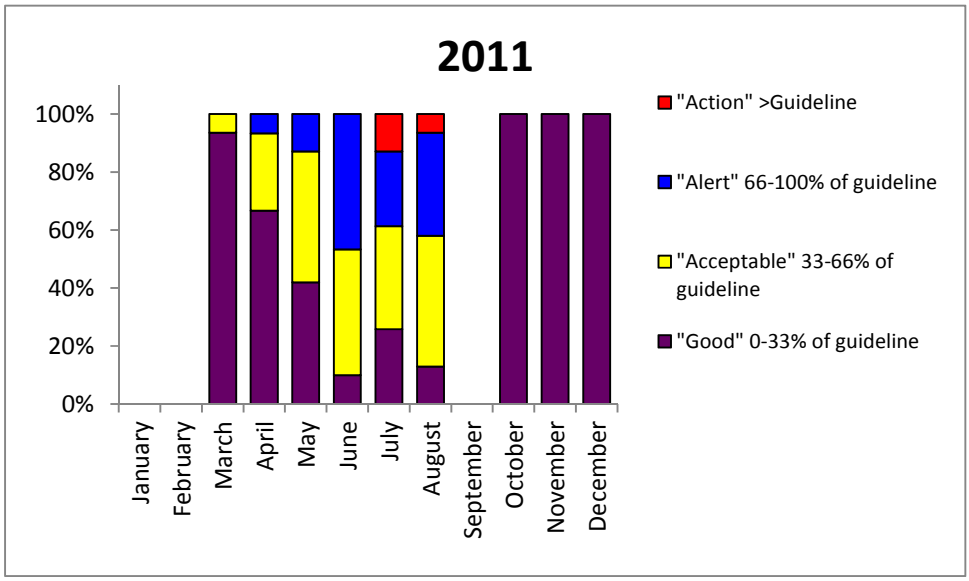

Figure 3.8: Comparison of daily PM_{10} concentrations each month during 2011 to air quality indicator categories.

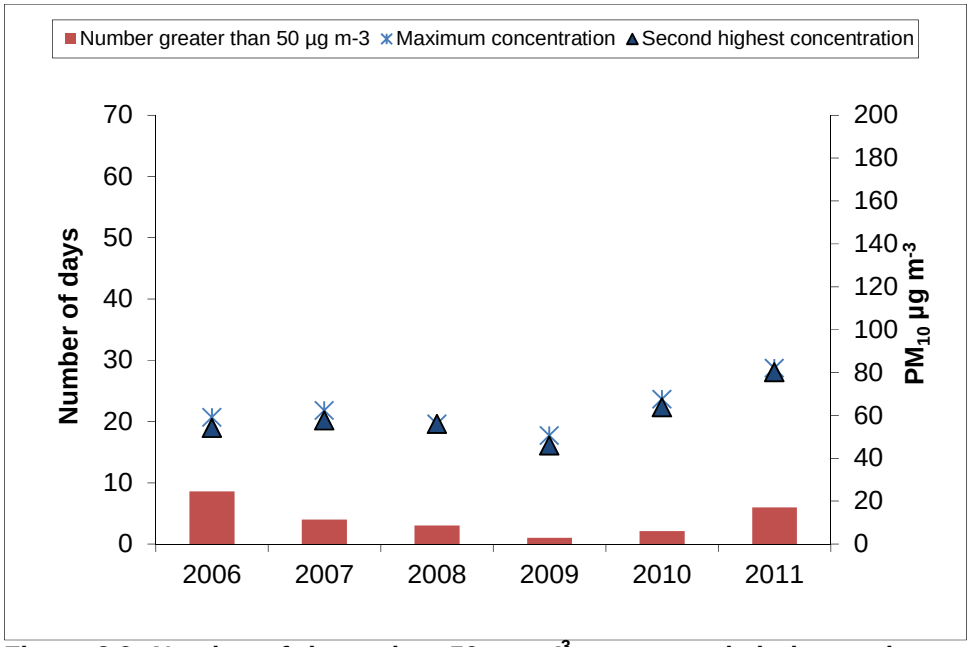

Figure 3.9: Number of days when 50 µg m^{-3} was exceeded, the maximum concentration and the second highest concentration from 2006 to 2011.

In 2011, the annual average PM_{10} concentration was 16 µg m^{-3}. This is similar to other years and no trend is evident from the annual average PM_{10} concentrations at Redwoodtown. The Ministry for the Environment specifies an annual average guideline for PM_{10} of 20 µg m^{-3}. The NES does not currently include an annual average concentration for PM_{10}.

Summary statistics for PM_{10} monitoring results from the Redwoodtown Bowling Club site since monitoring commenced in 2002 are provided in Table 3.2. It is noted that the monitoring period has varied from year to year. From 2005 monitoring was conducted from January to December and in 2004 air quality monitoring took place at a site in Brooklyn Street.

Table 3.2: Summary of PM_{10} concentrations measured at Redwoodtown – Bowling Club site from 2002-2011

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Monitoring method	Hi-vol	Hi-vol	Hi-vol	Hi-vol	BAM	BAM	BAM	BAM	BAM	BAM
"Good" 0-33% of guideline	18%	22%	46%	63%	66%	69%	66%	68%	72%	64%
"Acceptable" 33-66% of guideline	62%	30%	22%	17%	21%	24%	23%	22%	21%	21%
"Alert" 66-100% of guideline	10%	26%	20%	17%	10%	6%	10%	9%	6%	13%
“Action” >Guideline	10%	22%	12%	3%	3%	1%	1%	0%	1%	2%
Percentage of valid data	14%	7%	22%	32%	68%	99%	99%	98%	96%	87%
Annual average (µg m^{-3})	-	-	22	18	17	15	17	15	14	16
Measured PM_{10} concentrations above 50 µg m^{-3}	5	6	10	3	6	5	3	1	2	6
Extrapolated PM_{10} concentrations above 50 µg m^{-3}	16	34	31	9	10	4	3	1	2	6
Second highest PM_{10} concentration (µg m^{-3})					54	58	56	46	64	80
Annual maximum (µg m^{-3})	58	60	81	58	59	62	56	46	67	82
Number of records	50	27	82	115	247	360	363	357	352	319

3.3. PM_{10} and meteorology in Blenheim

Figure 3.10 shows variations in meteorological conditions and hourly average PM_{10} concentrations on the six days when the 24-hour average exceeded 50 µg m^{-3} at the Redwoodtown air quality monitoring site.

Some interesting points are worth noting about 2 July when the highest PM_{10} concentration occurred. Firstly, the wind direction from around 1pm appears north easterly rather than the westerly direction more typical of high pollution events in Blenheim. Secondly the wind speed increases to above 2ms^{-1} around 8pm, dispersing some of the pollution and resulting in a decrease in concentrations. A higher 24-hour average concentration may have occurred in the absence of this increase in wind speed. On 20 July when the second highest PM_{10} concentration was recorded the wind speed was less than 2 ms^{-1} for the duration of the day. The wind direction was westerly and concentrations increased from around 5pm. The duration of the evening peak was longer than for other days with concentrations of around 250 µg m^{-3} lasting until 11pm.

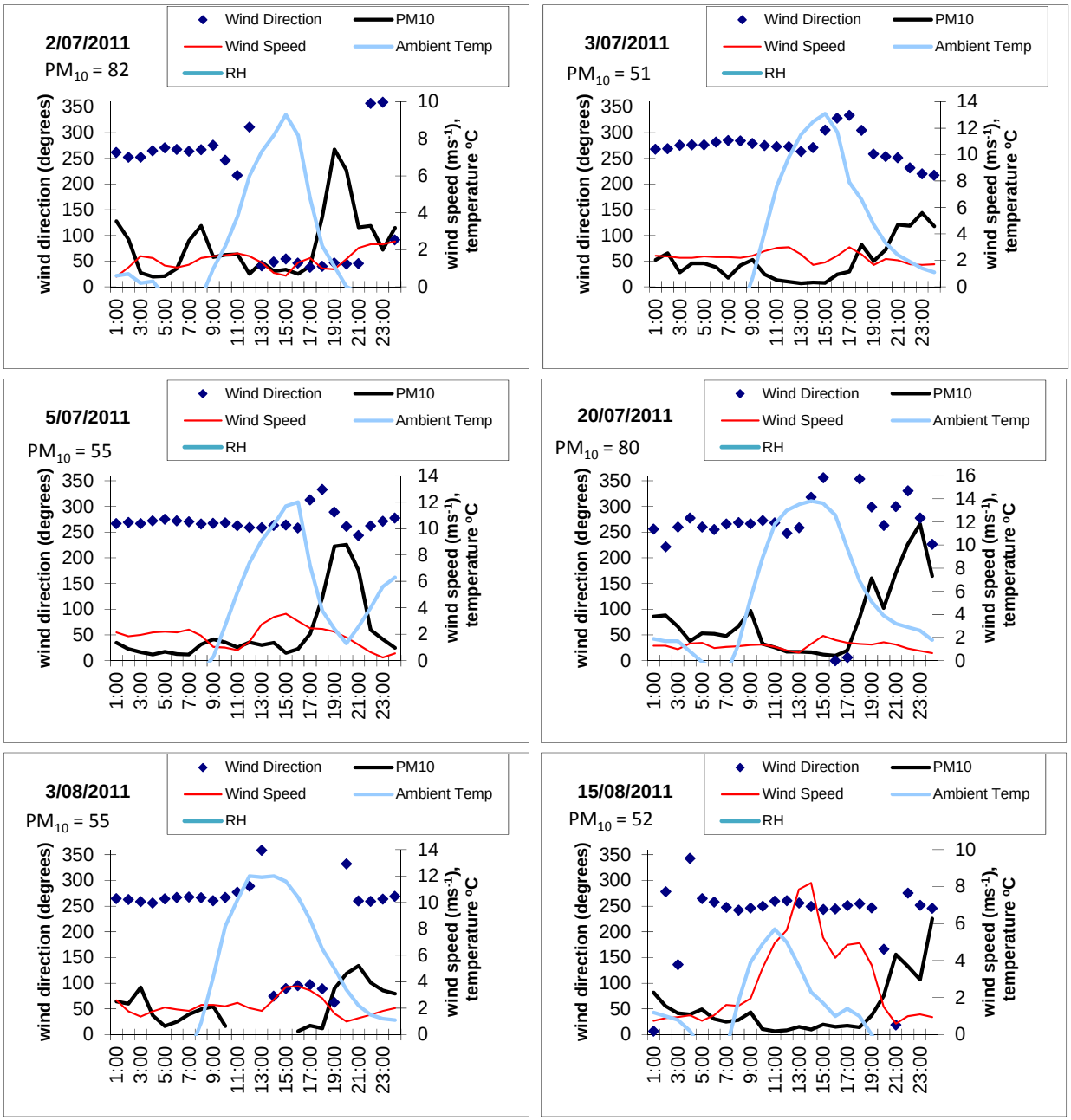

Figure 3.10: Hourly average wind speed, wind direction and temperature on days when PM_{10} concentrations exceeded 50 µg m^{-3} (24 hour average) at Blenheim.

4. Trends in PM_{10} concentrations in Blenheim

Prior to the 2011 review, the NES required that Councils develop a straight line path (SLiP) to assist with achieving compliance with the NES by 2013. The reductions required in PM_{10} concentrations to meet the NES and the starting point of the SLiP had been estimated based on monitoring data (Wilton et. al., 2008).

The recommended approach for developing the SLiP where there are sufficient monitoring data is to exclude the maximum PM_{10} concentration measured each year and to then evaluate the reduction based on the highest remaining concentration. The maximum concentration is excluded because the NES allows for one breach of 50 µg m^{-3} (24-hour average) per year.

The starting point for the SLiP for Blenheim was re-evaluated in 2007 (Wilton, 2007) and was set at 66 µg m^{-3}. This was based on the highest measured concentration for 2007 adjusted for the difference between the BAM and gravimetric sampling methods. The more conservative approach of using the highest measured concentration was used because at the time only a few years of monitoring data for the Redwoodtown site were available.

As a result of the 2011 NES review, the SLiP is no longer required. However, progress towards achieving compliance with the NES by 2016 requires assessment and to this end, the plotting of the second highest PM_{10} concentration per year is useful.

Figure 4.1 shows that the second highest PM_{10} concentration measured in Blenheim during 2011 was well above the SLiP and indicates that significant changes are required to achieve compliance with the NES by 2016.

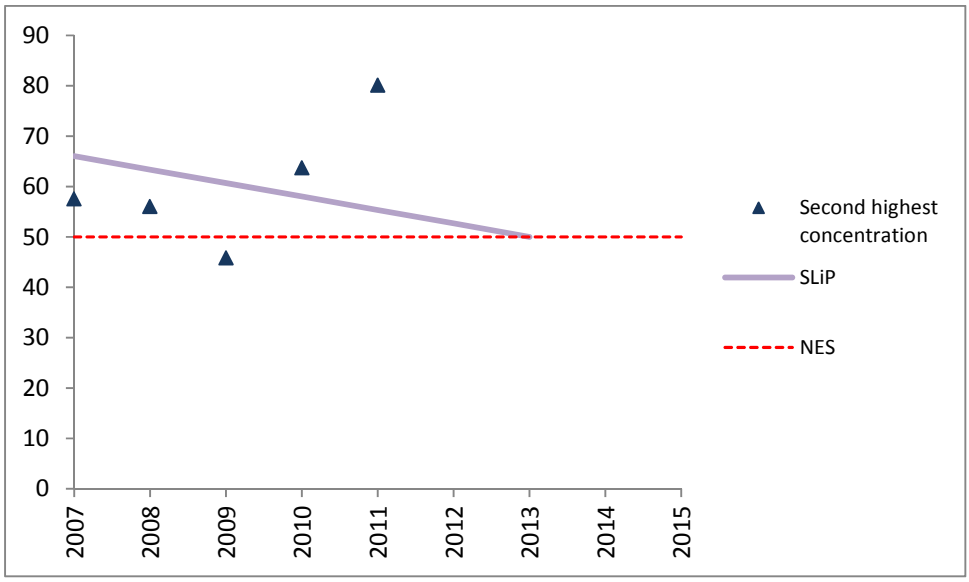

Figure 4.1: Comparison of PM10 concentrations measured from 2007 to 2011 to the straight line path to compliance with the NES

To further assess the likelihood of changes in PM_{10} concentrations since 2005, data for 2011 were integrated into a tool developed as a part of an evaluation into trends in PM_{10} concentrations in Blenheim (Wilton et. al., in 2009). The objective of that work was to identify meteorological conditions giving rise to concentrations of PM_{10} in excess of the NES and to provide a tool for comparing year to year PM_{10} concentrations whilst minimising the impact of variability in meteorological conditions. Until 2011, PM_{10} concentrations were on a slight downward trend. However, it appears from the 2011 data that concentrations in Blenheim have not decreased since 2006. It is also worth noting that the maximum measured PM_{10} concentration for Blenheim for 2011 was not included in the normalised trend because meteorological conditions were not typical of a high pollution event. It is recommended that a re-evaluation of meteorological conditions for the purposes of assessing trends is carried out in order to capture a fuller range of potential meteorological conditions.

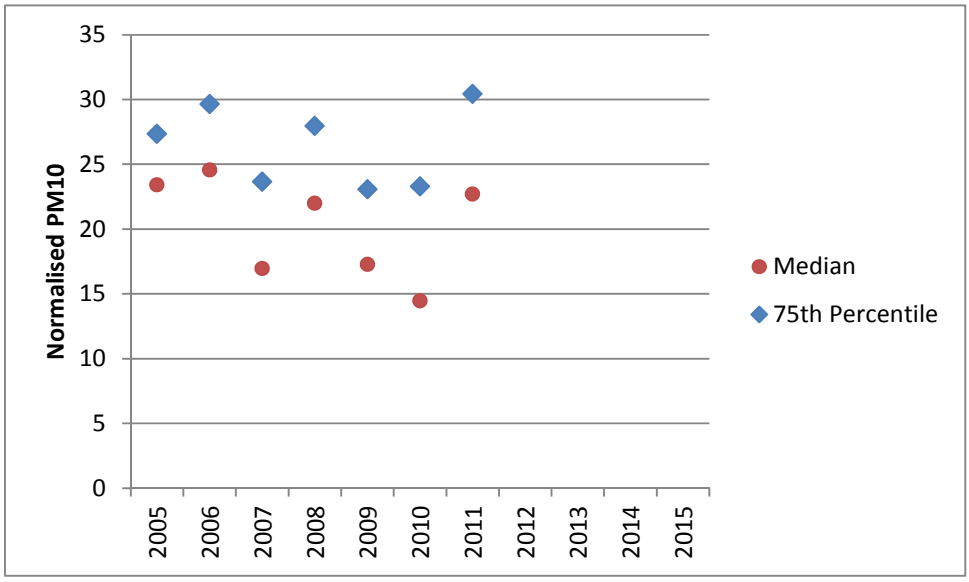

Figure 4.2: Median and 75th percentile PM_{10} concentrations after adjusting for meteorological conditions

5. Summary

Concentrations of PM_{10} measured at the Redwoodtown monitoring site in Blenheim during 2011 were higher than for previous years. Six exceedences of 50 µg m^{-3} were recorded and the maximum measured concentration of 82 µg m^{-3} is the highest ever measured at the site. The annual average PM_{10} concentration for 2011 at Redwoodtown was similar to previous years (at 16 µg m^{-3}) indicating that increases in concentrations are limited to peak events.

Concentrations of PM_{10} were also measured at the historical Middle Renwick Road monitoring site. In 2011 there were no exceedences of 50 µg m^{-3} at this site. This is consistent with historical monitoring of PM_{10} in this location. Furthermore, an evaluation of annual average concentrations measured at this site since 2000 suggests a downward trend in concentrations of around 30%. It is unusual that PM_{10} concentrations would be decreasing at this site and not at the Redwoodtown monitoring site.

The NES for PM_{10} was reviewed by the Ministry for the Environment in 2011. A new date of 2016 was given for compliance with 50 µg m^{-3} (24-hour average, one allowable exceedence) for areas with fewer than 10 breaches. Blenheim is required to meet this target date. Compliance with the straight line path is no longer required. Prior to 2010 PM_{10} concentrations appeared to be in compliance with the straight line path suggesting a reduction in worst case PM_{10} concentrations. However, the 2010 concentration was found not comply with the SLiP and the 2011 concentration is much higher than the SLiP target. Management intervention is required to ensure the NES for PM_{10} is met by 2016.

An evaluation of trends in PM_{10} concentrations in Blenheim suggests that concentrations have not decreased in Blenheim since 2005.

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