MARLBOROUGH DISTRICT COUNCIL

Ambient Air Quality Monitoring Annual Report 2001

Prepared for
Marlborough District Council

By
Laboratory Services - Air Quality Group

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Ambient Air Quality Monitoring
Annual Report 2001

A report for
Marlborough District Council
Seymour Square
Blenheim

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1 INTRODUCTION

The Marlborough District Council (MDC) undertakes ambient air quality monitoring within the Marlborough district. Currently, the MDC monitors visibility at one site in the district, and monitors inhalable particulate on a year-round basis at one site in Blenheim. In addition, the MDC monitored inhalable particulate at Redwoodtown, Blenheim, for a four month period in the spring/summer period of 2001.

Monitoring of visibility commenced in July 1999 at four sites in the Marlborough District. At three of these sites, monitoring was discontinued after one year. At the fourth site (Woodbourne), monitoring has continued from 1999 up until the present date.

Results from 1999 to August 2000 were previously reported in October 2000 (ESR 2000 "Visibility Study Marlborough District"). Results have not been reported since August 2000. The current report contains a summary of all visibility monitoring undertaken from July 1999 to April 2002.

Particulate concentrations are reported to MDC by Watercare on a monthly basis. This report contains an annual summary of particulate results, and also presents the results of additional particulate monitoring undertaken in 2001.

Figure 1: Marlborough

2 PARAMETERS MONITORED

2.1 Visibility

Visibility is a measure of the degree to which the atmosphere is transparent. Visibility degradation is caused by haze, which obscures the clarity, colour and form of what is seen through the atmosphere.

The amount of cloud cover, and angle of sun, can also affect visibility. Low cloud and rain can obscure visibility, and therefore weather conditions at the time of observation are recorded. Furthermore, it is desirable to have recordings of visibility made at similar times of the day to minimise variability due to sun angle.

Visibility can be used as an indicator of general air quality. The main factors which affect visibility include particulate matter and nitrogen dioxide (NO_2). Other air pollutants such as other nitrogen oxides (NO_2, NO, N_2O, and other nitrogen oxides collectively referred to as NO_x), sulphur dioxide (SO_2) and volatile organic compounds (VOC) can also affect visibility through secondary particle formation. Fine particles ($PM_{2.5}$) are the most significant contributors to reduced visibility.

Sources of contaminants that cause reduced visibility include natural processes (windblown dust, coastal processes, volcanic eruptions), industrial discharges (SO_2 and NO_x), agricultural discharges such as dust from cultivation and smoke from rural burn-offs, and domestic sources, including home heating and outdoor burning, and vehicles. Visibility may also be enhanced or reduced by weather conditions. Warm dry conditions may favour secondary particle formation, whereas rain can wash particles out of the atmosphere.

Figure 2: Agricultural Burnoff, Marlborough District

2.2 Inhalable Particulate (PM_{10})

Particulate matter refers to numerous substances that exist in the atmosphere. It is a somewhat complex category, encompassing a wide range of chemically and physically diverse substances. Particulate matter includes all solid and aerosol matter that exists in ambient conditions.

Particulate matter has been divided into several categories, based upon the potential health or environmental effect. Total suspended particulate (TSP) consists of all particles which range in size from 20 μm diameter downwards. Particles larger than 20 μm are too large to remain airborne for extended periods, and thus are categorised as deposited particulate.

TSP is sufficiently small to be inhaled, however, the larger particles (10 – 20 μm) are readily filtered out in the nasal cavity. Therefore, it is not considered to be the main cause of concern with respect to health effects. TSP has an effect on the aesthetic quality of the ambient air.

Particles with a diameter of 10 μm or less (PM_{10}) can be inhaled into the respiratory system. The main effect of inhalable particulate is on human health. Major health effects are increased mortality, aggravation of existing respiratory disease, increased hospital admissions, and increased lost days (lost work days, school days, and increase in restricted activity days).

Current research is recognising the division of particulate into finer fractions, including PM_5 and $PM_{2.5}$, which may penetrate beyond the bronchial tubes and deep into the aveoli. These fractions are commonly referred to as fine particulate.

3 AMBIENT AIR QUALITY GUIDELINES

3.1 New Zealand Ambient Air Quality Guidelines

The Ministry for the Environment (MfE) published the first set of ambient air quality guidelines (AAQG) in 1994. These guidelines have now been replaced by reviewed guidelines (May 2002). The guidelines are set to protect human health.

Visibility is an indicator of air pollution i.e. it can be used to indicate the presence of air pollutants which may have an adverse effect on health. As it is only an indicator criteria, it does not have a guideline value.

Inhalable particulate has recognised direct effects on human health. The guideline values for inhalable particulate are given in Table 1.

Table 1: Ambient Air Quality Guidelines

Contaminant	AAQG	Averaging Period	Purpose
PM_{10}	50 $\mu g/m^3$	24 hours	Acute health effects
PM_{10}	20 $\mu g/m^3$	Annual	Chronic health effects
$PM_{2.5}$	25 $\mu g/m^3$	24 hours	Monitoring guideline

3.2 New Zealand Environmental Performance Indicators

The MfE notes that AAQG should not be seen as a limit to pollute up to, but rather should be considered as minimum requirements for air quality. The Resource Management Act (1991) requires the quality of the environment to be maintained or enhanced. In order to provide guidance on when enhancement should be required, the MfE has provided Environmental Performance Indicators (EPI), as set out in Table 2. These indicators can act as both indicators of poor air quality, and goals which policy can work towards achieving.

Table 2: Environmental Performance Indicators for Air

Category	Maximum Measured Value	Comment
Action	Exceeds guideline	Completely unacceptable by national and international standards
Alert	Between 66 % and 100 % of the guideline	Warning level, which can lead to guidelines being exceeded if trends are not curbed
Acceptable	Between 33 % and 66 % of the guideline	A broad category, where maximum values might be of concern in some sensitive locations, but are generally at a level which does not warrant dramatic action
Good	Between 10 % and 33 % of the guideline	Peak measurements in this range are unlikely to affect air quality
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
Not Assessed		Insufficient monitoring data to assess this category

4 MONITORING SITES

4.1 Visibility

There are four sites that have been used for visibility monitoring. They are:

- Elisha Drive, Blenheim
- MDC Office Roof, Seymour Square, Blenheim
- Scotland Street, Picton
- Woodbourne Airport, Woodbourne

Monitoring is ongoing at Woodbourne.

A detailed description of each site, it's location, and visibility target is given in Appendix A.

4.2 Inhalable Particulate

The permanent PM_{10} monitoring site is located at 106 Middle Renwick Road, Blenheim. This site has been operating since February 2000. In 2001 it was also utilised for monitoring of short-term (4 – 5 hour) PM_{10} concentrations by co-locating a second HiVol sampler.

The Redwoodtown site was located at 65A Weld Street, Blenheim. This site had not previously been utilised for air quality monitoring.

A detailed description of each site, as provided by MDC, is included in Appendix A.

5 METHODS

5.1 Quality Assurance

All sampling is undertaken by the Marlborough District Council. Sampling operation includes maintenance of the site and calibration of monitoring equipment. Analysis of filters and provision of quality assured data is undertaken by Watercare.

Watercare Services Ltd holds IANZ accreditation for the operation of its laboratory, including analysis of HiVol PM_{10}. The Watercare Services Ltd Air Quality Department are taking steps to include its air quality methods in the IANZ accreditation.

5.2 Visibility Monitoring

Visibility monitoring in MDC was undertaken using manual observations of visibility. No instruments were used for recording visibility. Visibility monitoring was undertaken in accordance with the process determined for MDC, and detailed in the ESR report "Visibility observers guide: human judgement of visible air quality" (ESR July 1999). Monitoring required observation of visibility three times per week (Monday, Wednesday and Friday), at each of four sites. Multiple parameters were recorded, including weather conditions, sky colour, presence of haze, smoke, or dust, and farthest distance visible.

On-going monitoring at Woodbourne uses the same methodology as was employed in the project commencing 1999.

The visibility program design is in general accordance with the Ministry for the Environment's (MfE) "Good practice guide for monitoring and management of visibility in New Zealand" (MfE 2001).

5.3 Inhalable Particulate Monitoring

Particulate is collected by drawing air through a filter using a standard high volume (HiVol) air sampler (Figure 3). The inlet on the sampler has a cut-off of 10 microns (PM_{10}), which is the limit for total inhalable particulates. The method for the high volume sampling is Air Quality Test Method T104, which is based on AS 3580.9.6.

Sampling is usually undertaken for a 24 hour period. Sampling occurs once per three days in the winter period when particulate concentrations are potentially higher (1 in 3 day regime), but extends to once per six days throughout the rest of the year. In 2001, a 1 in 3 day regime was undertaken between 30 June and 30 September.

In addition to the permanent PM_{10} site in Blenheim, MDC hired a second HiVol sampler for a winter monitoring program. The winter program incorporated the following additional monitoring:

- Co-location of a second HiVol sampler beside the permanently located sampler. Assessment of morning (4 hours sampling) and evening (5 hours sampling) PM_{10} concentrations by running the second sampler twice within the 24 hour period that the permanent sampler was operating (July to August 2001).

- Assessment of 24 hour PM_{10} at a second site at Redwoodtown (September to December 2001).

Figure 3: HiVol PM_{10} Sampler

6 VISIBILITY STUDY – RESULTS AND DISCUSSION

6.1 Visibility Monitoring Summary

Monitoring was undertaken at the four sites described in Section 4 of this report, between the 12 July 1999 and 31 July 2000. Visibility monitoring was continued at Woodbourne up until 29 April 2002. From 1 August 2000, monitoring at Woodbourne was undertaken twice each observation day, once in the morning and once in the afternoon.

Woodbourne results have been split into 12 month periods, commencing on 1 August of each year of monitoring. The monitoring period is reported as the year each period commenced.

The number of observations, and time of day when observations were made, are given in Table 3.

Table 3: Visibility Monitoring Summary

Site	Number of Observations	Observation Times	Exceptions to Observation Times
Elisha Drive, Blenheim 1999	162	9am to 11.30am	3
MDC Offices, Blenheim 1999	168	8am to 11.30am	3
Picton 1999	163	9.45am to 11am	3
Woodbourne commenced 1999	158	8am to 9am	1
Woodbourne commenced 2000	307	8am to 9am 4pm	1
Woodbourne commenced 2001	235	8am to 9am 5pm to 5.45pm	1

6.2 Visibility and Presence of Haze

Aside from weather conditions, it is the presence of haze in the atmosphere that can most severely affect visibility. Haze may be caused by natural processes or human activity. It may also be exacerbated by atmospheric conditions, in particular by temperature inversions trapping particulate within a limited atmospheric depth.

Table 4 shows the percentage of observations when haze, dust, or smoke was recorded, for each site. Haze, smoke and dust recordings are taken directly from the field observations. These define "haze" as a brown sky colour. "Smoke" refers to either an individual plume e.g. agricultural fire, or a collection of sources e.g. households. "Dust" is non-smoke plume.

Haze has been recorded on between 2 and 27% of the observation days. There is insufficient information, from this region or on a national basis, to determine whether this is a relatively high or low percentage.

The occurrence of dust has also been recorded, but has occurred for a very low percentage of the time (0 – 7%).

Overall, a much higher frequency of days had the presence of smoke recorded (19 – 82%). Often, smoke will be visible across the observed area, without necessarily causing haze. However, when haze does occur, it is often co-incident with smoke (Figure 4).

Table 4: Occurrence of haze, smoke and dust

Site	Number of Observations	Haze as % of Total Observations	Smoke as % of Total Observations	Dust as % of Total Observations
Elisha Drive, Blenheim 1999	162	16.7%	82.7%	7.4%
MDC Offices, Blenheim 1999	168	2.4%	19.6%	0.0%
Picton 1999	163	8.0%	78.4%	3.7%
Woodbourne Commenced 1999	158	27.2%	28.5%	1.3%
Woodbourne Commenced 2000	307	10.4%	24.8%	4.2%
Woodbourne Commenced 2001	235	8.9%	14.0%	1.3%

Figure 4 shows the overall breakdown of days when haze was recorded. At the urban sites (Elisha Drive, MDC offices, and Picton), between 62 – 75% of total haze events were concurrent with smoke, compared to 49 – 52 % at Woodbourne. At the more rural Woodbourne location, the influence of factors other than smoke, including natural processes, is more frequently contributing to haze.

Inversions were concurrent with haze events for a small percentage of the time at all sites except the MDC offices. The relatively small percentage of haze with inversions suggests that inversions do not contribute significantly to formation of haze. However, it is also noted that observations times may extend into the late morning, by which time a temperature inversion from the previous night may have degraded.

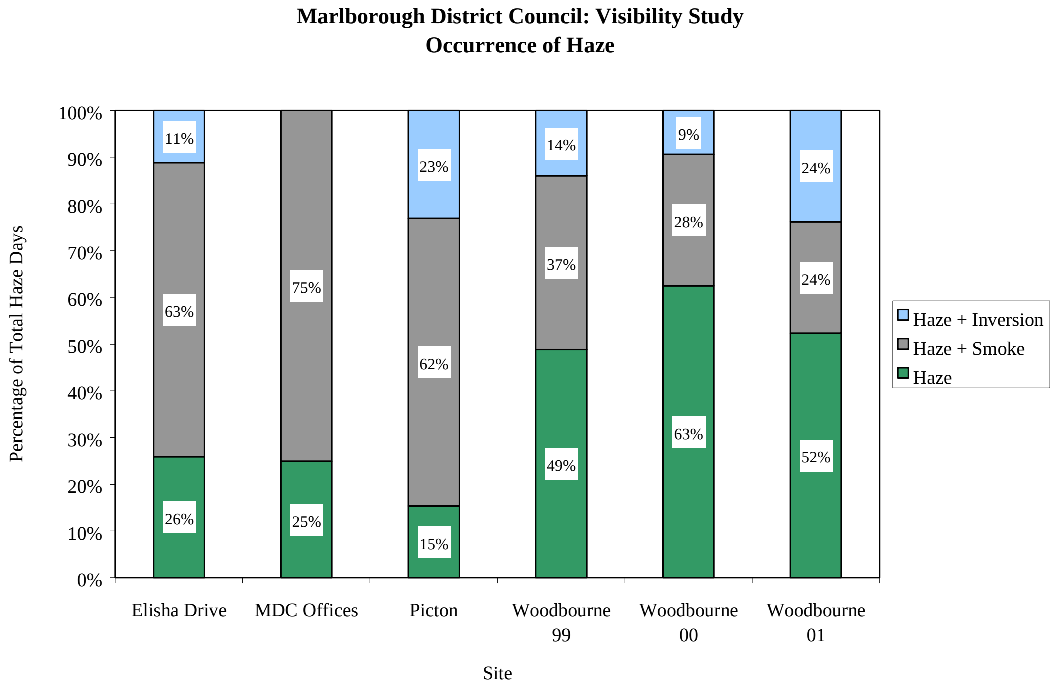

Figure 4: Occurrence of Haze

Over the three years of monitoring at Woodbourne, a higher percentage of haze was recorded in the first year of observation (27% of total observations)(Table 4).

The percentage of observations when smoke was recorded at Woodbourne dropped significantly in year commencing 2001 (Table 4). However, the occurrence of haze combined with smoke events were similar to other years. Dust events were low across all years (Table 4). Figure 4 shows that haze events concurrent with smoke and with inversions were similar across the three years of observations.

On the basis of frequency of occurrence of haze, Elisha Drive and Woodbourne had the most affected visual clarity.

The occurrence of haze showed a slight seasonal trend (Figure 5). At the MDC offices, only four haze days were recorded, and these fell in April, May and June. At Picton, haze occurred between February and June. At the other sites, and at Woodbourne for consecutive years, haze occurred throughout the year, but was slightly more frequent in the winter period.

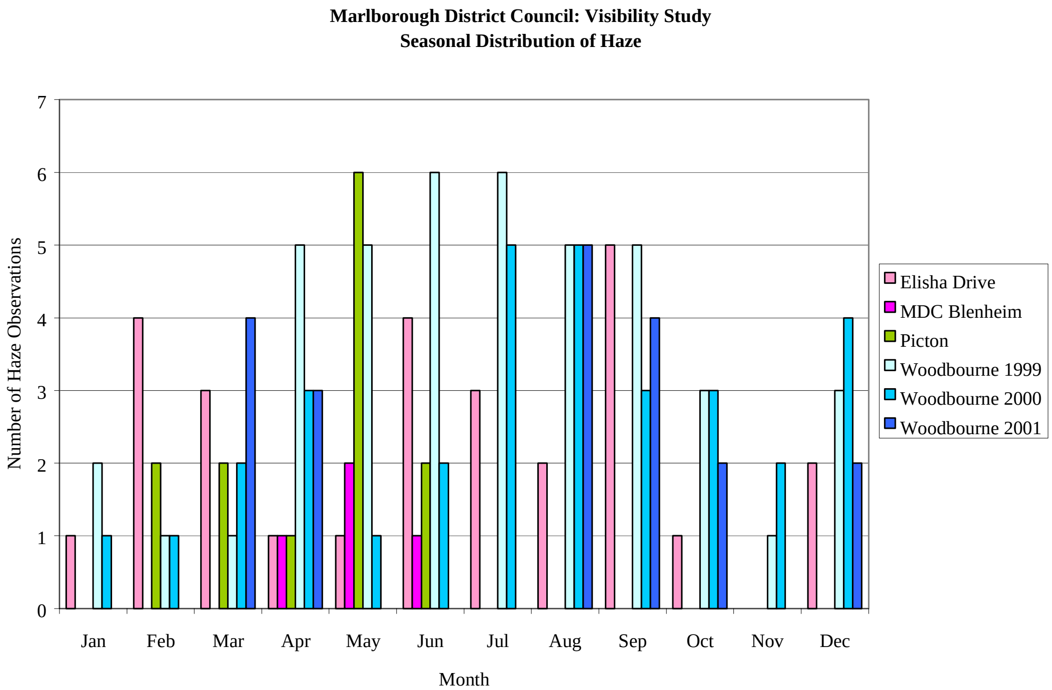

Figure 5: Seasonal Distribution of Haze

6.3 Overall Clarity Rating for Marlborough District

The overall visual clarity is represented by the distance through the atmosphere over which landmarks and features can be readily observed. It is represented by the ease with which the chosen target landmark for each site is observed, and by the farthest distance (farthest landmark) that can be viewed on an observation day. Visibility observations undertaken by MDC have included the clarity of the target outline, whether the target colour can be determined, and an estimate of farthest distance viewed. These combine to give an indication of the overall visual clarity.

The clarity with which the target could be viewed at each site is shown in Figure 6. Figure 6 shows that for the majority of the time, the target could be seen with excellent clarity, or only slight haziness, at all sites (>70%).

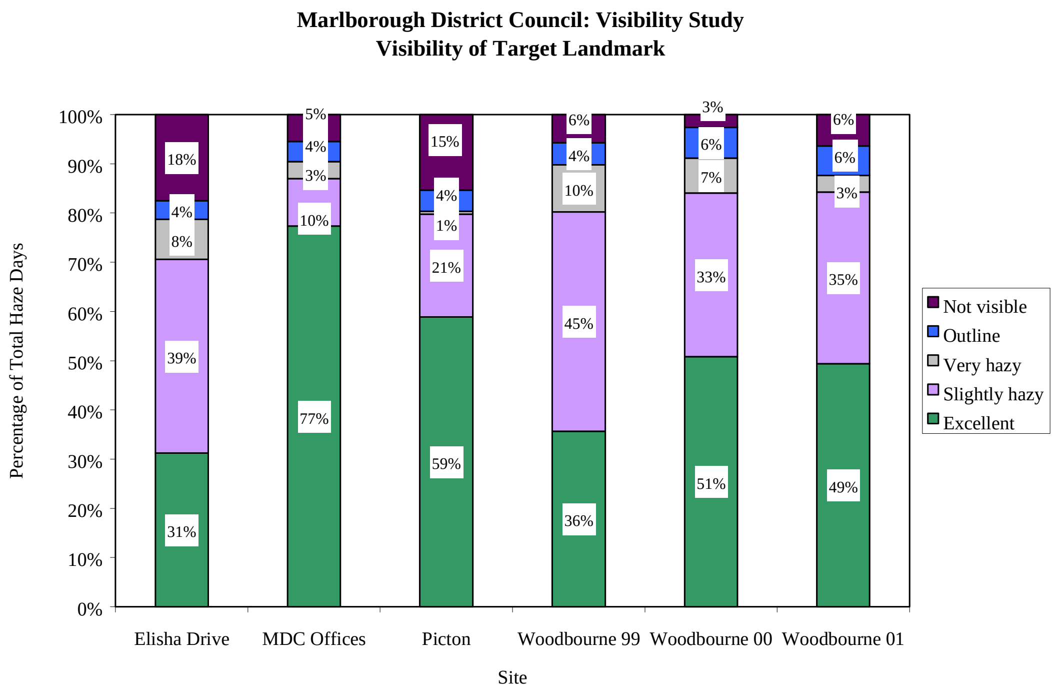

Figure 6: Visibility of Target Landmark

At MDC offices and Picton, the target colour was clearly distinguishable for the majority of observations (58 - 62%). At Elisha Drive and Woodbourne, target colour was clearly distinguishable for a smaller percentage of observations (23 – 41%).

On the basis of target visibility and colour, Elisha Drive has the poorest visibility of the sites monitored.

Table 5: Target Colour

Site	Distance to Target (km)	Target Colour Clear (% of observations)	Target Colour Indistinguishable (% of observations)
Elisha Drive, Blenheim 1999	18	23%	77%
MDC Offices, Blenheim 1999	20	62%	38%
Picton 1999	21	58%	42%
Woodbourne Commenced 1999	24	25%	75%
Woodbourne Commenced 2000		39%	61%
Woodbourne Commenced 2001		41%	59%

The maximum distance viewed each observation day was also recorded. The maximum distance provides an indication of the transparency of the atmosphere. Results are presented in Table 6.

Table 6: Visual Range – Farthest Distance

Site	0-2 km	2-10 km	11-25 km	26-50 km	51-69 km	70+ km
Elisha Drive 1999	1%	5%	4%	13%	25%	51%
MDC Blenheim 1999	1%	12%	10%	25%	18%	35%
Picton 1999	4%	13%	53%	30%	0%	0%
Woodbourne 1999	1%	7%	23%	28%	36%	5%
Woodbourne 2000	1%	4%	17%	56%	24%	0%
Woodbourne 2001	0%	3%	9%	33%	14%	41%

Elisha Drive, MDC offices, and Woodbourne has reasonable visual range (>25 km) for most of the time. Elisha Drive reported very high visibility range (>70 km) for 51% of the time.

In the third year of observations, Woodbourne reported more high visibility range (>70 km) events than in previous years. This does not appear to be due to different observers.

Picton had the lowest visual range, but this is due to topography at the site preventing viewing landmarks further than 50 km, rather than poorer visibility than other sites. Topographical maps and site information indicate that there are no significant land marks beyond Mt Stoke, at 27 km distant.

6.4 Overall Visibility

The overall visibility gives an indication of how good visibility is on each day. Visibility observations undertaken by MDC included an assessment of the overall visibility on each observation day. The overall visibility rating is presented in Figure 7. Figure 7 shows that for over 65% of the time, overall visibility was average or above average. There is insufficient information from other regions to compare this to national averages.

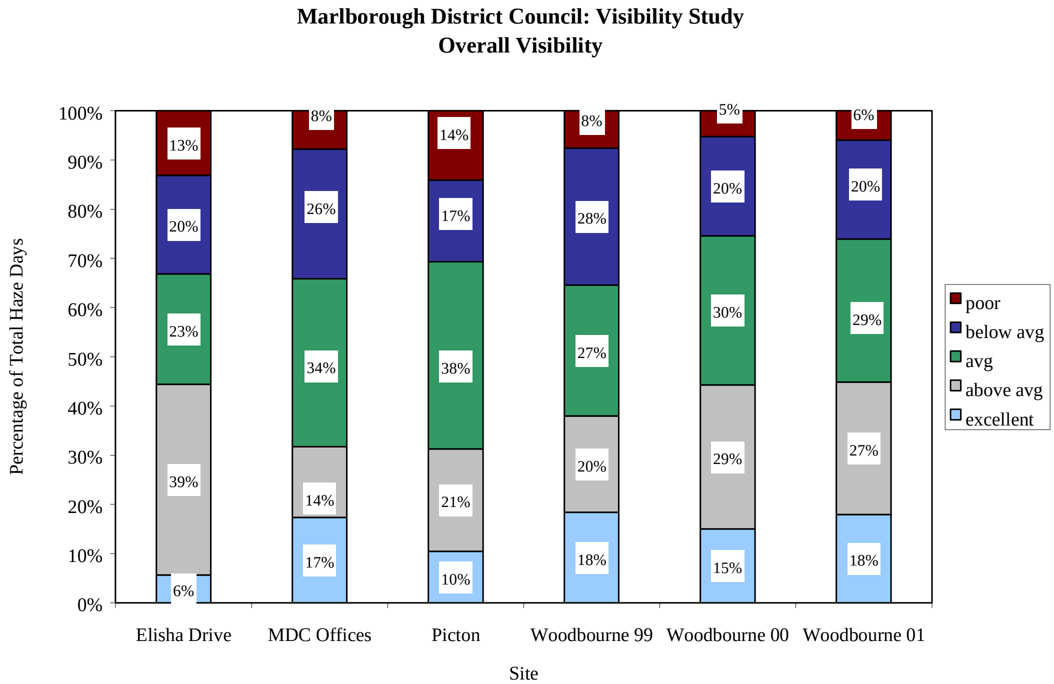

Figure 7: General Visibility Rating

It is usual for poor visibility to be attributed to weather conditions, rather than the effects of human activities. Observers also recorded the weather conditions, and whether there were any obvious causes for poor visibility.

Not all instances of poor visibility ratings had a main cause recorded. However, results have been summarised as follows:

- At Elisha Drive, poor visibility was attributed to low cloud, and sometimes to rain.
- At Picton, poor visibility was attributed to fog, rain, low cloud and mist. Also, of 23 recordings of poor visibility, five were attributed to smoke. Obscuration due to smoke was unique to the Picton site.
- At MDC offices, visibility was obscured by rain, low cloud and mist.
- At Woodbourne, poor visibility was attributed to low cloud, rain (a common cause), drizzle, fog and mist.

Poor visibility ratings were not linked to the occurrence of haze. Generally, the occurrence of haze coincided with a visibility rating between below average and average. Overall, correlation between visibility indicators of haze, target visibility, and overall visibility, was poor.

7 INHALABLE PARTICULATE – RESULTS AND DISCUSSION

7.1 Short-Term Particulate Concentrations at Blenheim

The hired Hi-Vol sampler was co-located at the Blenheim permanent site for July and August 2001. On days when the permanent sampler was operating, the second sampler was run from 6 am to 10 am (4 hours) and again from 5 pm to 10 pm (5 hours). Results are presented in Figure 8.

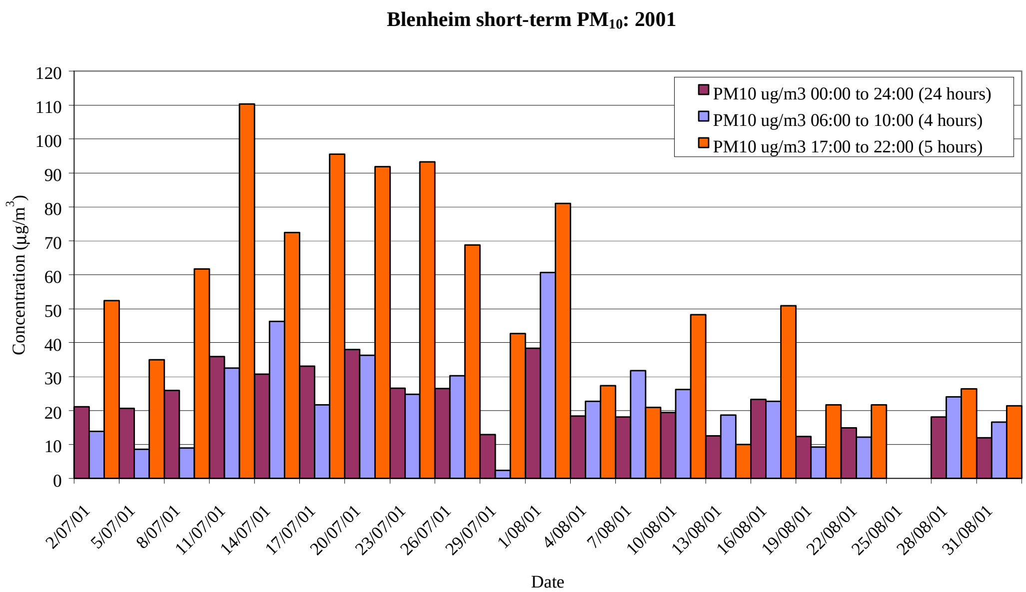

Figure 8: Short-term and 24 hour PM_{10} Concentrations at Blenheim

Figure 8 shows that the short-term PM_{10} concentrations can reach extremely high values especially during winter evenings. The AAQG of 50 $\mu g/m^3$ is frequently exceeded, and concentrations up to 110 $\mu g/m^3$ were recorded. However, it is noted that the AAQG is based on a 24 hour monitoring period. The timing of these peaks provides a strong indication that the source of the particulate is domestic home heating.

For the same monitoring days, the AAQG was not exceeded on a 24 hour basis. The high PM_{10} concentrations were limited to the night-time periods, when temperature inversions may have been present.

It is difficult to directly evaluate the effect of a short term, high concentration when comparing results to a longer-term (24 hour) guideline, as the results cannot be directly compared. However, to date, research has not been able to determine a PM_{10} concentration below which no adverse health effect will occur. Furthermore, evidence on whether short-term high concentrations are detrimental is inconclusive. Adverse health effects from exposure to high concentrations of inhalable particulate, even for limited periods, cannot be ruled out.

It is prudent to consider air quality management strategies which will minimise or avoid potential health risks from high particulate concentrations. Short and long term strategies and planning tools are available. Measures could include "High pollution potential" warnings on specific nights, economic incentives for using clean fuels (electricity, gas and oil), requirement for installation of clean burning solid fuel heaters, and public education on the benefits of using dry fuel and correctly operating burners.

7.2 Ambient Particulate at Blenheim and Redwoodtown

Site performance in 2001 was very good. At the Blenheim permanent site, valid results were obtained for all but three of the scheduled sampling days, resulting in 96% valid data collection. At Redwoodtown, valid results were obtained for all scheduled sampling days, resulting in 100% valid data.

The air quality measured at each site, relative to AAQG, was determined by calculating the Environmental Performance Indicator (EPI) for both sites. The EPI's are shown graphically in Figure 9.

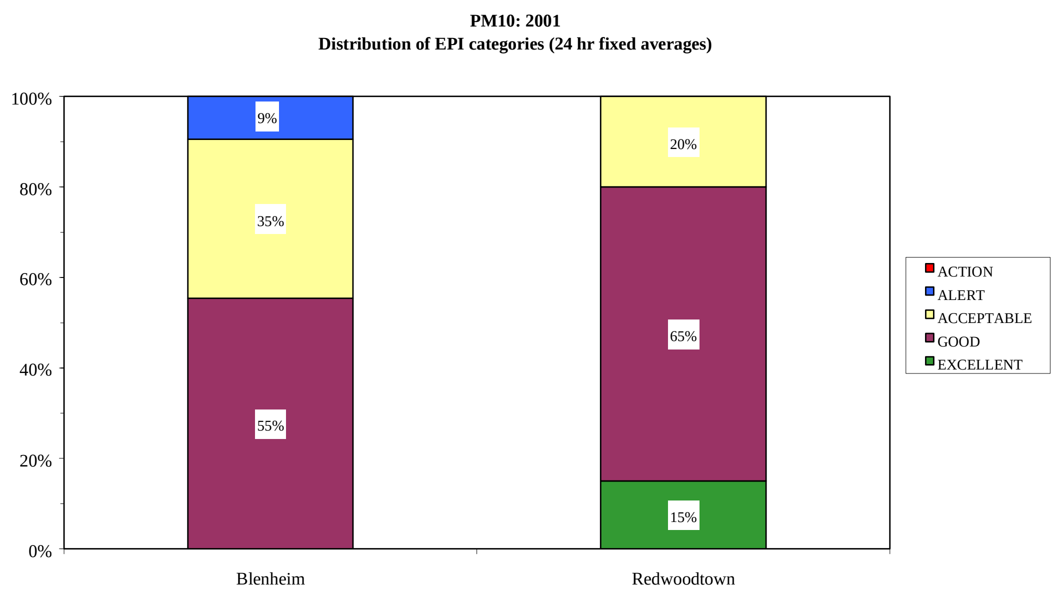

Figure 9: Comparison of PM_{10} to EPI

At the Blenheim site, there were no exceedances in 2001. Air quality was in the "alert" category for 9% of the time, in the "acceptable" category for 35% of the time, and in the "good" category for 55% of the time (refer to Table 2 for explanation of categories). Air quality was not "excellent" at Blenheim in 2001 with respect to PM_{10}. By contrast, in 2000, air quality was in "alert" for 2% of the time, "acceptable" for 52%, "good" for 35%, but achieved "excellent" for 7%. There is insufficient data at this stage to determine trends of PM_{10} between years, but in 2001 there was a higher percentage of "good" air quality at the Blenheim site.

The occurrences of "action" categories in 2000, and "alert" categories in 2000 and 2001, indicate the need to improve air quality in Blenheim with respect to PM_{10}.

At Redwoodtown, air quality appeared to be appreciably better than in Blenheim, with 20% "acceptable", 55% "good", and 15% "excellent".

PM_{10} concentrations are given in Figure 10 (Blenheim) and Figure 11 (Redwoodtown). Summary statistics are presented in Table 3.

Due to equipment availability, the seasonal monitoring at Redwoodtown was only undertaken for part of the year, and commenced in September. Results from the Blenheim site show highest concentrations typically occur in June to August. Therefore, the seasonal monitoring in 2001 may not have captured the worst particulate concentrations at Redwoodtown. Nevertheless, it provides useful information at the site, which allows comparison to Blenheim and will permit year – to - year comparisons.

Figure 10 and 11 show that for the monitored period, ambient PM_{10} concentrations at Redwoodtown were very similar to Blenheim.

Table 7: PM_{10} Summary Statistics

Site & Year	No. of Samples	Maximum (µg/m^3)	Minimum	No. of Exceedances of AAQG*
Blenheim 2000	54	55.8	5.0	1
Blenheim 2001	74	38.4	5.6	Nil
Redwoodtown 2001	20	30.2	1.2	Nil

* Exceedance of 50 µg/m^3, 2002 AAQG

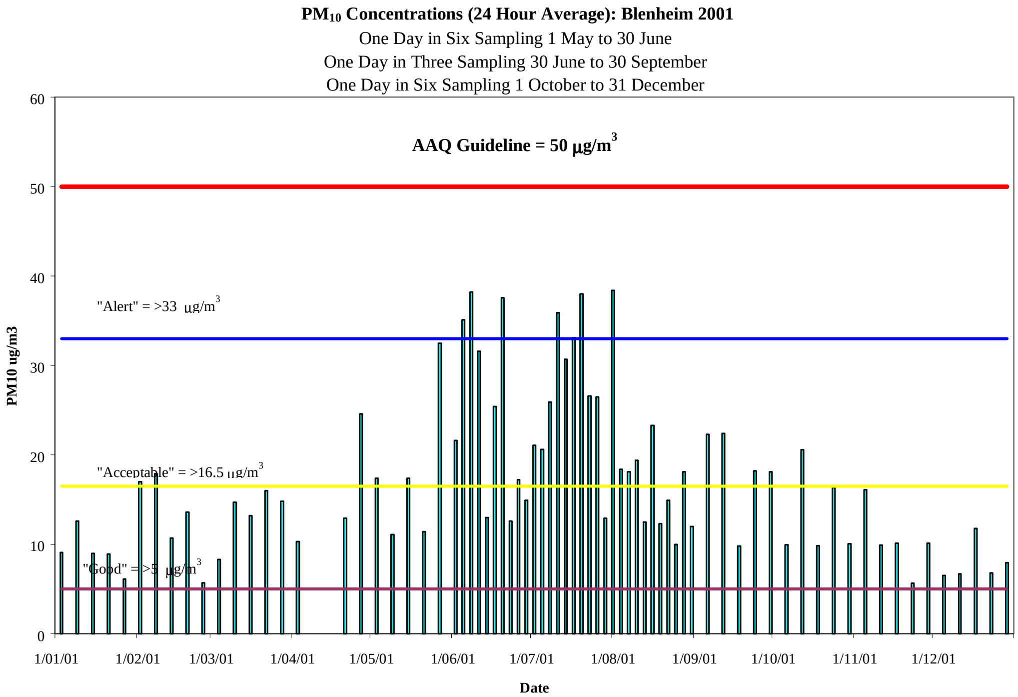

Figure 10: PM_{10} concentrations (24 hr avg) at Blenheim

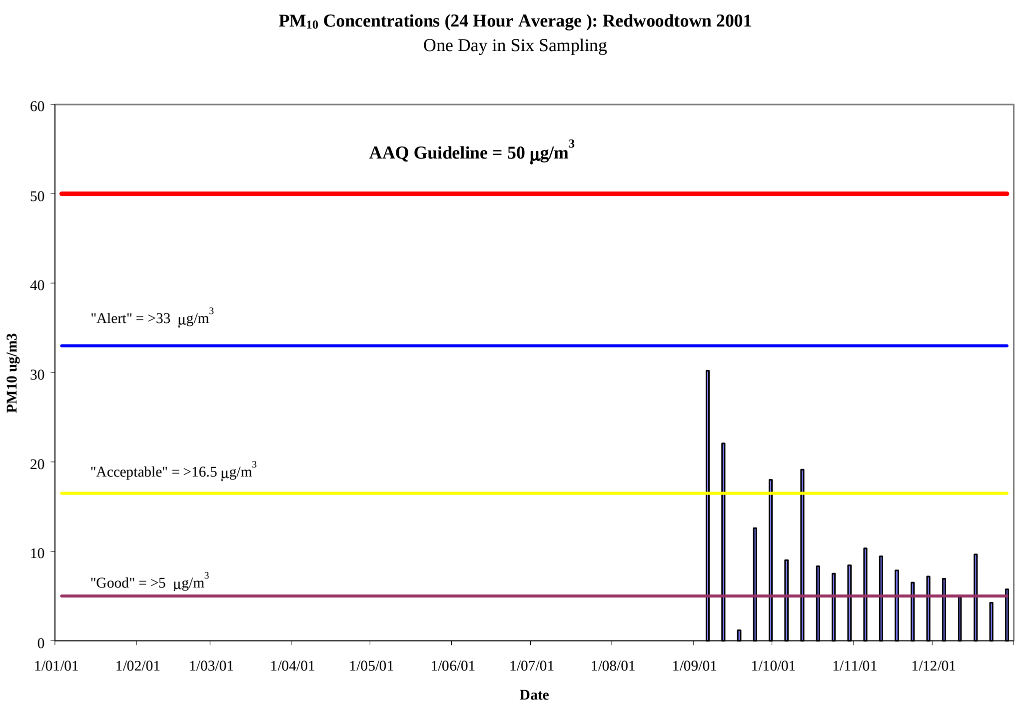

Figure 11: PM_{10} concentrations (24 hr avg) at Redwoodtown

8 COMPARISON OF PARTICULATE AND VISIBILITY DATA, 2001

In 2001, there were no exceedances of the PM_{10} AAQG. However, according to EPI, ambient PM_{10} caused air quality to be in the "alert" category on seven occasions i.e the 24 hour average concentration exceeded 33 $\mu g/m^3$. Over this period, visibility monitoring was undertaken at Woodbourne. The visibility conditions and average wind speed on high particulate days are summarised in Table 7. Wind speed data is from data reported to MDC on a monthly basis.

Table 8: Comparison of PM_{10} to Atmospheric Visibility

Date	PM_{10} 24 hr average ($\mu g/m^3$)	Haze	Inversion	Wind Speed (m/s)	General Visibility Rating
5 June 01	35.1	NR	NR	2.1	NR
8 June 01	38.2	Yes		3.5	Average/above
20 June 01	37.6		Yes	2.3	Average/excellent
11 July 01	35.9	Yes	Yes	1.4	Average/below average
17 July 01	33.0			3.2	Average
20 July 01	38.0	Yes		2.6	Average/below average
1 August 01	38.4	Yes	Yes	1.7	Average/below average

NR No Recording of visibility on 5 June 02

This comparison is limited because of the physical separation between the visibility and PM_{10} monitoring locations. Nevertheless, it does provide some useful information.

On high particulate days, there was a high proportion of haze and inversions, relative to annual results. On all days with high particulate, there was no rain and few clouds (visibility database), and wind speeds were low (1.4 –3.5 m/s). Visibility was not significantly impaired, having a general rating of below average to average.

The weather conditions during high particulate events are indicative of calm, clear weather, with poor potential to disperse contaminants. These conditions can be expected to occur on several occasions every winter, and a corresponding high particulate concentration can likewise be expected every winter.

9 CONCLUSIONS AND RECOMMENDATIONS

9.1 Visibility

From monitoring undertaken to date, visibility in the Marlborough district appears to be generally good. However, this conclusion is largely based on a single year of monitoring. Furthermore, there is little information from other regions around New Zealand to allow a nationwide comparison.

Visibility-reducing haze is recorded between 2 and 27% of days in the region. There is insufficient information to determine whether this is typical over time or on a national basis. Occurrence of haze may occur throughout the year, but shows a slight seasonal trend with a higher incidence in winter.

Atmospheric clarity is generally good, with good to excellent target visibility and a reasonable (>25 km) visual range for most of the time.

General visibility recordings are mostly in "average" range, although "excellent" status is recorded at all sites on occasions. The main source of very poor visibility is weather, with exception of Picton where poor visibility has also been caused by smoke.

With the exception of Woodbourne, monitoring to date has only encompassed one year. Further comparisons would be useful to determine if trends are occurring, and to identify how representative the 1999 year was. On-going monitoring at Woodbourne will build on the existing good data base.

If a full suite of monitoring can not be undertaken (four sites for a full year), winter monitoring in Blenheim could be considered to allow comparison of visibility with high PM_{10} events.

9.2 Inhalable Particulate

The AAQG of 50 $\mu g/m^3$, 24 hour average, was not exceeded in 2001. The EPI status of Blenheim reached the "alert" category each winter, which suggests a need to improve air quality and/or curb trends of increasing pollution.

Inhalable particulate shows a seasonal trend, with high concentrations in June, July and August. The short term concentrations are very high in this period, especially in the evening, indicating the source of particulate is domestic home heating.

The incorporation of a 1 in 3 day monitoring regime over the winter period has provided improved air quality monitoring over the 1 in 6 day monitoring. It is recommended that monitoring continue at Blenheim to provide information on long-term trends, and the winter-time 1 in 3 day regieme is repeated annually.

Inhalable particulate concentrations at Redwoodtown were similar to Blenheim for the period monitored. It is suggested that this site has similar air quality to the Blenheim site.

10 REFERENCES

MfE 2000 “Good Practice Guide for Air Quality Monitoring and Data Management”. Ministry for the Environment, Wellington, New Zealand

MfE 2001 “Good practice guide for monitoring and management of visibility in New Zealand”. Ministry for the Environment, Wellington, New Zealand

MfE 2002 “Ambient Air Quality Guidelines”. Ministry for the Environment, Wellington, New Zealand

APPENDIX A

Site Descriptions

Appendix A contains 7 pages including cover

PM_{10} Monitoring Sites
Information from Marlborough District Council

Air Quality Monitoring - Blenheim Permanent Site	
Indicators/contaminants monitored	PM_{10}
Site code	Site 1
Site title	Blenheim permanent site
Location	106 Middle Renwick Road Blenheim
Region	Marlborough
Co-ordinates	E 2588216 N 5966056
Equipment owner	Marlborough District Council (MDC)
Equipment operator	MDC, also calibrate sampler
Data owner, name and address	MDC PO Box 443 Blenheim
Equipment housing	Lear Siegler Flow-set high volume air sampler
Housing environment	Outside
Monitoring objectives	To obtain information about PM_{10} concentrations and relationship to MfE guideline values. Long term site from which trends can be identified.
Site topography	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 7 K to the north.
Location and description of major emission sources	Domestic fires, commercial heating, minor industrial sources. Adjacent to a car paint and panel beating workshop situated approx 10m north of sampler.
Site category	Residential
Scale of representation	Neighbourhood
Auxilliary information	
Meteorological variables measured	Wind speed, wind direction, rainfall.
Meteorological data operator	NIWA
Location of meteorological site	
Meteorological data information	NIWA Climate Database
Regional and local meteorological characteristics	
Site height above sea level	10 metres

Air Quality Monitoring - Blenheim Permanent Site	
Indicator/contaminant monitored at this site.	
Contaminant	PM_{10}
Data owner	MDC
Instruments	Lear Siegler high volume air sampler (PM10) Serial number A073
Period of operation	From 2 February 2000. Permanent site.
Method, standard method followed and variations	ESR Air Quality Test Method 104, based on AS3580.9.6 - 1990
Data logging	Not used
Data storage	Watercare Services Limited (Previously ESR) for MDC. MDC also in QDAS
Sampling period	1 day in 6 and 1 day in 3 during winter - May to September.
Sampling probe height	Approx 2 metres
Calibration frequency	Once in 6 months
Percentage valid data	96%

Air Quality Monitoring
Recording Site and Auxiliary Information

Air Quality Monitoring - Redwoodtown Site	
Indicators/contaminants monitored	PM_{10}
Site code	Site 3
Site title	Redwoodtown, (Blenheim relocatable)
Location	65A Weld Street Blenheim
Region	Marlborough
Co-ordinates	E 2589778 N 5964026
Equipment owner	Watercare Services Ltd
Equipment operator	MDC, also calibrate sampler
Data owner, name and address	MDC PO Box 443 Blenheim
Equipment housing	Lear Siegler Flow-set high volume air sampler
Housing environment	Outside
Monitoring objectives	To obtain information about PM_{10} concentrations during a winter period, and relationship to MfE guideline values. Comparison with long-term site results. To collect information relating to emissions from domestic use of solid fuel.
Site topography	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.
Location and description of major emission sources	Domestic fires.
Site category	Residential
Scale of representation	Neighbourhood
Auxilliary information	
Meteorological variables measured	Wind speed, wind direction, rainfall
Meteorological data operator	NIWA
Location of meteorological site	
Meteorological data information	NIWA Climate Database
Regional and local meteorological characteristics	
Site height above sea level	20 metres

Air Quality Monitoring - - Redwoodtown Site	
Indicator/contaminant monitored at this site.	
Contaminant	PM_{10}
Data owner	MDC
Instruments	Lear Siegler high volume air sampler (PM10) Serial number A003
Period of operation	6 September 2001 to 29 December 2001 1 May 2002 to 31 August 2002
Method, standard method followed and variations	ESR Air Quality Test Method 104, based on AS3580.9.6 - 1990
Data logging	Not used
Data storage	Watercare Services Limited for MDC. MDC also - QDAS
Sampling period	1day in 6 initially. 1 day in 3 during winter 2002
Sampling probe height	Approx 2 metres
Calibration frequency	Once in 6 months
Percentage valid data	100%

Visibility Monitoring Sites
(information from "Visibility Study Marlborough District" ESR Oct 2000)

Elisha Drive, Blenheim

Observations were carried out from the southern side of a road adjacent to 36 Elisha Drive. The location is 3 km south of the central business area of Blenheim. The site is predominantly suburban in nature, however it is situated on the edge of town adjacent to pastoral farmland. The line of observation runs across Blenheim from the south-eastern boundary across the town centre.

The reference target selected for this visibility site was the Mt Dobson summit. The summit may be viewed across the urban landscape and river valley, with pastoral and cropped farmland, and viticulture running from south to north in direction. The summit is 702 m above sea level, and is located to the west of State Highway 1 between Tuamarina and Koromiko. The Wairau River runs along the base of the foothills of Mt Dobson, and is situated 4.3 km from the target site.

Marlborough District Council Offices, Seymour Square, Blenheim

Observations were carried out from the roof of the new extension to the Council offices at Seymour Square in Blenheim. Seymour Square is located across the road from the Council building. The office site is adjacent to the Central Business District, and has main roads on two sides of the building. The site is 7.7 km west of the coast.

The Ward Peak summit was selected as the reference target for observation. The summit is a part of the range of hills east of the Waihopai River Valley, and is 922 m above sea level. It is located across the business district and urban landscape to the pastoral valley and foothills running from north-east to south-west.

Scotland Street, Picton.

Observations were carried out from a road reserve situated next to a power pole immediately adjacent to 39 Scotland Street, Picton. This observation point provided observers with a very clear view of the residential township, central business district, and industrial areas of Picton. The line of observation to the target site runs from southwest to northeast across urban, industrial, commercial, marina and other urban influences. The long distance view to Mt McMahon looks across the town, water and hills. The distance between the observation point and reference target is 21 km. The foreshore of Picton Harbour is located 1.1 km from the monitoring site.

The reference target selected for this site was an orange rooftop of a house located at 104 Milton Terrace. This residence is situated on an elevated site in a dense suburban area, 40 m above sea level.

Air Traffic Control Tower, Base Woodbourne, Ministry of Defence & Woodbourne Airport

Observations were carried out from an open deck of the Air Traffic Control Tower of the Woodbourne Base (first floor, outside the control room). The line of observation runs in a northwesterly to southeasterly direction across residential areas of Blenheim. The airport is located in the rural area of the Wairau Plain, which is 3 km from Renwick and 6.5 km from Blenheim. The Control Tower is situated in the middle of the hardstand and taxi areas for aircraft, and is adjacent to the runway area that is grassed and tarmac 5.3 km south of the Wairau River.

On the northern side of the hardstand area are airport hangars. The surrounding land area is influenced by viticulture, cropping and pastoral farming. The coast is located 14.5 km distance from the monitoring site.

The reference target selected for this site was the White Bluffs, which are approximately 100 m above sea level. This prominent landmark, which can be clearly viewed from the observation site (Control Tower), rises up from the Wairau Lagoons on the coast of Cloudy Bay.

APPENDIX B

Visibility Site Maps

Appendix B contains 5 pages including cover