ATMOSPHERE

Air quality and discharges in Marlborough vary depending on where you live. In urban areas smoke from home heating or outdoor burn-offs causes the most concern, while in the countryside the main issues are spray drift from vineyards and composting odours.

Other commercial activities that have an impact on air quality in Marlborough include methyl bromide fumigation of logs and emissions from industrial boilers. All of these discharges are monitored and managed by the Council, in many cases according to air quality standards set by Central Government.

Our atmosphere is also affected by variations in the climate. Data gathered by the Marlborough Research Centre help track the changes in our weather including the severe rainstorms and prolonged dry periods in recent years. This information is important for managing resources such as irrigation water and planning for the effects of climate change on the province.

CLIMATE TRENDS

Marlborough's climate varies a lot year by year so it is important to examine all historical data when looking at trends in climate change.

The Marlborough Research Centre's climate site by SH1 just north of Blenheim has a reasonably long record of data. While this does not represent climate trends across all of Marlborough it provides a good indication, particularly for the eastern coastal margin where much of the population and economic activity is located.

RAINFALL

Blenheim receives 400 mm-1000 mm of rain a year, with an average of about 650 mm. The 10-year moving average shows longer term cycles of higher or lower rainfall, with the past decade gradually trending close to the average (Figure 1).

There were two periods of successive dry years early in the Blenheim record. The first was 1930-1933, where the average annual rainfall was just 460 mm and the second was from 1958-1961, with an average of 525 mm. These two periods would have been extremely damaging to local agriculture, possibly more so than our recent droughts, which have generally lasted for just a year.

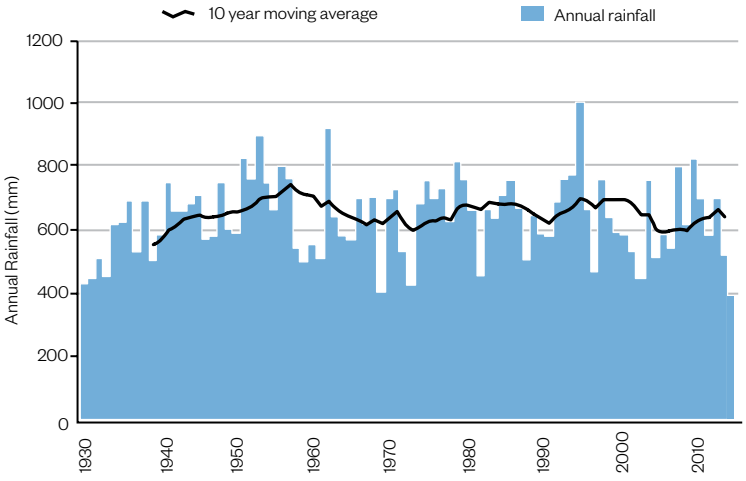

Figure 1: Blenheim rainfall record

CHANGES SINCE THE 2008 SOE REPORT

- Record low rainfall for Blenheim 2015.
- Record sunshine hours for Blenheim 2015.
- Major rain event in Te Hoiere / Pelorus area December 2010.
- Decrease in annual wind runs at Blenheim site.
- Continuing increase in temperature.

Servicing Tunakino rain gauge

CASE STUDY
2014-15 Drought

From July 2014 to June 2015 the region suffered an extended dry period with significant impacts on many primary producers. At the Blenheim climate site 347 mm of rain was recorded over 12 months, which is only 54% of the annual average. Of this, 87 mm, or (25%), fell in June 2015, the only month to record an above-average rainfall. The lack of rain was compounded by the high evapotranspiration (ET), which exceeded rainfall for 11 of the 12 months.

Inland areas fared slightly better than Blenheim. The Upper Wairau Valley at the Branch recorded normal or above normal rainfall for September, December, April, May and June and annual rainfall was 80% of the average.

Across the district, soil moisture levels were very low and there was significant pressure on irrigation supplies. Some irrigation consents were shut off after rivers fell below the prescribed flows.

CASE STUDY
December 2010 Te Hoiere / Pelorus rain event

The Te Hoiere / Pelorus area suffered a very damaging rain event on 28 December 2010. Record high river flows were recorded on the Te Hoiere / Pelorus and there were many hillside slips, some of which closed roads. The slip damage was probably caused by the succession of rain events in the second half of December when 745 mm fell within 13 days.

On 16-17 December 180 mm of rainfall was recorded at Tunakino, followed by further more rain on 19 and 21 December (128 mm and 180 mm respectively). These three events meant that soils were already saturated before 28 December, when another 257 mm fell in 24 hours. The final event included extremely high intensity, with 44 mm recorded in one hour 104 mm over three hours, and 184 mm over six hours. The three and six-hour rainfalls were the highest recorded at Tunakino in 35 years. The band of intense rain moved south and also caused significant damage in the Wakamarina and Kaituna Valleys.

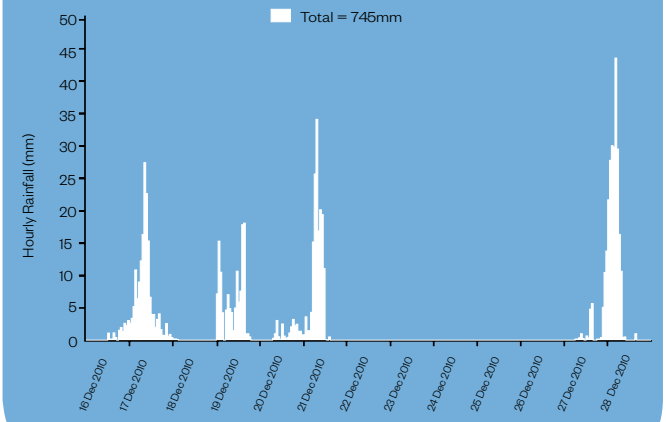

Figure 3: Tunakino rainfall, December 2010

Wairau River flood waters

Rainfall variation across the season

It's commonly thought that Marlborough summers are dry simply because of a lack of rain in that season. In fact, average summer rainfall is less than 20% below the average monthly rainfall. The main reason for our dry summers is the high level of evapotranspiration over much of the year. Of course there are some summers when rainfall is well below normal, which is when we move from a dry situation to drought. The difference between average monthly rainfall and evapotranspiration can be as much as 90 mm in the height of summer (Figure 2).

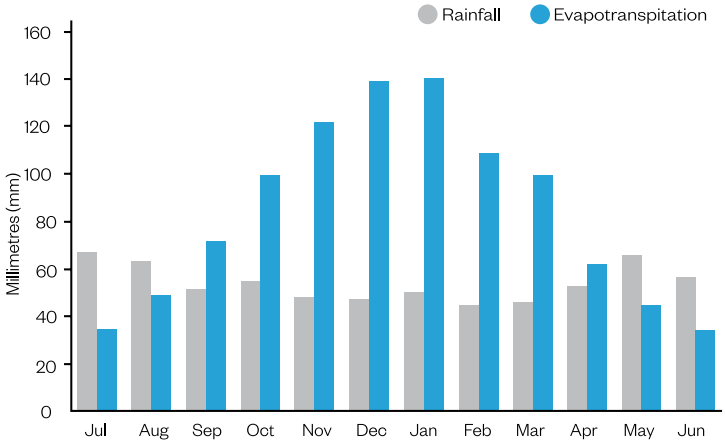

Figure 2: Blenheim rainfall and evapotranspiration averages

Rainfall variation across the region

Rainfall is highly variable across Marlborough, with annual averages ranging from 650 mm in Blenheim and the east coast to more than 2600 mm in parts of northern Marlborough. For instance there is four times as much rain in the upper Wakamarina Valley compared with Blenheim just 35 km away. This variation is due to topography and exposure to rain from different directions. Some parts of Marlborough are typical of dry east coast New Zealand, while others are more like west coast catchments.

High intensity rainfall events

Warmer air increases the moisture holding capacity of the atmosphere, so as the climate warms up we expect more high-intensity rain events. Data from two Council rainfall sites have been examined to see if there has been a trend over time. The Beneagle site (representing the east coast) is exposed to easterly rain and did not show any discernible trend for three or six-hour rain events. The Tunakino rainfall site (near Rai Valley) showed a distinct increase for six-hour events but there was no notable change in

Rain gauge maintenance

one-hour events. Tunakino, which is exposed to north-north westerly rain from the Tasman Sea, is one of the highest rainfall areas in Marlborough, with an annual average of 2,490 mm.

Temperature

Temperature records have been kept since 1933 and give a good indication of long-term trends. The annual mean temperature increased by about 1°C over 80 years. The main reason for the change is an increase in mean temperatures for May to October, with only a minor increase recorded for November to April (Figure 4). The trend is consistent with, although slightly higher than, the national average temperature rise of 0.91°C over the past 100 years (reported by NIWA).

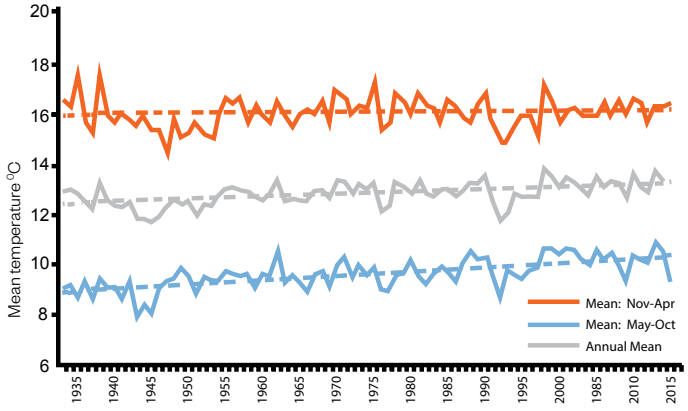

Figure 4: Blenheim temperature record

FROSTS

One measure of climate which always gets people talking is the number of frosts each year. The Blenheim climate station has been recording ground frosts (when the overnight grass minimum temperature is minus 1°C or below) since 1933 and shows a marked drop in the number of frosts since then (Figure 5). This is consistent with the gradual increase in mean daily temperatures and particularly with the increase in mean winter temperature. The 10-year trend line shows a slight increase in the number of ground frosts over the past decade, but whether this will continue remains to be seen.

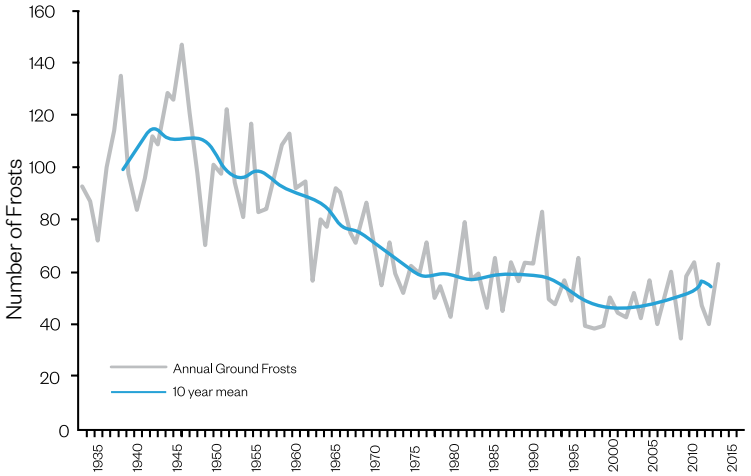

Figure 5: Blenheim annual ground frosts

SUNSHINE

Blenheim has a long and proud record for a high number of sunsine hours, with an average of 2,454 hours a year. Over the past decade the annual sunshine hours were within 5% of that average, until 2015 when a new sunshine hours record was set.

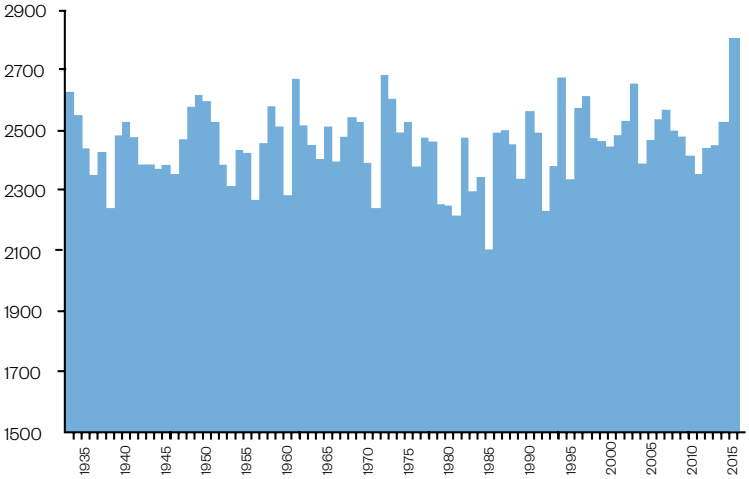

Figure 6: Blenheim annual sunshine hours

WIND

Marlborough has a high annual wind run (the amount of wind each year) and this is a significant contributor to evapotranspiration and our dry summer climate. The wind records do not go back as far as other climate data because of a change in measuring equipment in 1996. There appears to be a slight downward trend in the annual mean daily wind run, however it is too early to draw firm conclusions from this relatively short record. On average, the windiest month is November and the least windy month is May (Figure 7).

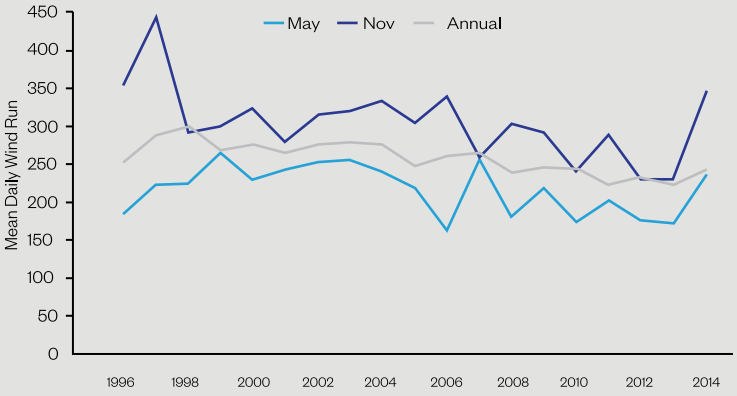

Figure 7: Annual wind run

MOISTURE DEFICIT

Moisture deficit is used to measure the intensity of a drought. It is calculated by subtracting potential evapotranspiration from rainfall and is sometimes called Potential Evapotranspiration Deficit (PED).

Moisture deficit is usually calculated for the July-June year because the soil should be fully replenished at the start of July. This is not necessarily the case in Marlborough, so while the moisture deficit data may show the severity of a single drought season, it does not account for successive dry years when there is not enough rain to build up soil moisture between summers.

PED usually reaches a maximum in about April or May and then begins to recover over winter. PED could be thought of as the total amount of irrigation water needed to keep soil moisture levels full for the entire year.

In Blenheim evapotranspiration always exceeds rainfall when looked at over a year. Blenheim has a long-term average PED of about 450 mm but in several droughts this has dropped to more than 700 mm by early autumn.

Omaka River drying up, February 2015

AIR QUALITY AND DISCHARGES

Clean fresh air is an important and valued part of Marlborough's environment and our quality of life. Having good air to breathe depends on how much pollution is released into the atmosphere and how quickly it is dispersed by wind or diluted by rain.

PRESSURE

In urban areas the main contributors to poor air quality are particles in the air less than 10 microns in diameter (PM_{10}). These particles mostly come from smoke from home heating and are worse in winter when people use their wood and coal fires.

Rural burning and controlled burn offs releases very large quantities of PM_{10} particulate into the atmosphere.

High concentrations of PM_{10} are a problem in Marlborough on cold frosty nights when pollutants get trapped by a layer of warmer air above, called an inversion layer. This trapped layer of air with a high concentration of PM_{10} doesn't disperse until a breeze develops and blows it away.

Smoke as a result of a controlled burn

Factory and industrial boiler emissions can also lead to a deterioration in air quality. However, particulate discharge from consented boilers make up only a small percentage (approximately 2%) of PM_{10} in Marlborough.

Regularly breathing in too much fine particulate matter can lead to health problems including asthma, bronchitis, headaches, coughing, high blood pressure and cancer. PM_{10} is regulated by a National Environmental Standard (NES) introduced by the Ministry for the Environment in 2004. The NES lists a range of contaminants, concentration levels and allowable exceedances. The ambient air quality standard for PM_{10} is set at 50 micrograms per cubic metre, with one allowable exceedance per year.

In rural Marlborough chemical spray drift and controlled burn-offs are the main air quality issues. The Council's Resource Management Plans allow agrichemicals to be used, but there are rules to prevent or reduce the risk of spray drifting from the target crop to another property.

CHANGES SINCE THE 2008 SOE REPORT

- Continued exceedence of the NES for PM_{10}.
- Overall PM_{10} concenration do no appear to have decreased since 2006.
- Main source of PM_{10} is from wood fires.
- Increase in odour complaints.

Spray drift can result when spraying takes place in high winds

Air quality monitoring station

Agrichemicals are used to control insects, weeds, plant diseases and other pests. These chemicals are applied to crops and products such as logs for export. When agrichemical spray drifts from the target area it is referred to as spray drift. Spray drift can cause health issues to those who breathe it in or get it on their skin. It can also damage other crops that were not supposed to be sprayed and can create a nuisance odour.

As the spread of vineyards in Marlborough has increased, so has the use of agrichemicals. Marlborough's wide open plains and windy weather increases the risk of spray drift.

Fumigating logs can also result in spray drift. Forestry products, particularly logs, are shipped out from Port Marlborough and some countries require treatment with fumigants such as methyl bromide to make sure pests and diseases are not exported as well. Controls on the discharge of methyl bromide are in place to ensure spray drift does not occur.

Methyl bromide can cause acute and chronic health effects if it leaks out from these enclosed situations. The use of methyl bromide is regulated by the Environmental Protection Agency, which sets Tolerable Exposure Limits (TELs).

Odour from discharges to air is a common problem and can have a significant impact on people nearby. As well as being annoying it may restrict people's ability to carry out activities. It can be difficult to deal with odour complaints as what one person finds objectionable another may tolerate. There is also the issue of reverse sensitivity, where new housing in a mixed-use area can lead to more residents making complaints about odours that are typical of the surrounding land use.

RESPONSE

The Council takes a combined approach to managing air pollution with surveys, monitoring, education, policy and compliance. It is working on new rules for woodburners to ensure clean and efficient heating that emits low levels of PM_{10}. The Resource Management Act (RMA) prohibits the discharge of contaminants into the air unless it is allowed by a rule in the Resource Management Plan or a resource consent has been granted.

PM_{10} is the only air contaminant that is monitored in Marlborough. There are two sites, both in Blenheim: Redwoodtown, monitored daily with hourly updates and Springlands, monitored every three days. Only Redwoodtown meets the monitoring requirements of the NES.

The Council carried out an industrial boiler survey from 2009 to 2011 to promote good management to minimise air pollution. Council visited sites that held resource consents for the discharge of particulates to air and collected data on the management and performance of diesel, oil, coal and wood-fuel boilers.

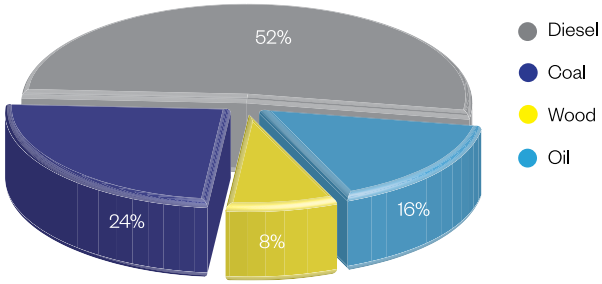

Figure 1: Fuel used for consented boilers

From 2011 to 2015 most discharges of particulate to air have been monitored by complaint only. However, the four largest commercial emitters of particulate matter are required to produce annual reports detailing results of monitoring and boiler maintenance.

The Wairau Awatere Resource Management Plan sets out the rules for managing spray drift. For vineyard spray drift, Sustainable Winegrowers NZ has a policy to reduce the amount of agrichemicals used by their members and maximum wind speed guidelines for spraying are set to minimise drift. The effects of spray drift are monitored only when a complaint is received.

For methyl bromide, the Environmental Risk Management Authority (ERMA) imposed a new regime for fumigation in 2010, which requires facilities to recapture the gas by 2020. In 2010-11, after public concern in Picton about the health effects on the community of spray drift from methyl bromide, the Council investigated the log fumigation at Port Marlborough.

STATE

PM_{10} concentrations in Blenheim have fluctuated over the years. There was a drop in concentrations from 2005-2009, however they increased in 2010 and 2011 and returned to around pre-2010 concentrations for 2012-2014. Overall concentrations do not appear to have decreased since 2006.

To comply with the NES there needs to be a 38% reduction in PM_{10} emissions by 2016. If home owners replace polluting wood and coal fires at the end of their useful life with modern solid fuel burners (or other heating methods) a reduction in PM_{10} emissions of 10 % is anticipated by 2020. Overall, some form of further intervention would be required to comply with the NES and ensure a safe living environment over the winter months.

The industrial boiler survey from 2009 to 2011 focused on assessing odour and smoke at the boundary, chimney height, the number of hours per day the boiler was operating, age and capacity of the boiler and whether any additional measures had been put in place to reduce contaminant emissions. No serious issues were observed and monitoring is now based on complaints received. In 2009 there were 40 resource consents for the discharge of particulates to air from industrial boilers. This had decreased to 37 in 2015. Diesel is the dominant fuel used in industrial boilers in Marlborough.

Responding to community concern, in 2010 and 2011 the Council investigated the potential effects of spray drift from fumigating logs using methyl bromide


Inversion layer of over Blenheim

at Port Marlborough in Shakespeare Bay. Air was monitored at two locations in Picton to determine if there was spray drift beyond the boundaries of the port. Monitoring was carried out during three fumigation events (December 2010, January 2011 and March 2011).

Methyl bromide concentrations were either not detected or detected at very low levels (up to 1,000 times lower than the relevant health standards). It was concluded that there was a very low health risk for the Picton community as a result of spray drift from these fumigation events.

Methyl bromide fumigation was used at the port two to four times a year up until 2011, but no fumigations have been carried out since then.

The number of complaints to Council about spray drift decreased between 2008 and 2014, with approximately half the number of complaints in 2014 compared to 2008. A rise in the number of complaints in 2011 mostly related to vineyard spraying.

There was a significant increase in odour complaints received between 2008 to 2014. This is thought to be due to urban infilling and new housing, meaning people are living closer together and are therefore more affected by their neighbours' activities. Issues associated with reverse sensitivity from new housing in rural areas are also a contributing factor to the increase in complaints. In 2008 complaints included smells from shellfish, winery waste, sewage and animal carcasses. In 2014 the majority of odour complaints were about composting facilities. Others were for effluent and wastewater discharges, landfill and burning rubbish outside.

Figure 2: Picton methyl bromide monitoring sites

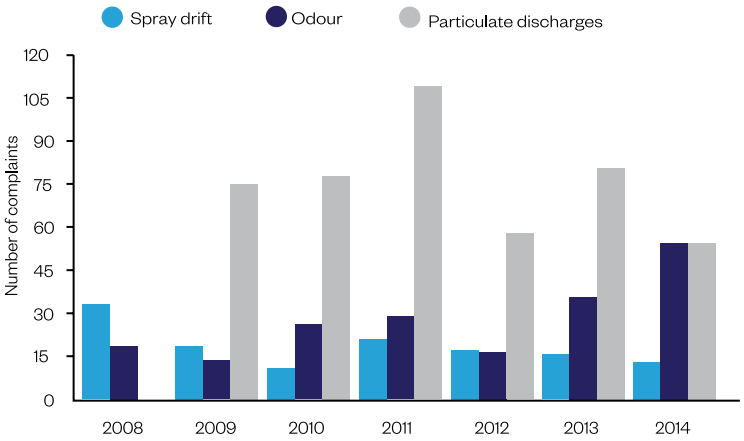

Figure 3: Number of air quality related complaints

WANT TO FIND OUT MORE?

- Ministry for Environment. (2004). Resource Management (National Environmental Standards for Air Quality) Regulations 2004. New Zealand Government.
- Assessment of the potential air quality impacts of vineyard spraying in and around Blenheim. Prepared for Marlborough District Council by Faye Lammers, Emily Wilton and Melanie Baynes, Environet Ltd. June 2007.
- Methyl Bromide Monitoring Picton, April 2011.
- MDC Technical Report No: 11-014. April 2011.

FUTURE RESPONSE

The air quality monitoring programme will continue to gather information to meet the NES and keep the Council and community informed on the current state of Marlborough's air and developing trends.

The Council will continue to collaborate with industry to get better information about the use of agrichemicals and effects on environmental and human health. The Council will continue to respond to residents' complaints on air quality issues.