

AIR QUALITY

Key Points

- Air pollution can be an issue in Canterbury towns and cities, mainly during the coldest months
- Of the five contaminants listed in the National Environmental Standards for Air Quality (NESAQ):
 - daily average PM₁₀ concentrations breach the NESAQ on some days during the coldest months every year
 - SO₂ and CO have breached the NESAQ in Christchurch
 - NO₂ and O₃ are unlikely to regularly breach the NESAQ
- The main source of PM₁₀ in Canterbury's towns and cities is from burning wood for home heating. Other sources include industry and transport
- Environment Canterbury is working closely with industry to reduce SO₂ in Christchurch
- Other contaminants not listed in the NESAQ, including PM_{2.5}, benzo(a)pyrene (BaP) and arsenic, are of concern
- Home heating is the main source of PM_{2.5} and BaP. Arsenic is emitted when treated timber is burned
- Strategies that reduce emissions of PM₁₀ from home heating will also lower emissions of PM_{2.5}, BaP, and possibly arsenic

See the airshed monitoring results pages for each Canterbury airshed

NATIONAL AIR QUALITY STANDARDS AND REGIONAL AIR QUALITY

The Government set national environmental standards for air quality in 2004 and updated these in 2011. These standards are currently under review. The legislation that sets these standards is called the Resource Management (National Environmental Standards for Air Quality) Regulations 2004 – commonly referred to as the NESAQ. The standards include five main air contaminants that, when breathed in, can cause negative effects to people's health (see table page 3):

- Particulate Matter (PM₁₀)
Includes fine particles (less than 2.5 micrometers) and coarse particles (between 2.5 and 10 micrometers)
- Sulphur dioxide (SO₂)
- Carbon monoxide (CO)
- Nitrogen dioxide (NO₂)
- Ozone (O₃).

To find out more about these contaminants: <http://mfe.govt.nz/air/specific-air-pollutants>

Canterbury has eight gazetted airsheds (see map page 4) that are identified as having high levels of pollution that exceed the national environmental standard. Each of these airsheds (Christchurch, Kaiapoi, Rangiora, Ashburton, Timaru, Washdyke, Waimate and Geraldine) have targets for compliance with the NESAQ from 1 September 2016 and 2020.

Find out about the NESAQ:

- <http://mfe.govt.nz/air/national-environmental-standards-air-quality>

What is Environment Canterbury doing in response to air pollution?

- Warmer Cheaper campaign
warmercheaper.co.nz
- Developing airshed strategies under the regional Air Plan to meet the NESAQ
- Helping householders to reduce emissions through better wood burning
- Encouraging development of ultra- low emissions technology for home heating
- Working with key partners and stakeholders
- Monitoring air quality.

Find out about other air quality monitoring information:

- Environment Canterbury science reports
www.ecan.govt.nz/data/document-library/
- LAWA air quality lawa.org.nz/explore-data/air-quality/
- Ministry for the Environment air quality reports
mfe.govt.nz/publication-search

To read more about guidelines for air quality, see page 2

AIRSHED MONITORING RESULTS

Rangiora airshed	pg 5	Geraldine airshed	pg 9
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MEETING THE NATIONAL AIR QUALITY STANDARD FOR PM₁₀ IN CANTERBURY

PM₁₀ – the main concern

The main air contaminants requiring action in Canterbury are particles. PM₁₀ includes fine particles (less than 2.5 micrometers) and coarse particles (between 2.5 and 10 micrometers). PM_{2.5} is produced by the combustion of wood and fossil fuels (mostly by home heating and traffic). Dust, pollen and other natural particles are typically in the 2.5 to 10 micrometer range or larger.

While there are national guidelines for both annual and daily average PM₁₀ concentrations, the NESAQ has a standard for PM₁₀ daily average only. There are currently no official national guidelines for PM_{2.5}, though there are daily and annual guidelines from the World Health Organisation (WHO).

Although the annual average concentrations in most airsheds are below national guidelines, daily averages can breach the NESAQ. The NESAQ required that from 1 September 2016 there shall be no more than:

- one high pollution day per year in Rangiora, Geraldine and Washdyke
- three high pollution days per year in Kaiapoi, Christchurch, Ashburton, Timaru and Waimate.

From 1 September 2020, all Canterbury airsheds must have no more than one high pollution day per year.

A high PM₁₀ pollution day is when the NESAQ threshold of 50 µg/m³ for PM₁₀ is exceeded – measured as a 24-hr average. There are several high pollution days each year in Canterbury airsheds. The highest concentrations generally occur on still, cold evenings during winter. At this time the main source of emissions is usually from home heating.

The number of days with high PM₁₀ has decreased in most airsheds.

Air quality has been managed in different ways across Canterbury's eight airsheds to take into account local conditions.

Management has included the use of rules through the regional Air Plan for home heating and non-regulatory measures, including education and awareness campaigns.

While, generally, there have been improvements in air quality in Canterbury, further improvement is needed in all airsheds to meet the NESAQ.

A more integrated approach to air quality improvement is most effective. This includes education, incentives, compliance and enforcement. Such an approach has been progressed through the Canterbury Air Regional Plan.

For more information see ecan.govt.nz/airplan

PM₁₀: NUMBER OF HIGH POLLUTION DAYS

Airshed	2012	2013	2014	2015	2016	2017
Rangiora	12	10	3	3	7	6
Kaiapoi	14	11	14	13	7	10
Christchurch	19	23	19	8	5	5
Ashburton	8	4	9	1	2	3
Geraldine	7	0	4	3	1	1
Timaru	33	30	41	26	27	17
Waimate	11	6	8	9	0	2
Washdyke	3	2	3	4	1	1

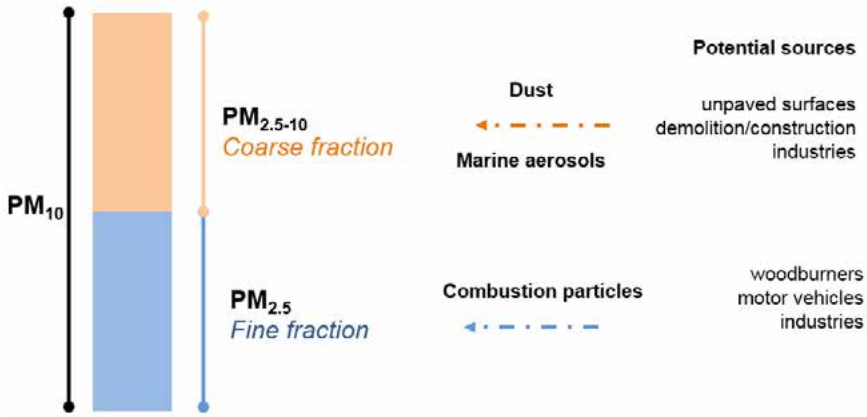
GUIDELINES AND REGULATIONS FOR AIR CONTAMINANTS

In New Zealand regional councils are responsible for managing air quality. This is done with reference to the Ministry for the Environment's Ambient Air Quality Guidelines (AAQG) as well as the NESAQ. The AAQG address 15 priority air contaminants, 5 of which have been developed into NESAQ. The AAQG "values are the minimum requirements that outdoor air quality should meet to protect human health and the environment. Where air pollution levels breach values, emission reduction strategies should be implemented to improve air quality. Where levels do not breach the values, efforts should be made to maintain air quality, and, if possible, reduce emissions."

In instances where there is no NESAQ or AAQG, such as for PM_{2.5}, then contaminant concentrations are sometimes evaluated against international guidelines and standards (e.g. World Health Organisation, European Union and the United States Environment Protection Agency). At the national level, the Ministry for the Environment reports against both New Zealand and international guidelines and standards.

For the purpose of this snapshot, the focus is on New Zealand guidelines and standards. For PM₁₀ the daily and annual average values are the same in the New Zealand and World Health Organisation guidelines. Where there is no national guideline (e.g. annual average PM_{2.5}) reference is made to the World Health Organisation guidelines.

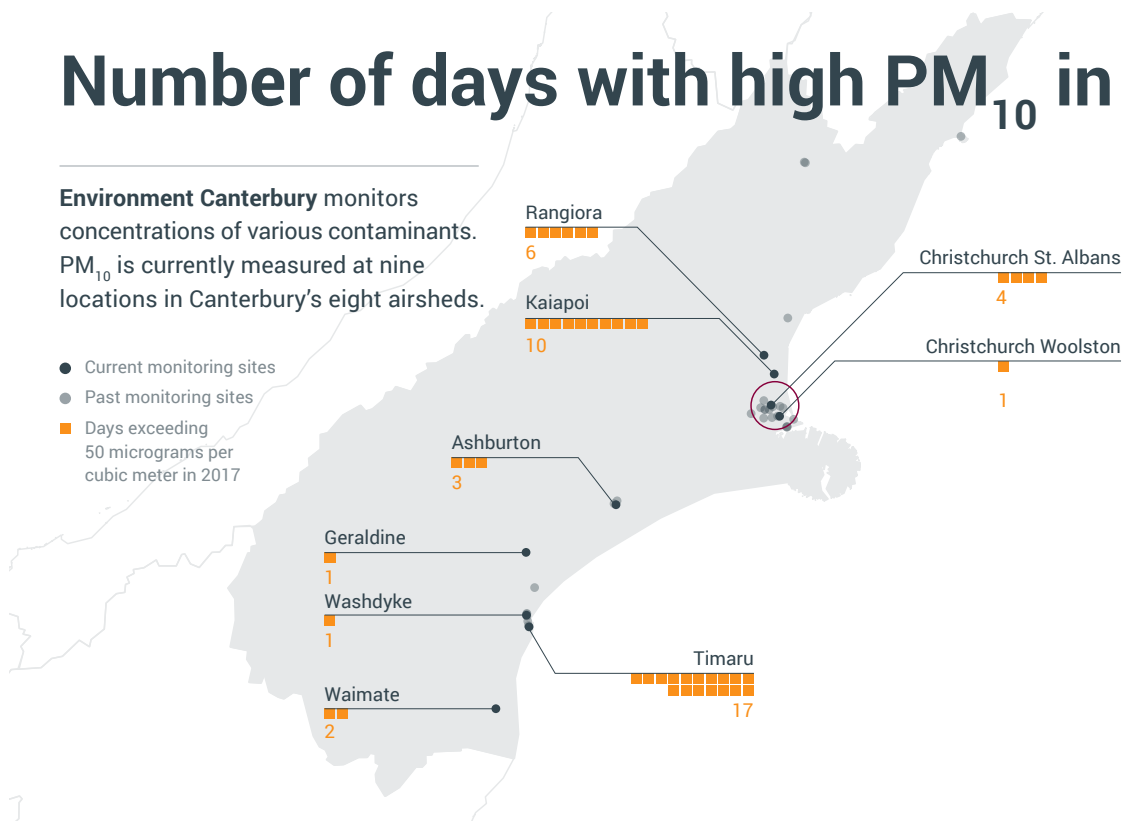
AIR CONTAMINANTS OF CONCERN IN CANTERBURY (NESAQ AND OTHERS)

Contaminant	What is it and where does it come from	Human health effects	Actions everyone can take to reduce contaminant emissions
Particulate Matter	<p>Airborne particles less than 10 micrometres in diameter (about a fifth of the thickness of a human hair). It includes fine particles (less than 2.5 micrometers) and coarse particles (between 2.5 and 10 micrometers). PM_{2.5} is produced by the combustion of wood and fossil fuels (mostly by home heating and traffic). Dust, pollen and other natural particles are typically in the 2.5 to 10 micrometer range.</p> 	<p>Airborne particles that are small enough to be breathed in, and to penetrate into the human lung can cause negative health effects for people's respiratory and cardiovascular systems.</p>	<p>Home heating:</p> <ul style="list-style-type: none"> ■ Burn dry, seasoned wood only ■ Get your fire going quickly and keep it burning hot ■ Don't damp your fire down over night ■ Switch to a non-emitting home heating source ■ Switch to a pellet fire or an ultra-low emission wood burner. <p>Vehicles:</p> <ul style="list-style-type: none"> ■ Keep your vehicle regularly serviced and tuned ■ Consider alternative travel methods - bus, bike or walk.
Benzo(a)pyrene (BaP)	<p>BaP is a polycyclic aromatic hydrocarbon (PAH). BaP is released into the air, as a by-product of incomplete combustion (eg in vehicle exhaust and in smoke produced from wood and coal fires).</p> <p>The main source of BaP is from transport and from the burning of wood and coal for home heating.</p>	<p>BaP is classified by the World health organisation (WHO) as 'probably carcinogenic' (cancer causing) to humans.</p> <p>BaP can enter the body through inhalation. When breathed in to the lungs, BaP can cause irritation to the lungs and respiratory system.</p>	<ul style="list-style-type: none"> ■ Keep your vehicle regularly serviced and tuned ■ Consider alternative travel methods - bus, bike or walk.

Number of days with high PM₁₀ in 2017

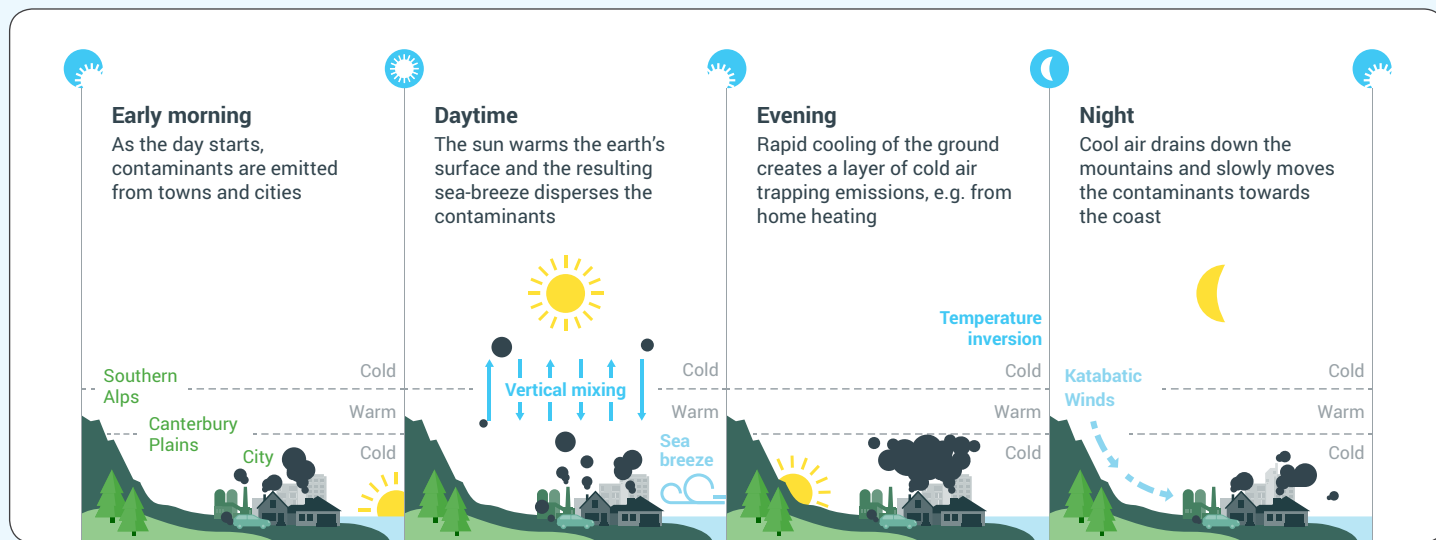
Environment Canterbury monitors concentrations of various contaminants. PM₁₀ is currently measured at nine locations in Canterbury's eight airsheds.

- Current monitoring sites
- Past monitoring sites
- Days exceeding 50 micrograms per cubic meter in 2017



HOW WEATHER IMPACTS AIR POLLUTION

Due to the combined effects of high emissions and Canterbury's weather and landscape, during calm winter nights pollution can be trapped in a layer of cold air near the surface.



Winter 2017

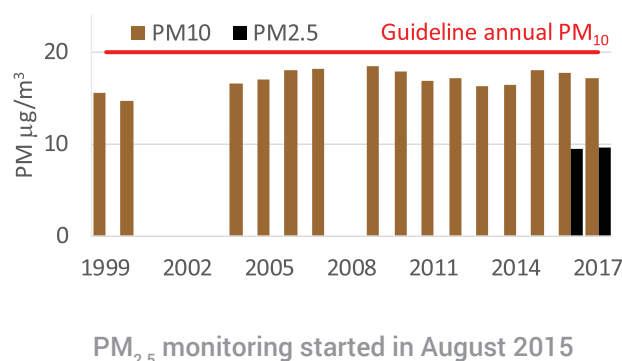
Key Points

- Air pollution can be an issue in Rangiora, mainly during the coldest months
- Of the five contaminants listed in the NESAQ, PM₁₀, SO₂ and CO have been measured over a number of years, and there have been no breaches of the NESAQ for SO₂ or CO. NO₂ and O₃ are unlikely to breach the NESAQ
- Annual average PM₁₀ concentrations have been below the national guideline
- Daily average PM₁₀ concentrations exceeded 50 µg/m³ mainly during the coldest months, on 6 days in 2017
- The number of PM₁₀ exceedances each year has ranged from 13 to 3, driven mainly by winter weather. A reduction in PM₁₀ emissions is still needed to meet the NESAQ of no more than one exceedance from 1 September 2016.
- Of the three main sources of PM₁₀ (home heating using wood and coal, industry and transport), an estimated 79% of the PM₁₀ comes from home heating on a typical winter day
 - Other contaminants, including PM_{2.5}, benzo(a) pyrene (BaP) and arsenic, are of concern
 - The annual average PM_{2.5} concentration in 2017 was 9.6 µg/m³, below the WHO guideline of 10.
 - Daily average PM_{2.5} concentrations exceeded the WHO guideline of 25 µg/m³ on 21 days during 2017
 - Home heating is the main source of PM_{2.5} and BaP in winter
 - Arsenic is emitted when treated timber is burned
 - Strategies that reduce PM₁₀ emissions from the burning of wood and coal for home heating, will lower emissions of PM_{2.5}, BaP and possibly arsenic.

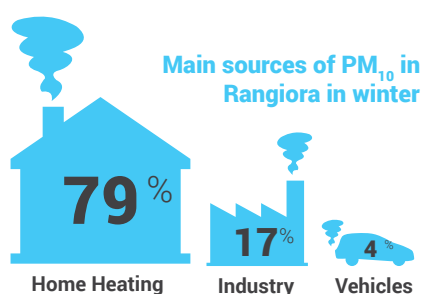
The Rangiora airshed



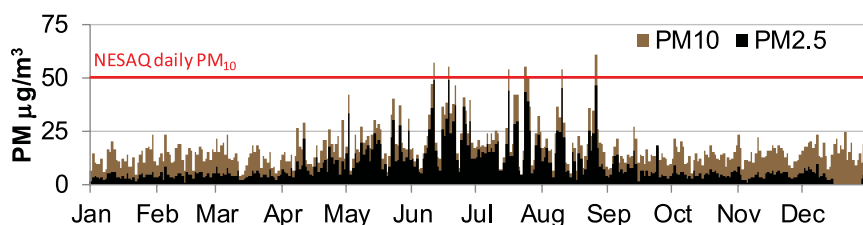
Annual average PM₁₀ and PM_{2.5} concentrations



See: lawa.org.nz/explore-data/air-quality/ to check air pollution in Rangiora during the last few hours and days. You can also find more information on Environment Canterbury's air quality page: www.ecan.govt.nz/data/air-quality-data



Daily average PM₁₀ and PM_{2.5} concentrations during 2017



Winter 2017

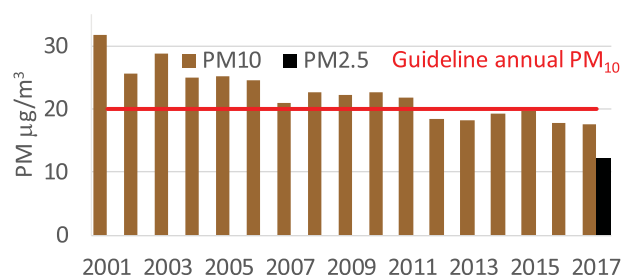
Key Points

- Air pollution can be an issue in Kaiapoi mainly during the coldest months
- Of the five contaminants listed in the NESAQ, PM₁₀, SO₂ and CO have been measured over a number of years, and there have been no breaches of the NESAQ for SO₂ or CO. NO₂ and O₃ are unlikely to breach the NESAQ
- Daily average PM₁₀ concentrations exceeded 50 µg/m³ mainly during the coldest months, on 10 days in 2017
- The number of PM₁₀ exceedances has reduced over time from 48 to 7. A reduction in PM₁₀ emissions is still needed to meet the NESAQ of no more than three exceedances from 1 September 2016 and one exceedance from 1 September 2020
- Of the three main sources of PM₁₀ (home heating using wood and coal, industry and transport), an estimated 90% of the PM₁₀ comes from home heating on a typical winter day
- Other contaminants, including PM_{2.5}, benzo(a) pyrene (BaP) and arsenic, are of concern
- The annual average PM_{2.5} concentration in 2017 was 12 µg/m³, above the WHO guideline of 10
- Daily average PM_{2.5} concentrations exceeded the WHO guideline of 25 µg/m³ on 37 days during 2017
- Home heating is the main source of PM_{2.5} and BaP in winter
- Arsenic is emitted when treated timber is burned
- Strategies that reduce PM₁₀ emissions from the burning of wood and coal for home heating, will lower emissions of PM_{2.5}, BaP and possibly arsenic.

The Kaiapoi airshed

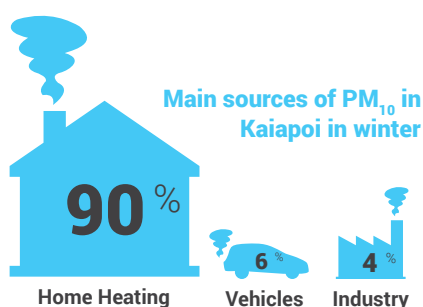


Annual average PM₁₀ and PM_{2.5} concentrations

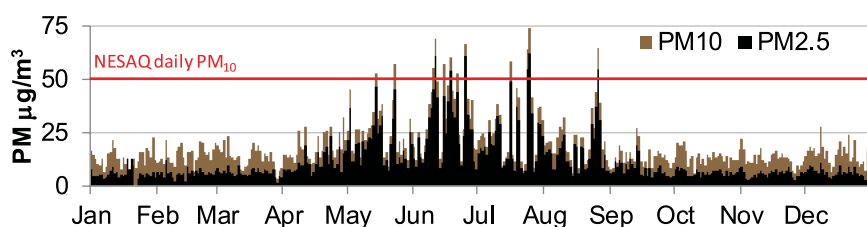


PM_{2.5} monitoring started in September 2016

See: lawa.org.nz/explore-data/air-quality/ to check air pollution in Kaiapoi in the last few hours and days. You can also find more information on Environment Canterbury's air quality page: www.ecan.govt.nz/data/air-quality-data



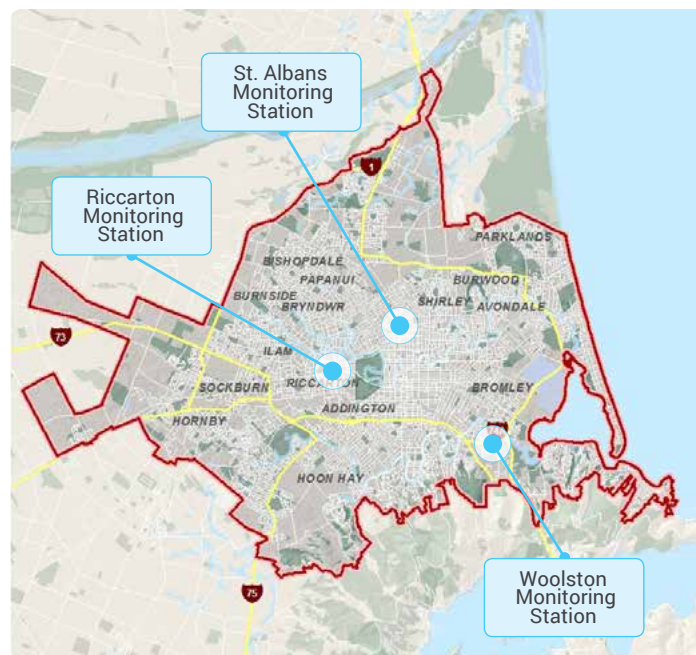
Daily average PM₁₀ and PM_{2.5} concentrations during 2017



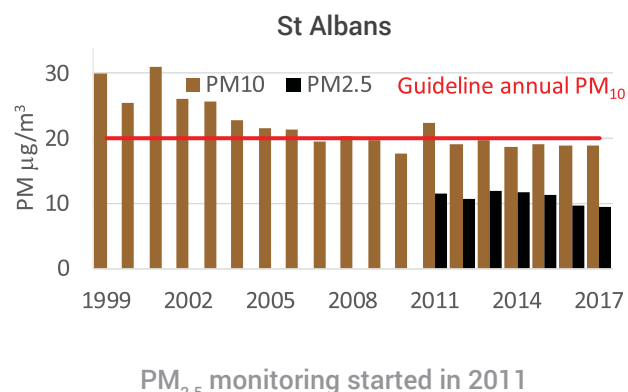
Key Points

- Air pollution can be an issue in Christchurch, mainly during the coldest months
- All of the five contaminants listed in the NESAQ, PM_{10} , NO_2 , SO_2 , CO and O_3 have been measured over a number of years. SO_2 and CO have exceeded their NESAQ thresholds at times, but not regularly
 - Environment Canterbury is working closely with industry to reduce SO_2 emissions
- Annual average PM_{10} concentrations in the last few years have been below the national guideline
- Daily average PM_{10} concentrations exceeded $50 \mu\text{g}/\text{m}^3$ mainly during the coldest months, on 5 days in 2017
- The number of PM_{10} exceedances has reduced over time from 60 to 5. A reduction in PM_{10} emissions is still needed to meet the NESAQ of no more than three exceedances from 1 September 2016 and one exceedance from 1 September 2020.
- Of the three main sources of PM_{10} (home heating using wood and coal, industry and transport), an estimated 67% of the PM_{10} comes from home heating on a typical winter day
- Other contaminants, including $\text{PM}_{2.5}$, benzo(a) pyrene (BaP) and arsenic, are of concern
 - The annual average $\text{PM}_{2.5}$ concentration in 2017 measured at the St Albans monitoring station was $9.4 \mu\text{g}/\text{m}^3$ and at the Woolston monitoring station was $7.4 \mu\text{g}/\text{m}^3$. Both these concentrations were below the WHO guideline of 10.
 - Daily average $\text{PM}_{2.5}$ concentrations exceeded the WHO guideline of $25 \mu\text{g}/\text{m}^3$ on 19 days during 2017 at the St Albans monitoring station, on 11 days at the Woolston monitoring station and on 5 days at the Riccarton Road monitoring station
 - Home heating is the main source of $\text{PM}_{2.5}$ and BaP in winter
 - Arsenic is emitted when treated timber is burned
 - Strategies that reduce PM_{10} emissions from the burning of wood and coal for home heating, will lower emissions of $\text{PM}_{2.5}$, BaP and possibly arsenic.

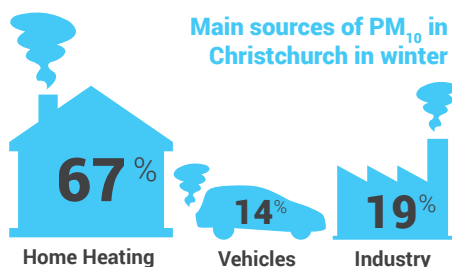
The Christchurch airshed



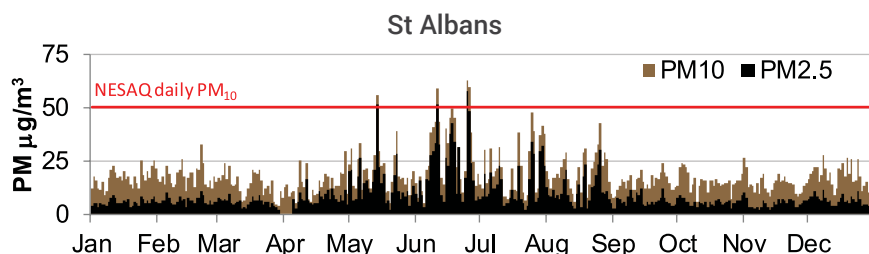
Annual average PM_{10} and $\text{PM}_{2.5}$ concentrations



See: lawa.org.nz/explore-data/air-quality/ to check air pollution in Christchurch in the last few hours and days. You can also find more information on Environment Canterbury's air quality page: www.ecan.govt.nz/data/air-quality-data



Daily average PM_{10} and $\text{PM}_{2.5}$ concentrations during 2017

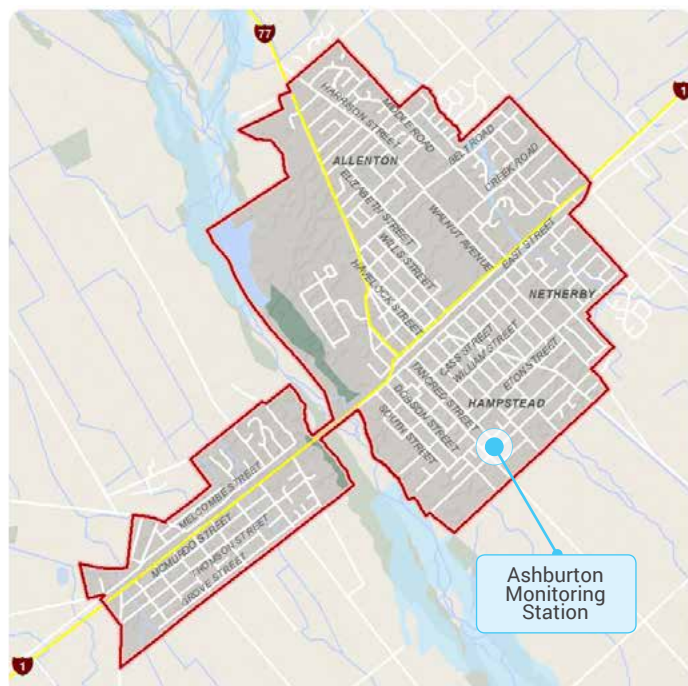


Winter 2017

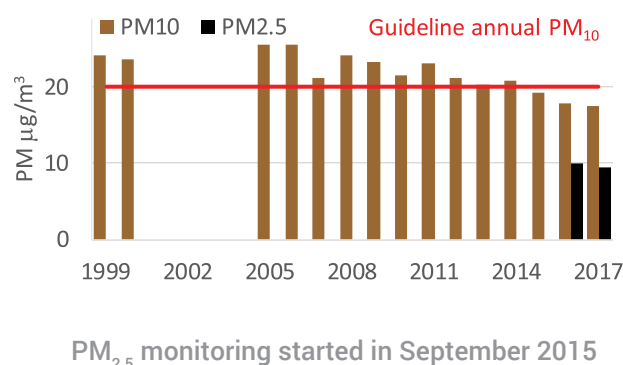
Key Points

- Air pollution can be an issue in Ashburton, mainly during the coldest months
- Of the five contaminants listed in the NESAQ, PM₁₀, SO₂ and CO have been measured over a number of years, and there have been no breaches of the NESAQ for SO₂ or CO. NO₂ and O₃ are unlikely to breach the NESAQ
- Annual average PM₁₀ concentrations in the last few years have been below the national guideline
- Daily average PM₁₀ concentrations exceeded 50 µg/m³ mainly during the coldest months, on 3 days in 2017
- The number of PM₁₀ exceedances has reduced over time from 28 to 1. A reduction in PM₁₀ emissions may still be needed to continue to meet the NESAQ of no more than three exceedances from 1 September 2016 and one exceedance from 1 September 2020
- Of the three main sources of PM₁₀ (home heating using wood and coal, industry and transport), an estimated 93% of the PM₁₀ comes from home heating on a typical winter day
 - Other contaminants, including PM_{2.5}, benzo(a) pyrene (BaP) and arsenic, are of concern
 - The annual average PM_{2.5} concentration in 2017 was 9.5 µg/m³, below the WHO guideline of 10.
 - Daily average PM_{2.5} concentrations exceeded the WHO guideline of 25 µg/m³ on 20 days during 2017
 - Home heating is the main source of PM_{2.5} and BaP in winter
 - Arsenic is emitted when treated timber is burned
 - Strategies that reduce PM₁₀ emissions from the burning of wood and coal for home heating, will lower emissions of PM_{2.5}, BaP and possibly arsenic.

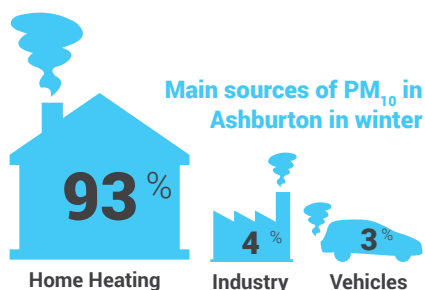
The Ashburton airshed



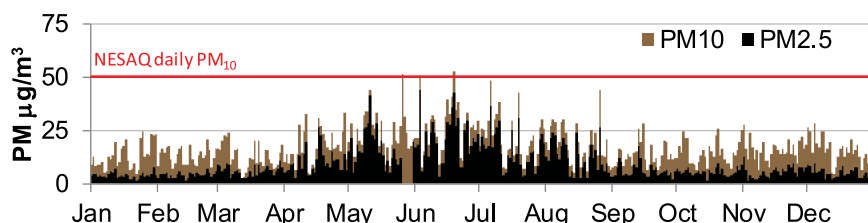
Annual average PM₁₀ and PM_{2.5} concentrations



See: lawa.org.nz/explore-data/air-quality/ to check air pollution in Ashburton in the last few hours and days. You can also find more information on Environment Canterbury's air quality page: www.ecan.govt.nz/data/air-quality-data



Daily average PM₁₀ and PM_{2.5} concentrations during 2017

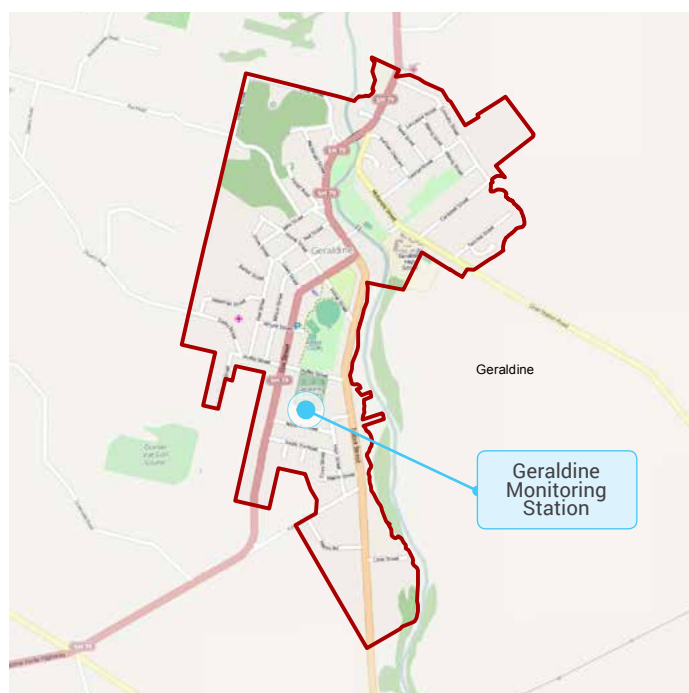


Winter 2017

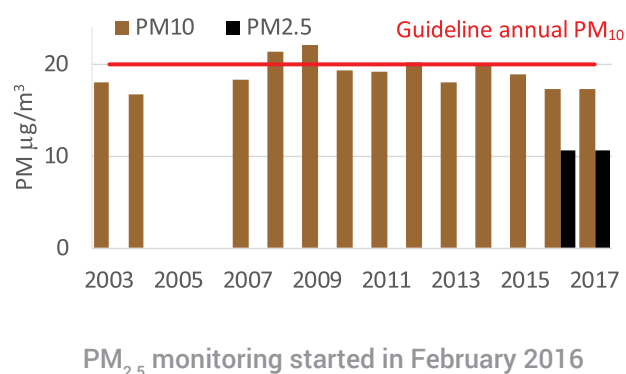
Key Points

- Air pollution can be an issue in Geraldine mainly during the coldest months
- Of the five contaminants listed in the NESAQ, PM₁₀, SO₂ and CO have been measured over a number of years. There have been no breaches of the NESAQ for SO₂ or CO. NO₂ and O₃ are unlikely to breach the NESAQ
- Annual average PM₁₀ concentrations in the last few years have been below the national guideline
- Daily average PM₁₀ concentrations exceeded 50 µg/m³ mainly during the coldest months, on 1 day in 2017
- The number of PM₁₀ exceedances each year has ranged from 8 to 0, driven mainly by winter weather. A reduction in PM₁₀ emissions may still be needed to continue to meet the NESAQ of no more than one exceedance from 1 September 2016
- Of the three main sources of PM₁₀ (home heating using wood and coal, industry and transport), an estimated 98% of the PM₁₀ comes from home heating on a typical winter day
 - Other contaminants, including PM_{2.5}, benzo(a) pyrene (BaP) and arsenic, are of concern
 - The annual average PM_{2.5} concentration in 2017 was 10.6 µg/m³, above the WHO guideline of 10.
 - Daily average PM_{2.5} concentrations exceeded the WHO guideline of 25 µg/m³ on 24 days during 2017
 - Home heating is the main source of PM_{2.5} and BaP in winter
 - Arsenic is emitted when treated timber is burned
 - Strategies that reduce PM₁₀ emissions from the burning of wood and coal for home heating, will lower emissions of PM_{2.5}, BaP and possibly arsenic.

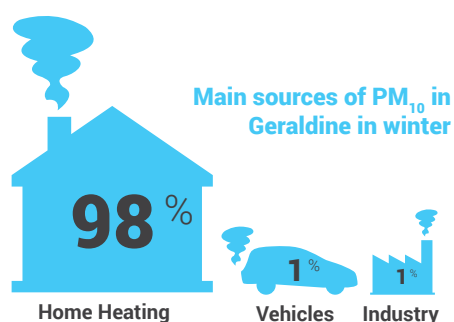
The Geraldine airshed



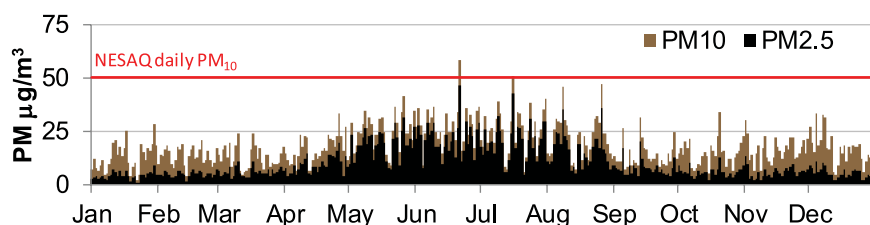
Annual average PM₁₀ and PM_{2.5} concentrations



See: lawa.org.nz/explore-data/air-quality/ to check air pollution in Geraldine in the last few hours and days. You can also find more information on Environment Canterbury's air quality page: www.ecan.govt.nz/data/air-quality-data



Daily average PM₁₀ and PM_{2.5} concentrations during 2017

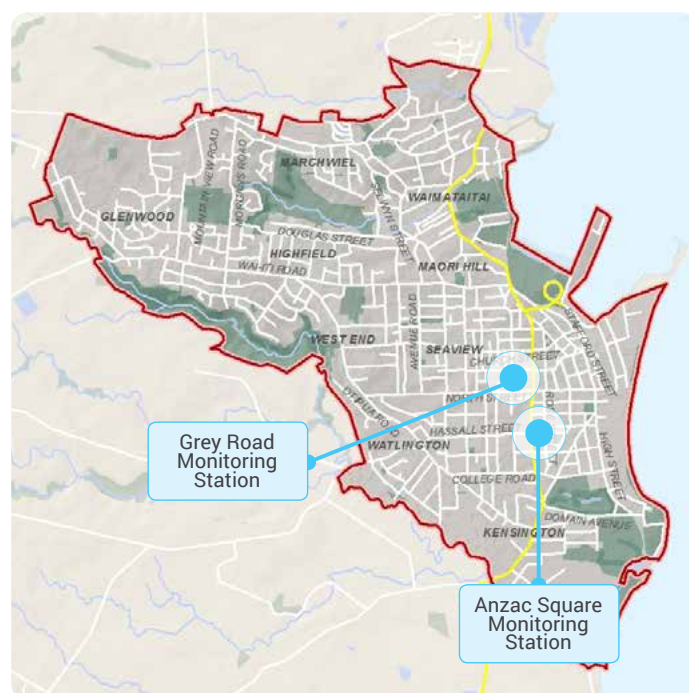


Winter 2017

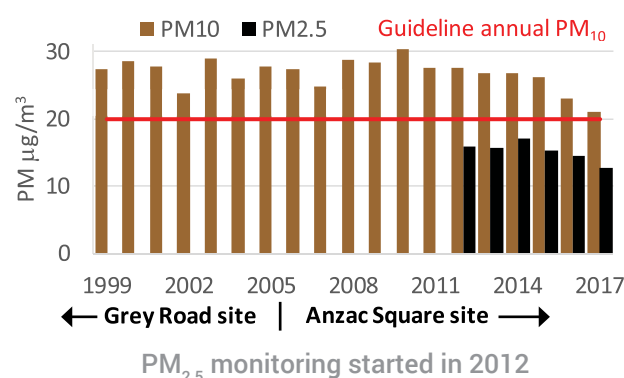
Key Points

- Air pollution can be an issue in Timaru, mainly during the coldest months
- Of the five contaminants listed in the NESAQ, PM₁₀, SO₂ and CO have been measured over a number of years. There have been no breaches of the NESAQ for SO₂ or CO. NO₂ and O₃ are unlikely to breach the NESAQ
- Annual average PM₁₀ concentrations have been above the national guideline
- Daily average PM₁₀ concentrations exceeded 50 µg/m³ mainly during the coldest months, on 17 days in 2017
- The number of PM₁₀ exceedences each year ranged from 57 to 37 at the Grey Road station up to 2005 and from 41 to 17 at the Anzac Square station since 2006. A reduction in PM₁₀ emissions is still needed to meet the NESAQ of no more than three exceedences from 1 September 2016 and one exceedence from 1 September 2020.
- Of the three main sources of PM₁₀ (home heating using wood and coal, industry and transport), an estimated 95% of the PM₁₀ comes from home heating on a typical winter day.
 - Other contaminants, including PM_{2.5}, benzo(a) pyrene (BaP) and arsenic, are of concern
 - The annual average PM_{2.5} concentration in 2017 was 12.8 µg/m³, above the WHO guideline of 10.
 - Daily average PM_{2.5} concentrations exceeded the WHO guideline of 25 µg/m³ on 49 days during 2017
 - Home heating is the main source of PM_{2.5} and BaP in winter
 - Arsenic is emitted when treated timber is burned
 - Strategies that reduce PM₁₀ emissions from the burning of wood and coal for home heating, will lower emissions of PM_{2.5}, BaP and possibly arsenic.

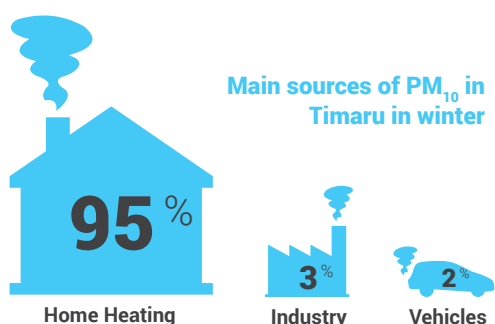
The Timaru airshed



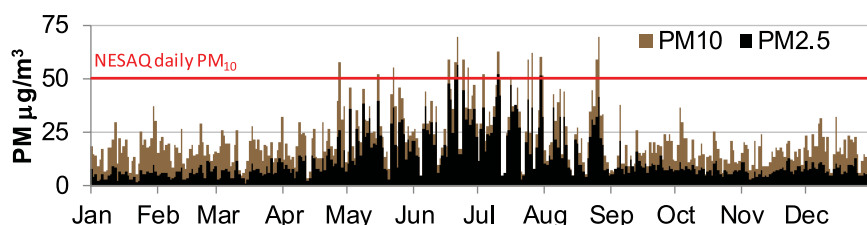
Annual average PM₁₀ and PM_{2.5} concentrations



See: lawa.org.nz/explore-data/air-quality/ to check air pollution in Timaru, in the last few hours and days. You can also find more information on Environment Canterbury's air quality page: www.ecan.govt.nz/data/air-quality-data



Daily average PM₁₀ and PM_{2.5} concentrations during 2017



Winter 2017

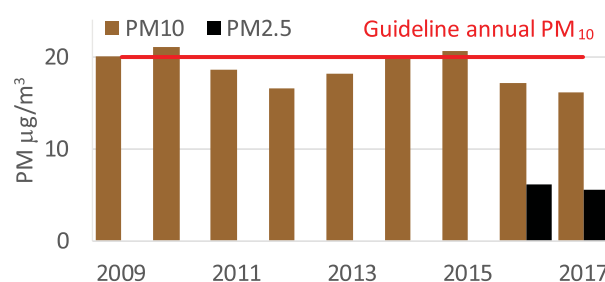
Key Points

- Air pollution can be an issue in Washdyke at any time of the year
- Of the five contaminants listed in the NESAQ, PM₁₀, SO₂ and CO have been measured over a number of years. There have been no breaches of the NESAQ for SO₂ or CO. NO₂ and O₃ are unlikely to breach the NESAQ
- Annual average PM₁₀ concentrations in the last few years have been below the national guideline
- Daily average PM₁₀ concentrations exceeded 50 µg/m³ on 1 day in 2017
- The number of PM₁₀ exceedances each year has ranged from 6 to 1. A reduction in PM₁₀ emissions may still be needed to continue to meet the NESAQ of no more than one exceedance from 1 September 2016
- Of the three main sources of PM₁₀ (home heating using wood and coal, industry and transport), an estimated 89% of the PM₁₀ comes from industry on a typical winter day
- Monitoring of fine and coarse particles since July 2015 shows that most of the PM₁₀ are larger than 2.5 µm, especially outside the winter period and indicate sources like dust, rather than combustion
- The annual average PM_{2.5} concentration in 2017 was 5.5 µg/m³, below the WHO guideline of 10
- Daily average PM_{2.5} concentrations exceeded the WHO guideline of 25 µg/m³ on one day during 2017

The Washdyke airshed

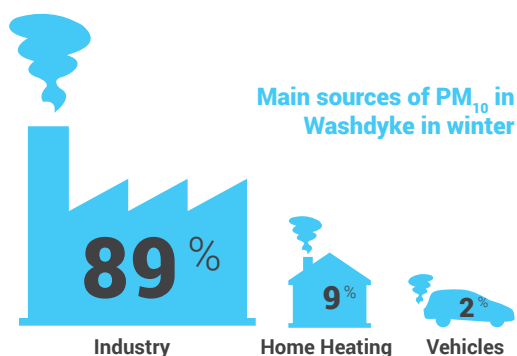


Annual average PM₁₀ and PM_{2.5} concentrations

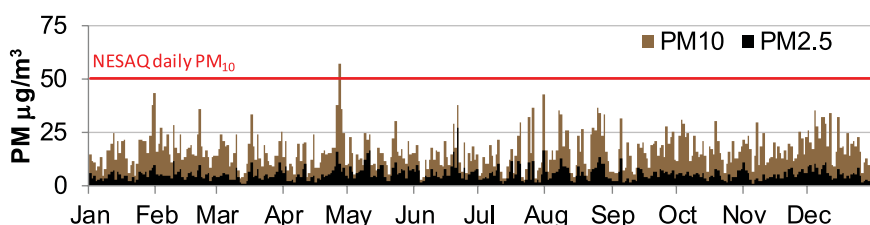


PM_{2.5} monitoring started in July 2015

See: lawa.org.nz/explore-data/air-quality/ to check air pollution in Washdyke, in the last few hours and days. You can also find more information on Environment Canterbury's air quality page: www.ecan.govt.nz/data/air-quality-data



Daily average PM₁₀ and PM_{2.5} concentrations during 2017



The Waimate airshed

