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Committee Regulatory Committee  
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## Progress report: implementation of the national environmental standard for air quality (PM<sub>10</sub>)

### 1. Purpose

To provide an update on:

- progress towards implementing the national environmental standards<sup>1</sup> for air quality (the national standard); and
- options for reductions in domestic emissions of particulate matter needed to meet the national standard in 2013 and the LTCCP target in 2016.

### 2. Background

#### 2.1 Implementation of national environmental standard for air quality

The implementation of the national air quality standard in the Wellington region is an ongoing exercise that has been the subject of three prior council reports. The most recent report (07.32) in February 2007 presented an overview of the five stages needed to implement the standard. These are:

- Stage 1 – Identify and gazette regional airsheds;
- Stage 2 – Install air quality monitoring stations in all gazetted airsheds;
- Stage 3 – Define “straight line paths” to show how at-risk airsheds will meet the standard for PM<sub>10</sub>;
- Stage 4 – Develop strategies to reduce PM<sub>10</sub> emissions in airsheds where needed; and
- Stage 5 – Monitor the effectiveness of strategies in reducing PM<sub>10</sub> emissions in airsheds.

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<sup>1</sup> Resource Management (National Environmental Standards Relating to Certain Air Pollutants, Dioxins, and Other Toxics) Regulations 2004

We have completed stage 1 and will complete stage 2 this financial year when a monitoring station is installed in the Kapiti airshed. This report looks at the development of straight line paths to meet the standard (stage 3) and discusses options that will be examined in more detail in developing strategies to reduce PM<sub>10</sub> emissions in at-risk air sheds (stage 4). Options that would be required to meet our current LTCCP are also discussed.

The development of the straight line path, emissions projections and evaluation of effectiveness of management options for reducing PM<sub>10</sub> levels was carried out by Environet Ltd<sup>2</sup> consultants.

## **2.2 What is particulate matter?**

Particulate matter, termed PM<sub>10</sub> (particles less than 10 microns (µm) in diameter) comprises airborne particles produced by combustion processes (e.g. car exhausts, domestic fires, industrial boilers) and mechanical processes that involve the crushing of minerals (e.g. quarrying) or abrasion of surfaces (e.g. sand blasting). Natural substances such as sea salt also contribute to PM<sub>10</sub> in air.

Exposure to PM<sub>10</sub> can lead to a range of adverse health outcomes in the population, ranging from restricted activity days through to illness and premature death. According to the World Health Organisation, the risk for various health outcomes has been shown to increase with exposure and there is little evidence to suggest a threshold below which no adverse health effects would occur.

There is increasing evidence that fine particulate matter (PM<sub>2.5</sub>), typically produced by combustion processes, is more harmful than particulates such as sea salt found in the coarse fraction (2.5 to 10 µm). It is likely that a national standard for PM<sub>2.5</sub> will be introduced at some future date.

## **2.3 National environmental standard for air quality and regional target**

The national standard for PM<sub>10</sub> is a daily average of 50 micrograms per cubic metre (µg/m<sup>3</sup>). This came into force on 1 September 2005. Councils are required to continuously monitor PM<sub>10</sub> in airsheds where exceedances are likely and publicly report any breaches of the standard. The standard permits one exceedance in a 12 month period to allow for unusual events such as Guy Fawkes. The purpose of the national standard is to minimise adverse health effects and create a level playing field by imposing minimum requirements for outdoor air quality to apply throughout the country.

If the national standard is not met by 2013 in an airshed, then no resource consents may be granted to industries in that airshed for discharges to air containing PM<sub>10</sub>, no matter how minor.

Prior to the establishment of the national standard, Greater Wellington had already set a target for PM<sub>10</sub> in its LTCCP. This was that PM<sub>10</sub> should not exceed 33 µg/m<sup>3</sup> (24-hour average) by 2016 - equivalent to not exceeding 66 per cent of the national air quality guideline. Despite the new national standard,

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<sup>2</sup> Wilton, E. 2008. *Management of PM<sub>10</sub> in Masterton, Upper Hutt and Wainuiomata*. Environet Ltd, Christchurch.

this is still the target that is guiding our air quality management. The superseded national guideline for PM<sub>10</sub> is the same as the national standard, but does not allow the one annual exceedance.

## **2.4 Air quality monitoring results**

The region has good air quality, especially during the summer months. However, PM<sub>10</sub> concentrations can become elevated during cold, calm periods when pollutants become trapped within valley areas. This winter the national standard for PM<sub>10</sub> was exceeded three times in Masterton due to emissions from domestic fires. Exceedances have been recorded in Wainuiomata in previous years and once in Tawa last year. A longer period of monitoring is required before a reliable assessment of air quality in Tawa can be made.

## **2.5 National woodburner standards**

All woodburners installed on a property less than two hectares in area after 1 September 2005 must meet a design standard to achieve a discharge of less than 1.5g of particulate per kg of dry wood burnt and a thermal efficiency standard not less than 65 per cent (ratio of useable heat output to energy input). Territorial authorities regulate the installation of woodburners through the Building Act 1991.

Open fires, multi-fuel heaters, pellet heaters, coal burning heaters or woodstoves designed for cooking are not regulated by the national standard.

# **3. Straight line paths to compliance with PM<sub>10</sub> standard**

## **3.1 Statutory requirements**

The national standard contains provisions applying to the granting of resource consents to industries discharging PM<sub>10</sub> (e.g. sawmills, boilers, aggregate crushing etc.). For the purposes of deciding resource consent applications before 2013 in airsheds experiencing PM<sub>10</sub> exceedances, regional councils are required to construct straight line paths (SLP). A straight line path is a projection showing a steady improvement in air quality (through reducing emissions) over time so that by 1 September 2013 the airshed will have no more than one PM<sub>10</sub> exceedance in a 12 month period.

As part of Stage 3 of our national standard implementation programme (see section 2.5) we now have emissions projection information that supports defining straight line paths for Masterton and Wainuiomata, and have confirmation that a straight line path is not needed for Upper Hutt.

## **3.2 Straight line path starting point**

Setting the appropriate starting point for the SLP is essential; other regional councils are using either the maximum or the second highest concentration recorded in their airsheds over the past five to ten years. Table 1 shows the values proposed for the Wellington region's airsheds, with the SLP starting point based on the second highest concentration (as the national standard allows for the maximum concentration to exceed 50 µg/m<sup>3</sup> on one day per year).

Although not a statutory requirement, SLPs are proposed for the more stringent LTCCP target. Because the LTCCP target doesn't allow for any exceedances, the start point is based on the maximum recorded value.

Table 1: Proposed starting points for straight line paths and LTCCP target

	Straight line path start point	LTCCP target start point
Airshed	2 <sup>nd</sup> highest concentration	Maximum concentration
Wairarapa (Masterton)	62 µg/m <sup>3</sup> (2003) adjusted TEOM	69 µg/m <sup>3</sup> (2003) adjusted TEOM
Wainuiomata	56 µg/m <sup>3</sup> (2001) high volume sampler	71 µg/m <sup>3</sup> (2006) high volume sampler
Upper Hutt	N/A	45 µg/m <sup>3</sup> (2008) FH62

A straight line path is not proposed for Upper Hutt as there have been no exceedances of the national standard at the monitoring station (since its installation in late 2005) and domestic emissions are predicted to decline. However, due to the relatively short monitoring record it is possible that the monitoring data do not capture worst-case PM<sub>10</sub> concentrations.

### 3.3 PM<sub>10</sub> emission trends and reductions required

#### 3.3.1 Emissions projections

Emission inventories to benchmark the quantities and sources of anthropogenic PM<sub>10</sub> emissions were carried out in 2006 for Upper Hutt and Wainuiomata and in 2008 for Masterton. The emission inventory results are combined with estimates of the natural sources of PM<sub>10</sub> to calculate the kg per day of PM<sub>10</sub> emitted during winter months when air quality is poorest.

Projected changes in emissions over time are modelled based on expected changes in vehicle kilometres travelled, population growth, industrial activity, and assumed wood burner conversion rates. A number of assumptions underpin the model and these are detailed in the Environet report<sup>1</sup>. Overall the projections show a decreasing trend in winter emissions (kg/day) from domestic fires due to the attrition of older, more polluting wood burners.

Figure 1 is based on the Masterton emissions inventory and shows the expected reductions in emissions from domestic fires. The daily rates of emissions equating to air quality that will meet the national standard and the LTCCP target are also indicated in this figure. The shortfall between domestic emission reductions occurring under status quo conditions and that required to meet the national standard in 2013 and the LTCCP target in 2016 is detailed in Table 2.

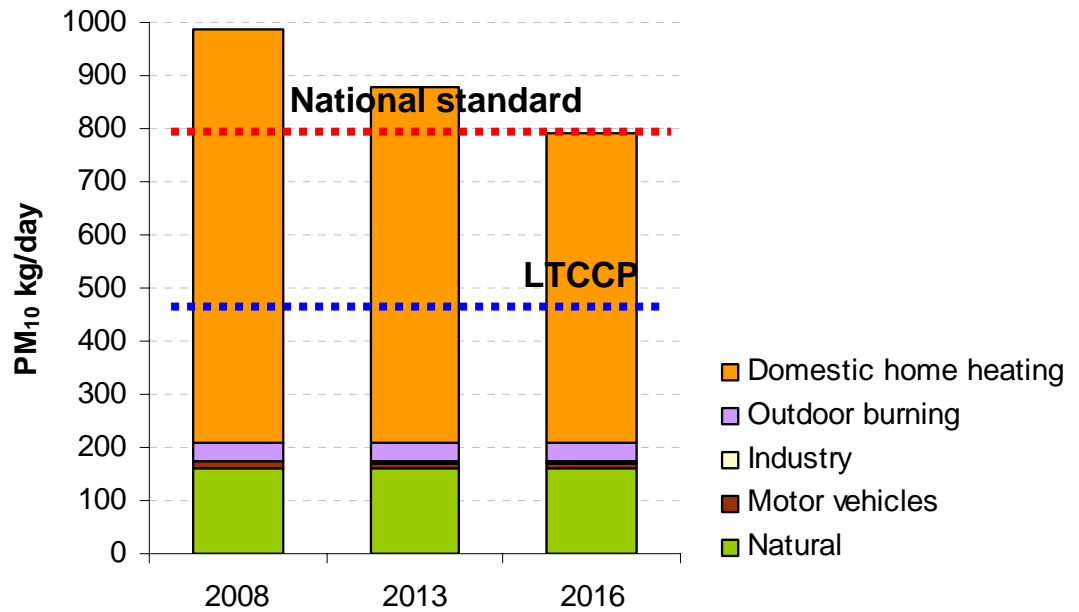


Figure 1: Status quo emission projections for Masterton compared to the national standard and LTCCP target

Table 2: Percentage reduction in domestic emissions needed in each airshed

Airshed	Household number projections (Statistics NZ)	Decrease in domestic emissions needed to meet national standard (%)	Decrease in domestic emissions needed to meet LTCCP target (%)
Wairarapa (Masterton)	Unchanged between 2008 and 2021	8 % from 2008 levels (79 kg/day)	34 % from 2008 levels (334 kg/day)
Wainuiomata	13 % increase between 2006 and 2021	None needed – predicted to meet national standard	30 % from 2006 levels (131 kg/day)
Upper Hutt	4 % decrease between 2006 and 2021	None required – predicted to meet national standard	12 % from 2006 levels (50 kg/day)

## **4. Air quality management options**

As part of Stage 4 of our national standard implementation programme (see section 2.5), we are now ready to begin developing strategies in Masterton to achieve the emission reductions needed to meet the national standard in 2013. Emission reduction strategies will also be needed in Masterton, Wainuiomata and Upper Hutt to attain the LTCCP target in 2016.

The Ministry for the Environment recommend that ‘airshed action plans’ be prepared to achieve emissions reductions to improve air quality. The airshed action plans need to be prepared in a transparent manner so that affected parties, which include the general public, are informed and able to participate. It should be noted that to maximise their effectiveness, the airshed action plans should be linked to other related community and national programmes to improve health, such as sustainable housing, warmer homes through insulation subsidies, and energy efficiency initiatives.

A number of regulatory and non regulatory options that target emissions from the domestic sector are outlined below. A number of issues will need to be considered before any option is adopted, such as the likely impact on emissions, feasibility, costs, benefits, council resources, social and economic equity, fairness and external influences (e.g. security of energy supply).

### **4.1 Regulatory options**

The regulatory options to reduce emission levels to meet the national standard and the LTCCP target are: a ‘ban’ on open fires, a ‘ban’ on outdoor burning (backyard burning), new multi-fuel burners for Masterton from 2012 onwards and mandatory replacement of solid fuel appliances 15 years and older. All regulatory options would mean changes to the Regional Air Quality Management Plan to control discharges from open fires and wood burners. The Regional Air Quality Management Plan cannot control the installation of heating device – only the discharge. The installation of new wood burners is controlled by territorial authorities through the Building Act.

#### **4.1.1 A ban on open fires**

Open fires are not only inefficient (20 per cent efficiency rating), they also contribute a higher amount of PM<sub>10</sub> per kilogram burnt compared with national standard-compliant wood burners. Emission inventories for Masterton and Wainuiomata indicate that open fires predominantly use wood over coal. However, in many cases householders would burn the two fuel types together. According to the emission inventories there are 329 open fires operating in Wainuiomata (2006) and 301 in Masterton (2008).

Some councils in the South Island have banned open fires in some of their airsheds. Environment Canterbury has banned open fires for Clean Air Zone 1 airshed (entire urban area of the city) and more recently Nelson City Council banned open fires from 1 January 2008.

A ban on open fires could have a positive effect if householders were to comply immediately and change their form of heating. However, our research shows that a ban on open fires means only 50 per cent of households will replace open fires with wood burners, with the remainder converting to electricity or gas (unflued) to heat their homes. These householders might not have the resources to replace their open fire with a wood burner and so may revert to substandard forms of heating.

#### 4.1.2 A ban on outdoor backyard burning

Backyard fires in urban areas are for the burning of vegetation or rubbish in incinerators or piles on the ground. On average about 150 kg of material is burned per backyard fire. Burnt material can be damp or of a type that produces large amounts of smoke that is not only a nuisance but adds to the overall emissions total. About 4 per cent of the total emissions in Masterton and 4 per cent in Wainuiomata can be attributed to backyard burning on a typical winter day.

Some territorial authorities in the region have moved to ban backyard burning during the summer fire season and Hutt City Council has recently banned all backyard fires. The Regional Air Quality Management Plan permits the burning of 'other materials', which includes backyard fires, provided that the smoke is not noxious, dangerous, offensive or objectionable at or beyond the property boundary. Masterton District Council and Upper Hutt City Council both allow backyard burning throughout the year.

#### 4.1.3 A ban on the use of multi-fuel burners

Multi-fuel burners can burn both wood and coal, and have similar emissions ratings as open fires. These burners tend to be more expensive than wood-only burners as the fire box contains thicker metal to withstand the higher temperature from coal burning. There are approximately 361 multi-fuel burners in Masterton and 345 in Wainuiomata, and our emission surveys reveal that householder's burn mostly wood in them. A ban on multi-fuel burners is suggested mainly because they can burn coal (and therefore able to produce more PM<sub>10</sub>) and are not covered by the national standard.

#### 4.1.4 Mandatory replacement of solid-fuel appliances 15 years and older

Emission inventories show that in 2006, 669 Wainuiomata households (11 per cent) had pre-1996 wood burners and about 1,345 Masterton households (19 per cent) had old burners. Older burners produce higher emissions and require more fuel for the same heat output compared to post-2005 burners that meet the national standard. The average useful life of a burner is around 15 years. However, in reality a reasonable proportion of households are likely to keep their woodburners for longer than 15 years. To achieve compliance with the national standard and the LTCCP target, all burners 15 years and older have to

be replaced with either new national standard-compliant burners or non-solid fuel forms of home heating (heat pumps or gas).

In summary, the regulatory options could produce an immediate result if there is 100 per cent compliance. However, householders generally take time to adjust to newer forms of home heating. In other regions, all regulatory options have been complemented with a range of incentive programmes to assist households to convert to cleaner forms of heating.

## 4.2 Non-regulatory options

Non-regulatory options include publicity and education campaigns and incentive schemes. Many councils run either publicity or incentive campaigns, or both in the case of clean heat programmes.

### 4.2.1 Publicity and education campaigns

Greater Wellington's *Be the difference* has organised internet and flier-based publicity campaigns over the winter months to inform households of the correct fuels to burn (e.g. no treated timber or painted wood) and information about insulation and the best method to operate wood burners without producing too much smoke. These campaigns have targeted Masterton, Wainuiomata, Karori, Tawa and the Kapiti Coast. It is not possible to find out how successful these campaigns have been as they have not been monitored. Any regulatory change would require some level of publicity or education to be successful.

### 4.2.2 Incentive schemes

A number of regional councils around New Zealand have some form of incentive scheme to attract householders to change their older home heating device. Generally, schemes have four main incentive options that target different groups with different levels of subsidy or assistance. Environment Canterbury's Clean Heat project, for example, provides a summary of what many councils offer:

- **Full assistance** – provided to low income households or owner occupiers who would have the greatest difficulty funding any conversion to cleaner forms of heating. Full conversion is provided to households on a Community Services Card.
- **Subsidy** – provides discounts on ceiling/underfloor insulation costs and appliance cost. Subsidies are available to those households that do not qualify for full assistance.
- **Loans** – a 10-year interest-free loan (payable over 10 years through the rating system on the householder property) offered as an alternative to the subsidy.
- **Landlord subsidy** – provided to encourage landlords to participate by offering a higher level of subsidy.



The Clean Heat Project has the principal objective of providing cleaner air, but also considers options that make a better use of home heating energy. Therefore, it is a requirement that energy efficient measures are installed as part of the project. The project works by a trained independent assessor determining the eligibility of each participant and agreeing with the householder on the technology that is to be installed. The heating choices available to the householder are based on objective information covering the capital costs and efficiencies of each option.

The Clean Heat Project is a good model which shows how multiple objectives of clean air and warm homes can be integrated through a single package. However, there are equity issues with the scheme; over 70 per cent of rate payers derive no direct benefit from their contributions because they are currently ineligible under the conditions of the scheme (even though within this group there are many households facing financial difficulties).

#### **4.3 Other agency schemes**

Central government agencies also fund subsidies and loans to householders for improvements to home heating. The 'energywise' scheme from the Energy Efficiency and Conservation Authority (EECA) is similar to the Clean Heat Project, with assistance given to homeowners on a Community Service Card and subsidies and loans available depending upon the age of the house and current form of insulation. The energywise scheme works through approved operators and, in the Wellington region, this is the Sustainability Trust. The Trust works mostly in Wellington city and Porirua city providing advice and subsidies on insulation and cleaner forms of heating.

More recently, Housing New Zealand has begun a home heating programme for homes built prior to 1977. The programme aims to make homes more energy efficient and healthier, and to lower power bills.

### **5. Relative effectiveness of management options**

The various options outlined in section 4 of this report differ in their relative effectiveness in reducing PM<sub>10</sub> emissions. To meet the national standard in 2013 and the LTCCP target in 2016, the following options have been examined for Masterton:

**Option A** Do nothing. Assumes all woodburners are replaced 20 years after their installation with low emission models.

**Option B** Mandatory replacement of all woodburners 15 years after their installation with low emission models (1345 appliances replaced with low emission models by 2013). Note some of these appliances will be phased out voluntarily as woodburners approach or reach the end of their useful life.

**Option C** No outdoor burning. Prohibit the use of open fires (301 open fires no longer used with half replaced by low emission woodburners) and no new multi-fuel burner installations from 2012.

**Option D** a) Incentives introduced in 2010 to replace half of all woodburners (aged 20 years and older) with clean heat alternatives (381 appliances replaced by zero emission options between 2010 and 2013 and 229 appliances replaced between 2014 and 2016) and no outdoor burning and open fires from 2012, or

b) Incentives introduced in 2010 to replace half of all woodburners (aged 15 years and older) with clean heat alternatives (748 appliances replaced by zero emission options between 2010 and 2013 and 573 appliances replaced between 2014 and 2016) and no outdoor burning and open fires from 2012.

Figure 2 shows the relative impact of these selected management options on Masterton’s emissions. The national standard could be met by any of the above options. It is possible that the LTCCP target could also be met by Option D(b). Table 3 shows possible management options for all the airsheds.

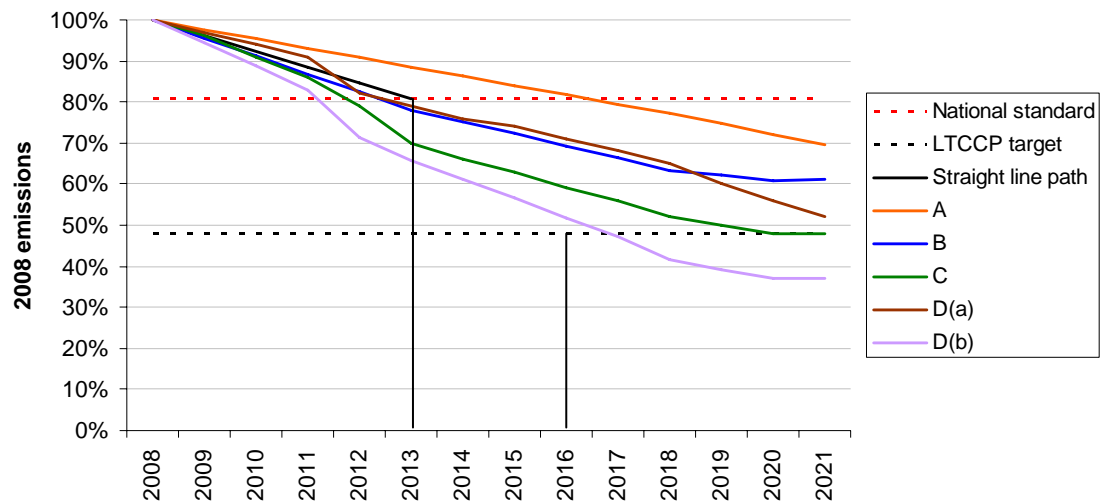


Figure 2: Masterton: relative effectiveness of proposed management options in attaining the national standard in 2013 and the LTCCP target in 2016

Table 3: Summary of management options to reduce emissions in airsheds

Airshed	National standard 2013	LTCCP 2016
<b>Wairarapa (Masterton)</b>	<p>Mandatory replacement of all woodburners aged 15 years and over with low emission models (Option B)</p> <p><b>or</b></p> <p>No open fires, no outdoor burning and no new multi-fuel burner installations after 2012 (Option C)</p> <p><b>or</b></p> <p>convert half of all woodburners aged 20 years and over to clean heat alternatives in conjunction with no open fires and outdoor burning (Option D(a))</p> <p><b>or</b></p> <p>convert half of all woodburners aged 15 years and over to clean heat alternatives in conjunction with no open fires and outdoor burning (Option D(b))</p>	<p>No open fires, no outdoor burning and no new multi-fuel burner installations after 2012 (Option C)</p> <p><b>and</b></p> <p>convert half of all woodburners aged 15 years and over to clean heat alternatives (Option D(b)).</p>
<b>Wainuiomata</b>	No action required	<p>No open fires and no outdoor burning after 2012 and no new multi-fuel installations from 2010</p> <p><b>and</b></p> <p>convert half of all woodburners aged 15 years and over to clean heat alternatives.</p>
<b>Upper Hutt</b>	No action required	<p>Mandatory replacement of all woodburners aged 15 years and over with low emission models (Option B).</p> <p><b>or</b></p> <p>No outdoor burning from 2012</p> <p><b>or</b></p> <p>Convert a quarter of all woodburners aged 15 years and over to clean heat alternatives.</p>

## 6. Regional target

Greater Wellington's LTCCP target was set before the national standard came into force and, as noted in section 2.2, was based on applying the 'acceptable' air quality category to the national ambient air guideline. This target is more stringent and will therefore provide a greater level of health protection than the national standard.

While we are required to give effect to the national standard, the question arises as to whether Greater Wellington should also retain the current LTCCP target, or whether the national standard gives a sufficient level of health protection and the LTCCP target can be dropped.

If the existing target is considered to be more appropriate, then there needs to be consideration as to whether the existing target date of 2016 should remain or whether this could be extended to 2019 (the end of the upcoming LTCCP period). An extension of the target date would allow more time for the target to be reached as a consequence of interventions designed to meet the national standard without needing additional interventions.

The Committee's views on the LTCCP target are sought to assist the upcoming LTCCP review process in preparation for setting the 2009/10 to 2019 plan.

## 7. Recommendation

*It is recommended that the Committee:*

1. **Receives** the report;
2. **Approves** the proposed straight line path starting points of  $62 \mu\text{g}/\text{m}^3$  for the Wairarapa airshed and of  $56 \mu\text{g}/\text{m}^3$  for the Wainuiomata airshed;
3. **Notes** that an action plan will be developed for the Wairarapa airshed with the objective of achieving the emissions reductions needed to attain the national standard by 2013; and
4. **Notes** that a review will be undertaken of the LTCCP target for particulate matter for the 2009 to 2019 period.

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