

STAFF REPORT

TO: Environment & Planning Committee

FROM: Trevor James, Resource Scientist

REFERENCE: C301

SUBJECT: **AIR QUALITY IN RICHMOND - AN UPDATE 2009 - REPORT EP09/10/05** - Report prepared for meeting of 8 October 2009

1. INTRODUCTION

The purpose of this report is to present results for air quality monitoring for the 2009 year to date and compare these results to previous years.

The continuous particulate monitor in Richmond Central (the BAM) continues to perform well with only two days in the year with more than 30 minutes of lost record and this was due to the need to shut down during calibration routines. No new sites were investigated as the Partisol particulate monitor was used in a QA/QC function at Richmond central site.

The compliance monitoring programme relating to the use of small scale solid fuel burning appliances within the Richmond Airshed (Rule 36.3.16B of the Tasman Resource Management Plan) has not been running due to loss of the staff member responsible. This rule prohibits the discharge of contaminant from non authorised solid fuel burning appliances, if the subject property has undergone a transfer of ownership since 13 January 2007. It is hoped that this work will resume later in 2009.

2. BACKGROUND

The overall aim of the Tasman District 'State of the Environment' air quality monitoring programme is to determine the condition of ambient air for the purpose of understanding potential effects on human health. More specifically, the programme aims to determine the concentration of fine particulate (PM₁₀) and determine trends over time. At present we are not in a position to report trends with any confidence as specialists advise us that we will only have sufficient record to undertake trend analysis after another year's worth of data.

The Richmond air emission inventory shows 84% of PM₁₀ is caused by domestic home-heating appliances. Diurnal patterns of PM₁₀ concentration measured in Richmond Central are typical of those in an air-shed dominated by wood smoke with peak PM₁₀ concentrations occurring in the evening (from 7.00 pm to 1.00 am) and morning (a smaller peak about 9.00 am) and very low concentrations from late morning to late afternoon. The evening peak is most-often double-crested with the first peak at about 7.00 - 8.00 pm with the second peak (usually the highest) occurring at about 10.00 pm when people go to bed and damp down the fire.

Rules requiring upgrading of domestic wood burners at the point of property sale came into effect in January 2007. All owners of houses with a wood burner who have bought from this date to the present have been visited to ensure compliance. No combustion burners other than pellet fires can be installed in Richmond in new houses or existing houses without burners although existing householders are able to upgrade their existing burner to one of the complying burners as listed on the MfE site (www.mfe.govt.nz)

3. “STATE OF THE ENVIRONMENT” AIR QUALITY MONITORING

3.1 Methods

24-hour average PM₁₀ concentrations above 50 µg/m³ are termed “exceedences” under the National Environmental Standard. Data above 50.5 µg/m³ was rounded up, but data less than this number was not considered an exceedence. As for previous years the BAM data has been adjusted upwards by approximately 16% upon the recommendation of Wilton 2007. The difference between the BAM and Partisol was on average very similar this winter, although there is still reasonable variability in this relationship.

3.2 Update for Richmond Central

At the Richmond Central site there were 21 measured exceedences of the standard for 24-hour average PM₁₀ this last winter (see Figure 1 and 2).

Figure 1 shows a plot of 24-hour average PM₁₀ for the year to date. The highest recorded maximum concentration (79 µg/m³) this winter was on 19 June (by coincidence this is the same maxima as 2008).

The mean PM₁₀ 24-hour average for days when there was an exceedence was the same as last year (see Figure 3). This analysis includes only those days when there was an exceedence. These days are generally amongst the coldest and most calm of the winter period. While there were more 24-hour concentrations above 70 µg/m³ than last year, there appears to be a general trend towards lower maxima (see Figure 3). Another way of representing the data is shown in Appendix Three where data is grouped into the following categories: good, acceptable, alert and exceeding the NES limit.

Like the previous two winters, the number of exceedences was well down on totals for previous years. However, unlike the last two winters this winter was much colder with May and June being the coldest in 25 years. May 2009 was the first time that the month of May had the highest median PM₁₀ concentration (see Appendix One).

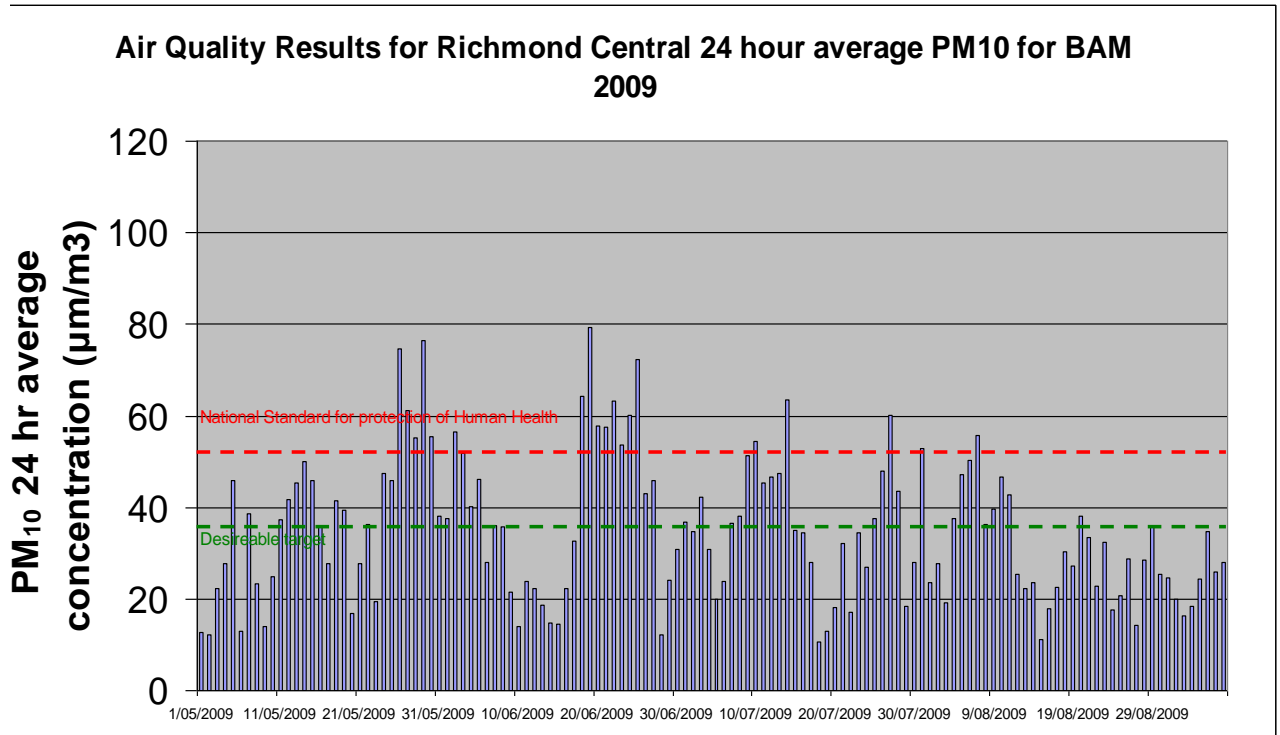


Figure 1: PM₁₀ 24-hour Average for Richmond Central

The total number of days when the PM₁₀ 24-hour standard was breached was significantly lower for the last three winters than any previous winter of monitoring (see Figure 2).

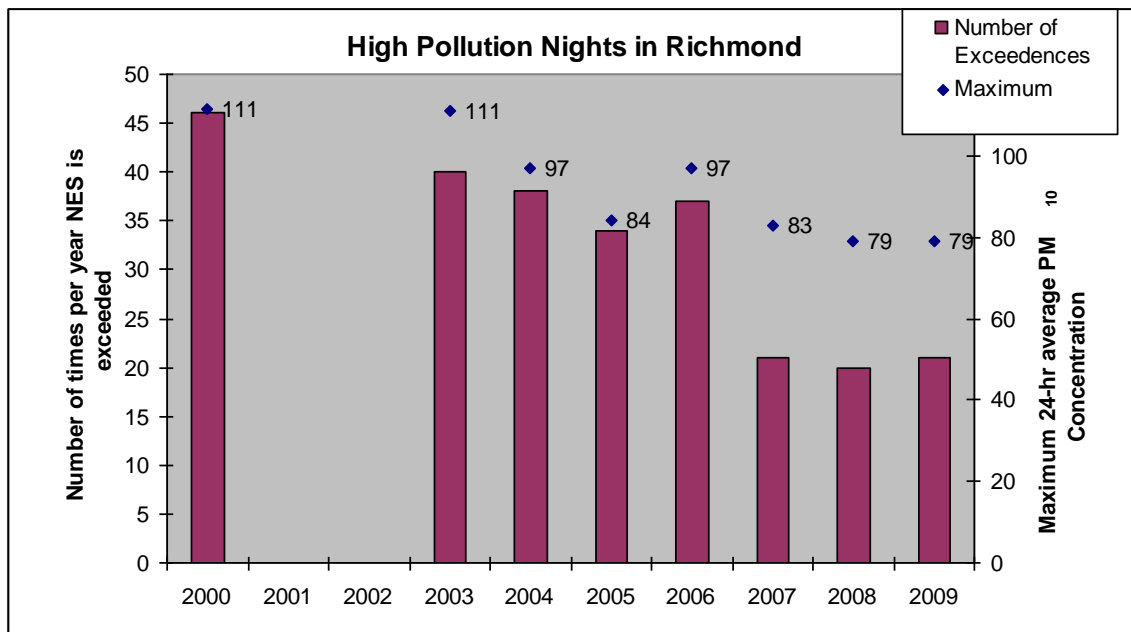


Figure 2: Total number of days per year that the NES was exceeded

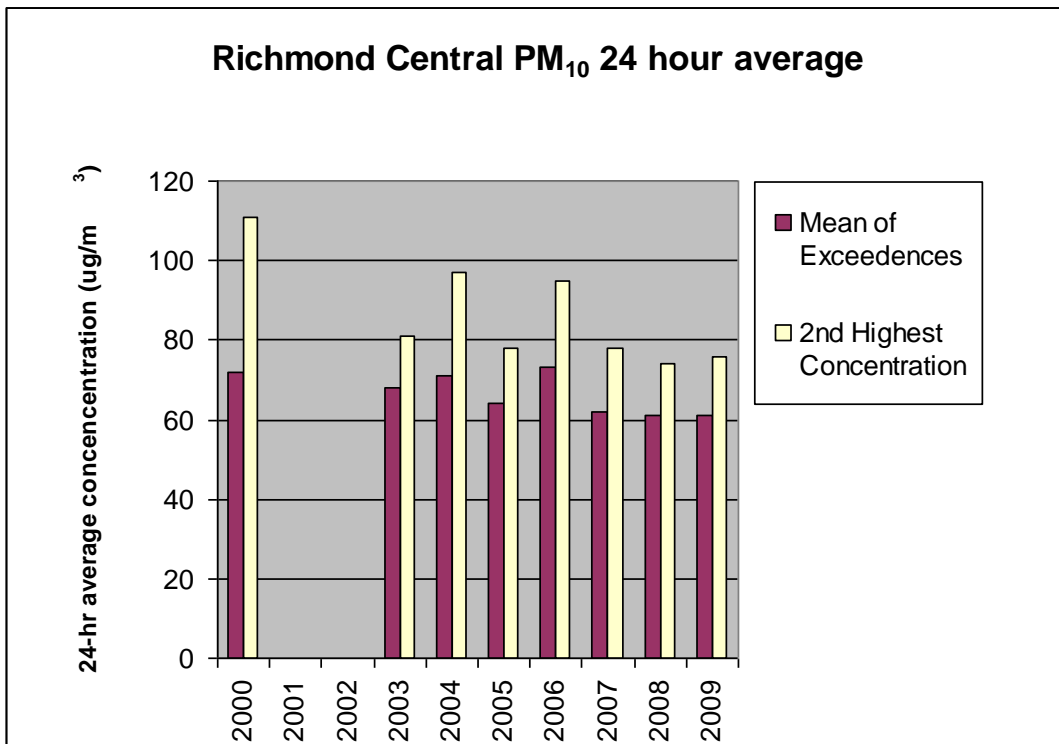


Figure 3: Annual mean of days when there was an exceedence (red) and second-highest concentration (yellow). The second-highest value is used because one exceedence is allowed under the NES rules.

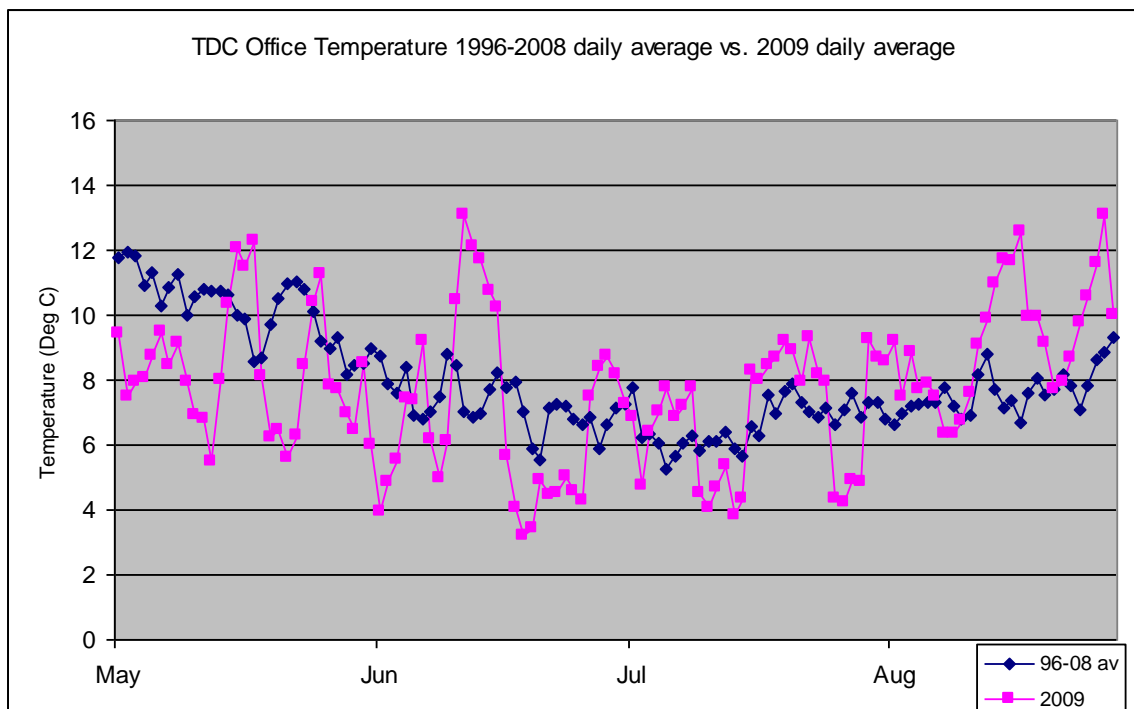


Figure 4 Daily Average Temperatures for 2009 (Pink) Compared To Long-term Average Daily Temperatures (Blue)

Nelson's St Vincent Street site recorded 29 exceedences which is up 20% on last year. The Tahunanui site recorded six exceedences and was down 40% on last year. Christchurch's St Albans site had 12 exceedences.

With respect to annual average for the 24-hour average concentrations over the seven years of record, there appears to be a slight downward trend (see Figure 5). While annual averages are not part of the national standard for assessing PM₁₀ condition, the Ministry for the Environment provides a guideline for annual average PM₁₀ at 20 µg/m³.

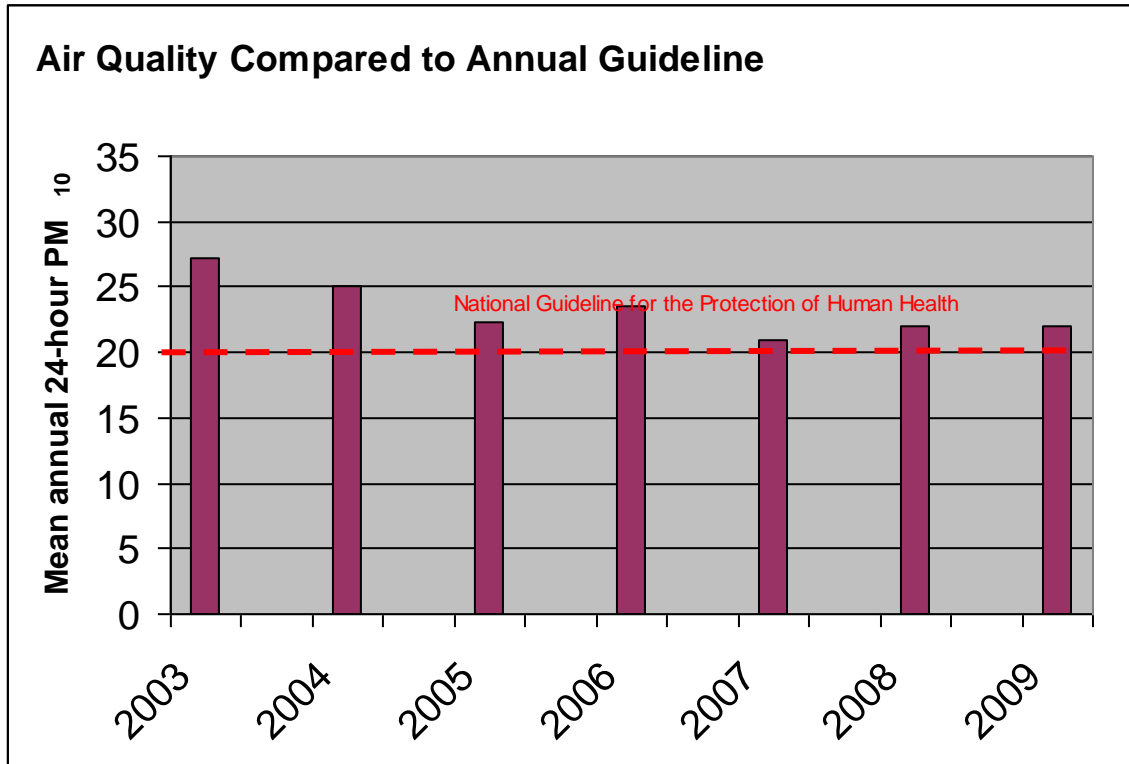


Figure 5 Year-round daily average PM₁₀ concentration

3.3 Deviations from the National Standard Straight Line Path for Richmond

In September 2005 the National Environmental Standard (NES) for air quality was introduced. This sets out a path for compliance with the standard by 2013. Any of the second-highest 24-hour average PM₁₀ results above this line after 2005 must be highlighted. The second-highest value is plotted in respect of this standard because the NES allows for one breach each year. For the Richmond Central site all results were below the straight line path (see Figure 8).

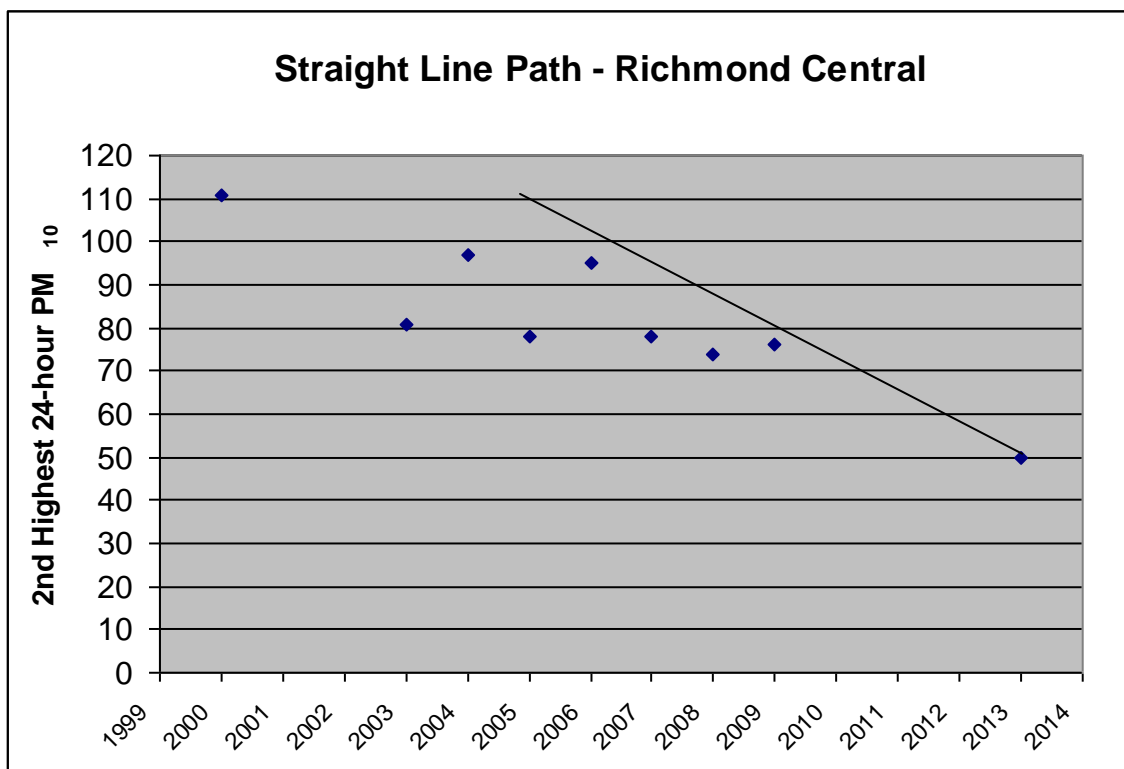


Figure 6 Maximum 24-hour concentrations as plotted on the straight line path set down by the NES (based on second-highest concentration)

3.4 Further Monitoring and Analysis

The following initiatives are planned:

1. This financial year we will contract out a project (soon to go to tender) to undertake three-dimensional air dispersion modelling. This is a joint project with Nelson City Council. The model will provide information which will enable more targeted and effective policies and methods to protect people's health and comply with the air quality National Environmental Standard (NES). More specifically this information will be critical for staff to do the following:
 - A. Consider controls on emissions specific to certain sub-airsheds. A cross-check on our emissions inventory will give us more confidence to target specific sources.
 - B. Consider review of location of current monitoring sites (both compliance and 'State of the Environment' Monitoring).
 - C. Consider review the appropriateness of current airshed boundaries
 - D. Consider review of methods to achieve the NES - the models will forecast particulate matter out to 2013 when we must be compliant with the NES. If the forecast says we will not meet the NES then we may have to consider further options.
 - E. Provide applicants of resource consents for discharge to air with a standard and high quality meteorology model which can be used to model the effects of their emissions.

- F. "State of the Environment" reporting
 - G. Better coordinate management of the issue across the Council borders (Tasman District Council and Nelson City Council boundary runs right through an airshed)
2. Undertake trend analysis in 2010 using four years of continuous monitoring data (project underway with NIWA & Environet Ltd).
 3. Measure PM_{2.5} using the Partisol monitor at the central Richmond alongside the continuous PM₁₀ monitor (the BAM) to determine ratio of these fine particle size classes. It has been found that the PM_{2.5} fraction is the more significant fraction for human health, even though the national standard is PM₁₀.

4. COUNCIL RESPONSE TO IMPROVE AIR QUALITY

4.1 Summary Of The Level Of Compliance With Respect To Wood Burners

Information from the Air Quality Monitoring database was utilised in order to undertake a programme of door knocking and telephone interviews during the period June 2008 to March 2009. The following information was gathered by Compliance Officers for each property that had registered a change of ownership since the rule came into effect:

- Presence of a chimney stack;
- The primary heat source for the dwelling;
- Make and model of the solid fuel burning appliance (if applicable);
- Compliance pursuant to rule 36.3.16B (if determined on site/phone; see Table 1);

Of all the burners subject to this rule with compliance status known (274), about 65% were found to be non-complying and 22.6% have replaced their burner with a complying one (see Table 1).

Table 1a: Results of all compliance monitoring to date (Jan 2007 – March 2009) with respect to Rule 36.3.16B.

| Number of properties investigated | Number of Authorised wood burners | Wood burners replaced with 'Clean Heat' alternative | Number of confirmed non-compliant wood burners | Properties not subject to the rule: |
|-----------------------------------|-----------------------------------|---|--|-------------------------------------|
| 822 | 34 | 62 (approx) | 178 | 476 |

Table 1b: Results of compliance monitoring with respect to Rule 36.3.16B in the period since the last report (i.e. transfers of ownership between 1 July 2008 – 30 March 2009).

| Number of properties investigated | Number of Authorised wood burners | Wood burners replaced with 'Clean Heat' alternative | Number of confirmed non-compliant wood burners | Properties not subject to the rule | Unknown Outcome at present [#] |
|-----------------------------------|-----------------------------------|---|--|------------------------------------|---|
| 272 | 12 | 2 (confirmed) | 114* (sent correspondence) | 72 | 72 |

Note:

* Of those 114 sent correspondence regarding a non-compliant wood burner, the program is currently incomplete to confirm how many have been replaced.

The unknown outcome column represents those properties that were sold and added to the program but need further investigation.

In addition to this, the results from the survey have shown a large number of dwellings have converted the primary heat source from solid fuel burners, to a 'clean heat' source such as a heat pump or gas fire. This information is not currently held on the Council property files, as a Building Consent is not required to undertake this work. The number of properties that had applied for a building consent to install an authorised wood burner was low when compared to the number of houses that have installed a heat pump or gas fire.

5. CONCLUSION

Air quality in Richmond for the last winter continued to exceed national standards to a similar degree as for the last two years and is a great improvement years prior to that. The 24-hour average standard for PM₁₀ was exceeded 21 times. This result is also just below the straight-line path required under the NES. While robust trend analysis has not been undertaken, it would appear that air quality has improved given the relatively cold winter and a total number of exceedences has not risen well above the last two years. Any statistically valid trends in PM₁₀ (number of exceedences or other statistic) will be able to be confirmed later this financial year. The annual average exceeded guidelines but by only a small amount, again a similar result to the last two years.

The promulgation of Rule 36.3.16B of the TRMP in January 2007 has initiated a compliance programme. Almost a quarter of solid fuel burning appliances subject to this rule have been replaced with a compliant burner, with about two-thirds not complying and that will need replacement. Further monitoring of the airshed will indicate whether this is an effective method of achieving better air quality in Richmond according to the requirements of the National Environmental Standards for Air Quality.

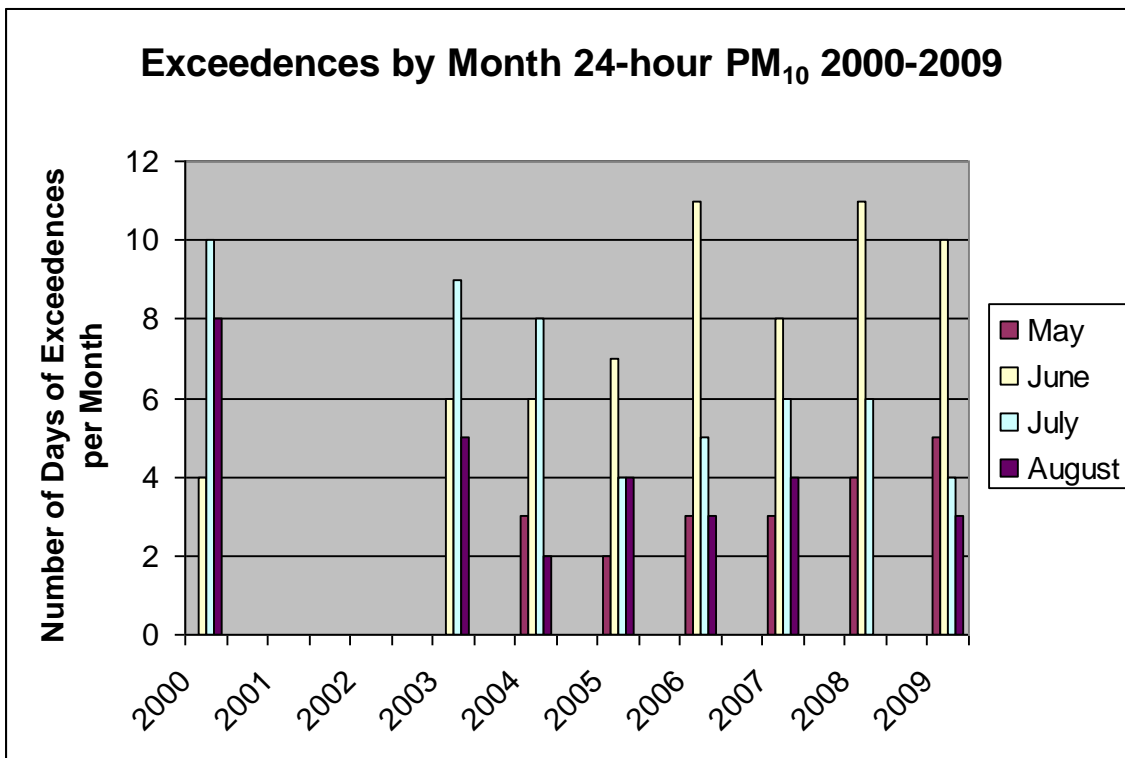
6. RECOMMENDATION

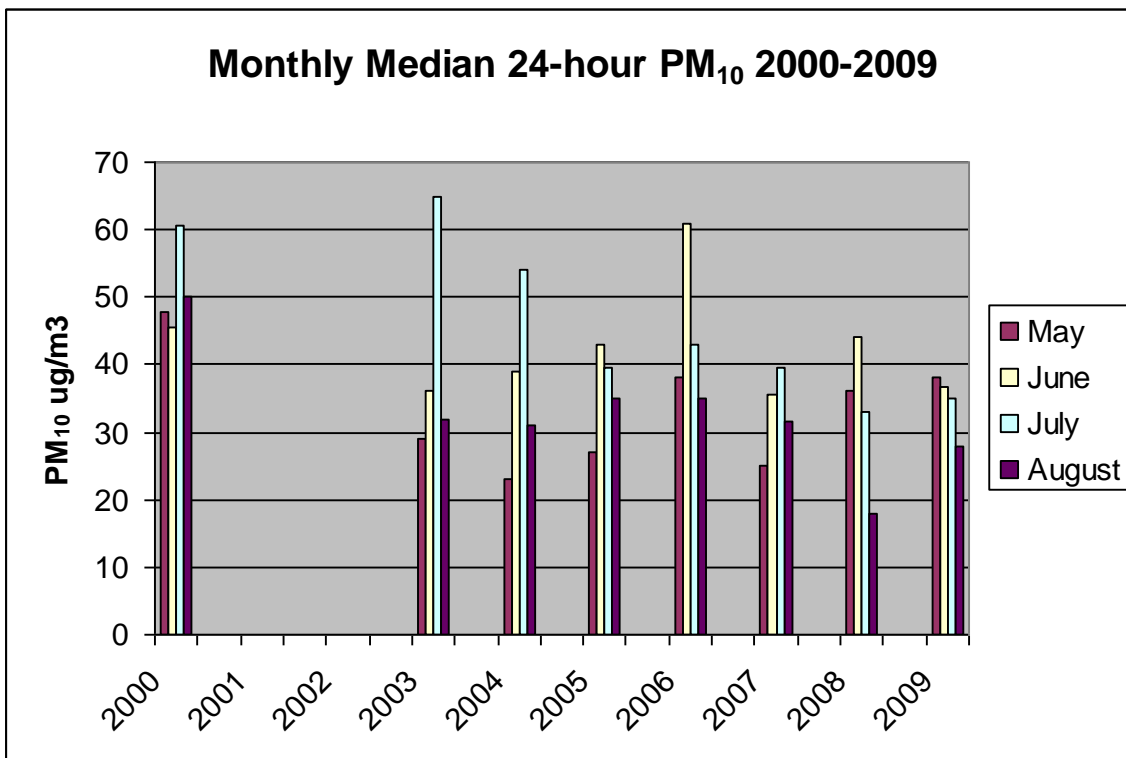
The Committee receives this report.

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APPENDIX 1

Winter Monthly Variation in PM₁₀.
Total number of exceedences of the Air Quality NES by month





APPENDIX 3

Ministry for the Environment Indicator Categories Comparing to the National Environmental Standard for Air Quality (NES)

