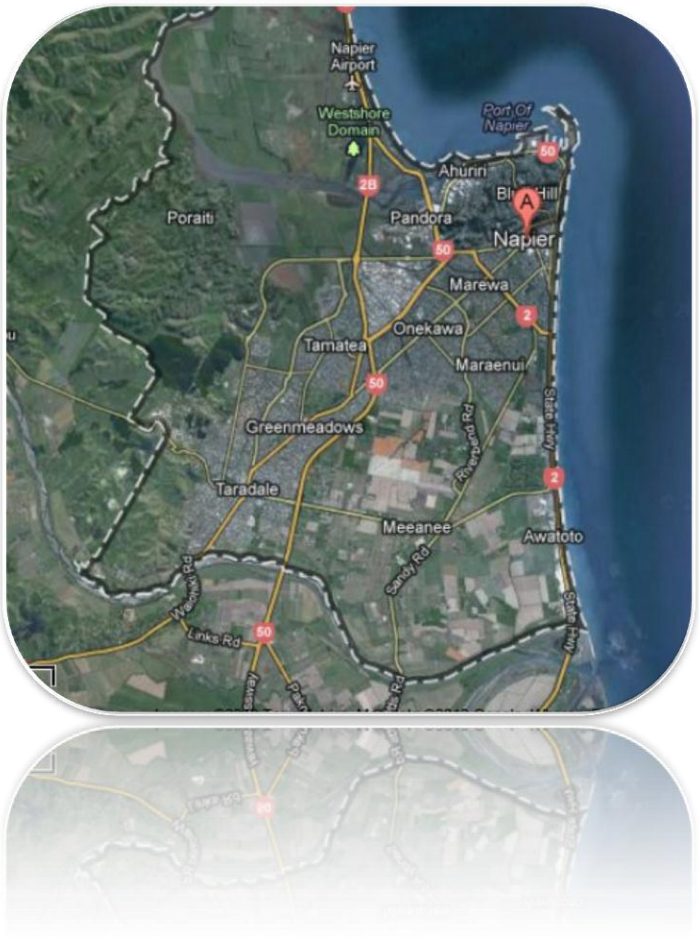

Airshed Action Plan for Napier

Hawke's Bay Regional Council

Prepared by Emily Wilton, Environet Limited — www.environet.co.nz

Executive Summary

In Napier concentrations of PM10 exceed National Environmental Standards (50 µg m-3, 24-hour average, one allowable exceedence per year) on most years during the winter months.

The main source of PM_{10} in Napier is solid fuel burning for domestic home heating. This source contributes around 92% of the 2010 anthropogenic PM_{10} emissions. Airshed dispersion modelling indicates that the highest PM_{10} concentrations in Napier are likely to occur in Pirimai approximately two kilometres from the Marewa air quality monitoring site. A 47% reduction in 2010 domestic home heating emissions is required to achieve compliance with the NES.

The Hawke's Bay Regional Council has introduced management measures to reduce PM_{10} concentrations in Napier to meet the NES by 2016. The Resource Regional Management Plan Change 2 – Air Quality Plan includes a prohibition on domestic outdoor rubbish burning, the use of open fires (from 2012), staged burner phase outs (2014 – 2020) and emission limits for new installations of solid fuel burners.

These measures have been effective in reducing PM_{10} concentrations with 2012 data confirming reductions have occurred. A good correlation between measured PM_{10} concentrations (adjusted for variability in meteorological conditions) and projected improvements associated with air plan measures is observed. If this correlation continues Napier should be on target to achieve compliance with the NES by 2016.

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Air quality in Napier

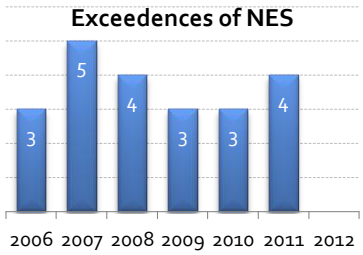
The main air contaminant of concern in Napier is PM_{10} (particles in the air less than 10 microns in diameter). Air quality monitoring for PM_{10} in Napier commenced in 1998. The monitoring was initially at Nelson Park using a gravimetric method and collecting one sample every six days. Since 2005 PM_{10} concentrations have been measured continuously (every day) at Marewa Park using a beta attenuation monitor (BAM). The BAM method is an allowed method under the National Environmental Standards (NES).

The Napier Airshed has been gazetted under the NES because it is non-complying with the NES for PM_{10}. The NES for PM_{10} is set at 50 µg m^{-3} (24-hour average) with one allowable exceedence per year.

Exceedences of the NES in Napier

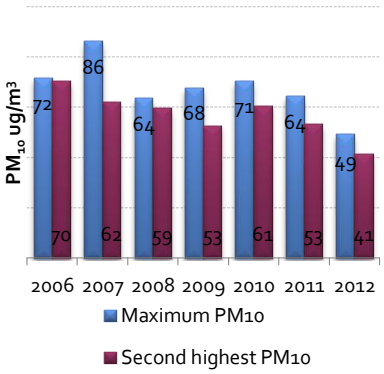
Concentrations of PM_{10} in Napier typically exceed the National Environmental Standard for PM_{10} of 50 µg m^{-3} (24-hour average, one allowable exceedence per year) during the winter months. Typically in Napier there are between three and five exceedences of 50 µg m^{-3} per year. However, in 2012 no exceedences of 50 µg m^{-3} were measured.

Napier has until 2016 to comply with the NES for PM_{10}.



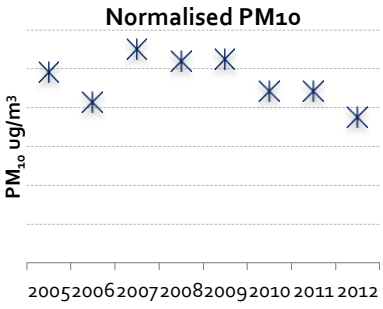
PM_{10} concentrations in Napier

The magnitude of PM_{10} concentrations are important in deriving an action plan to reduce PM_{10} because they influence the amount of reduction required to achieve compliance. The second highest concentration is an important indicator of the magnitude of reduction required because the NES allows one exceedence of 50 µg m^{-3} per year. In Napier the largest second highest PM_{10} concentration was 70 µg m^{-3} and was measured in 2006. Airshed modeling of PM_{10} concentrations has also been used to refine the assessment of reductions in PM_{10} required for Napier (see over).



Trends in PM_{10} concentrations in Napier

Year to year variations in PM_{10} concentrations are influenced by variations in meteorological conditions, making trends assessments difficult. An assessment of trends in PM_{10} concentrations in Napier, using statistical techniques to minimise for the impact of meteorological conditions has been carried out for Napier (Wilton, 2011) and was updated with 2012 data for this report. The graph to the right shows normalised PM_{10} concentrations from 2006 to 2012 after adjusting for the impact of meteorological conditions. This suggests PM_{10} concentrations have decreased since 2007.



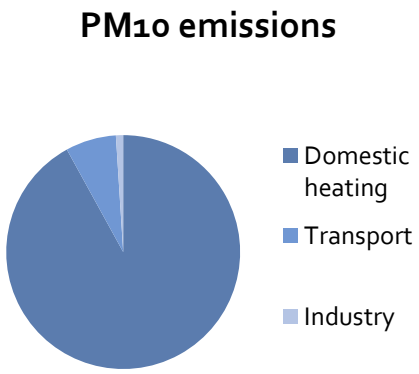
Managing air quality in Napier

The Hawke's Bay Regional Council has carried out numerous scientific studies of air quality in Napier to determine the most effective methods of managing PM10 concentrations. Sources of PM10 have been identified using an emission inventory and a source apportionment study was conducted to confirm sources and to evaluate the contributions of natural sources such as sea spray and dusts to measured PM10 concentrations. Airshed modeling has provided insight into spatial variability in PM10 concentrations, potential airshed interactions and the likely contributions of different emissions sources to high PM10 concentrations. The impact of different management measures on PM10 concentrations has been estimated using a projections model and the results have been validated using airshed dispersion modeling

Sources of PM_{10} in Napier

A 2010 emission inventory indicates that solid fuel burning for domestic home heating contributes around 92% of the winter time PM_{10} emissions. Transport including motor vehicles, shipping and aviation were estimated to contribute 6% and industry (excluding Awatoto) was found to contribute 2%. Outdoor burning was excluded from the assessment as a result of regulations in force at the time the inventory was carried out.

Around 10800 households in Napier use solid fuel for domestic heating.



Reductions required in PM_{10} to meet the NES

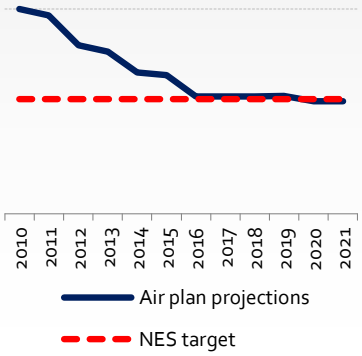
The reductions required in PM_{10} concentrations in Napier had been assessed at around 47% of 2006 concentrations using dispersion modeling of worst case meteorological conditions (Gimson, 2006). This modeling has been updated using 2010 emissions. This showed the highest PM_{10} concentration in Napier was likely to be around 89 $\mu g\ m^{-3}$ and was likely to occur in Pirimai approximately two kilometers from the Marewa monitoring site (Gimson, 2012). The overall reduction in PM_{10} required to meet the NES based on this concentration is 44%. This can be achieved by reducing domestic heating emissions by 47% (Gimson, 2012).

SOURCE CONTRIBUTIONS TO MAXIMUM PM_{10} CONCENTRATIONS - 2010

	Emission Inventory	Modeled - worst case
DOMESTIC HEATING	92	93
TRANSPORT	7	<2
INDUSTRY	1	<2
NATURAL SOURCES	n/a	4

KEY TECHNICAL REPORTS

- **AIR QUALITY MONITORING**
  Assessment of trends in concentrations and method for normalizing (Wilton, 2011).
- **AIR EMISSION INVENTORIES AND SOURCE APPORTIONMENT**
  Source evaluations include emission inventories in 2005 & 2010 (Wilton & Baynes, 2010) and a source apportionment study (Wilton, Zawar Reza, & Baynes, 2010)
- **AIRSHED METEOROLOGY AND MODELLING**
  Reports on airshed modeling reports (Gimson, 2006), (Gimson, 2009), (Gimson, 2012).
- **AIR QUALITY MANAGEMENT**
  Method and options documented (Wilton, 2007) and updated in 2012 (Wilton, 2012). Air plan measures are predicted to result in compliance with the NES by 2016.



Impact of regulatory measures in Napier

Air Plan – Regulatory measures to reduce PM10

Measures to reduce PM_{10} concentrations in Napier were included in the Resource Regional Management Plan Change 2 – Air Quality Plan (operative 1 January 2012). In addition to the regulatory methods outlined in the table below non-regulatory methods such as education and communication, the introduction of a "dry wood scheme" and "Heat Smart" programme to assist with the conversion to clean heat have also been introduced.

REGULATORY MEASURES TO REDUCE PM10 IN NAPIER

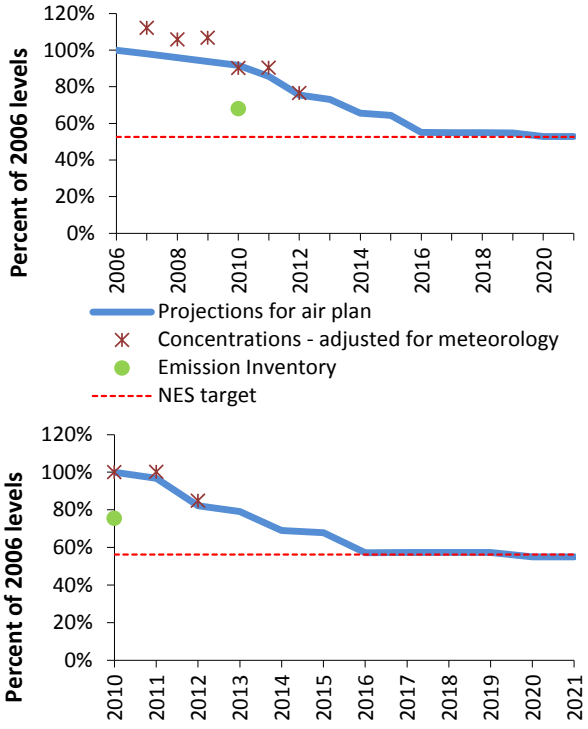
RULE	YEAR	COMMENTS
PROHIBIT DOMESTIC OUTDOOR BURNING	2010	Likely to contribute to reduced post 2010 data
PHASE OUT OPEN FIRES	2012	Likely to contribute to the reduced 2012 PM10
PHASE OUT PRE 1996 BURNERS	2014	Some change outs likely to occur prior to 2014
PHASE OUT 1996-2005 BURNERS	2016	
PHASE OUT POST 2005 NON COMPLYING WOOD AND MULTI FUEL BURNERS	2020	Most post 2005 burners will be NES compliant. The main exception is coal burners.
RESTRICT THE INSTALLATION OF ALL NEW BURNERS TO THOSE MEETING AND EMISSION LIMIT OF 1.5 G/KG	2012	Under the NES any wood burners installed on properties less than 2 hectares were required to meet this limit from September 2005. This extends the limit to apply to coal burners as well.

Air plan projections - tracking progress

Monitoring the effectiveness of the plan in achieving its objectives is an important part of the planning process. In the case of PM_{10} concentrations this can be done using a combination of air quality monitoring data (adjusted for the impact of meteorological conditions), air plan projections of the anticipated effectiveness and air emission inventories.

In the case of Napier two comparisons are shown. The top graph illustrates air plan projections of the effectiveness of the regulatory methods targeting domestic heating and outdoor burning, trends in concentrations relative to 2006 and the estimated emissions from the 2010 inventory. This shows the latter is inconsistent with estimated emissions for 2010 and trends in concentrations. Bias in survey respondents is the assumed reason for this discrepancy (Wilton & Bluett, 2012).

The bottom graphs tracks changes relative to 2010 using the updated assessment of reductions required. Both graphs show a good correlation between predicted changes and trends in PM_{10} concentrations and suggest that Napier is on target for NES compliance.



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