1 AIR QUALITY MONITORING

Overview

- In general, Northland has a high standard of natural air quality
- Monitoring of particulate matter (PM_{10}) using a high volume sampler at Kaitaia has been conducted over the past year. Sample results reveal that the PM_{10} concentrations vary considerably on a daily basis, and according to national air quality guidelines are acceptable or better 96% of the time
- Deposition gauge results provide a measure of dust nuisance within the Whangarei urban area. The 2002-03 results indicate that the concentrations of dust are good or acceptable for the majority of the time and do not differ significantly from previous years
- Continuous monitoring of SO_2 in Onerahi has commenced. This will provide important data regarding SO_2 concentrations in a residential area

Annual Plan Performance Targets

To continue to develop and implement a prioritised State of the Environment monitoring programme based on the Regional Policy Statement and Regional Plans by:

- **Monitoring ambient air quality; including background levels of dust and sulphur dioxide in the Northland region and ambient levels of pesticides**

1.1 Background

Since the introduction of the Resource Management Act (RMA) 1991, the Northland Regional Council has been the primary agency responsible for air quality management in Northland. In accordance with this responsibility, the Northland Regional Council undertakes:

- State of the Environment monitoring to determine ambient (background) air quality
- Resource consent compliance monitoring
- Investigation of and response to air quality related incidents

Northland's climate is dominated by the region's exposure to the prevailing southwesterly winds, which, particularly during the winter and spring, quickly disperse air pollutants. This, along with the relatively dispersed population, low vehicle density and sparce heavy industry, means that Northland enjoys a high standard of natural air quality.

The air, like any other natural resource, can be adversely affected by pollutants. Pollutants are substances that, under certain conditions, can harm human, animal or plant life. Polluted air can also interfere with the use and enjoyment of life and property by affecting visibility, causing odour, dust or smoke problems or corroding and disfiguring materials.

1.2 Particulate Matter (PM_{10})

The term 'particulate matter' refers to a range of small to medium sized particles, which exist in solid or aerosol states under normal conditions. There are a number of different types of particulate matter, PM_{10} is the name given to very small, fine suspended particles that have an aerodynamic diameter of 10 microns or less.

PM_{10} particulates are sourced from a variety of different processes. Some are generated from combustion and industrial processes, others from naturally occurring dusts and salt spray. Because of their small size these particulates can be inhaled into the lungs where they can cause a variety of adverse health effects.

In the early 1950s many residents in London were affected by what became known as the "killer fogs". These fogs were responsible for affecting the health of a large number of residents in the central London area, in part because the concentration of fine particulate (or PM_{10}) from local coal burning exceeded safe guidelines. PM_{10} concentrations are now closely monitored in major cities around the world to ensure that they stay below concentrations that cause health effects.

1.2.1 PM_{10} in Northland

During 2002 and 2003, a PM_{10} high volume sampler was installed along Awanui Straight, Kaitaia to monitor daily PM_{10} concentration. Samples are collected and analysed gravimetrically on a weekly basis in accordance with USEPA methodology. Although the sampler has only been operating for twelve months, some useful information has already been obtained.

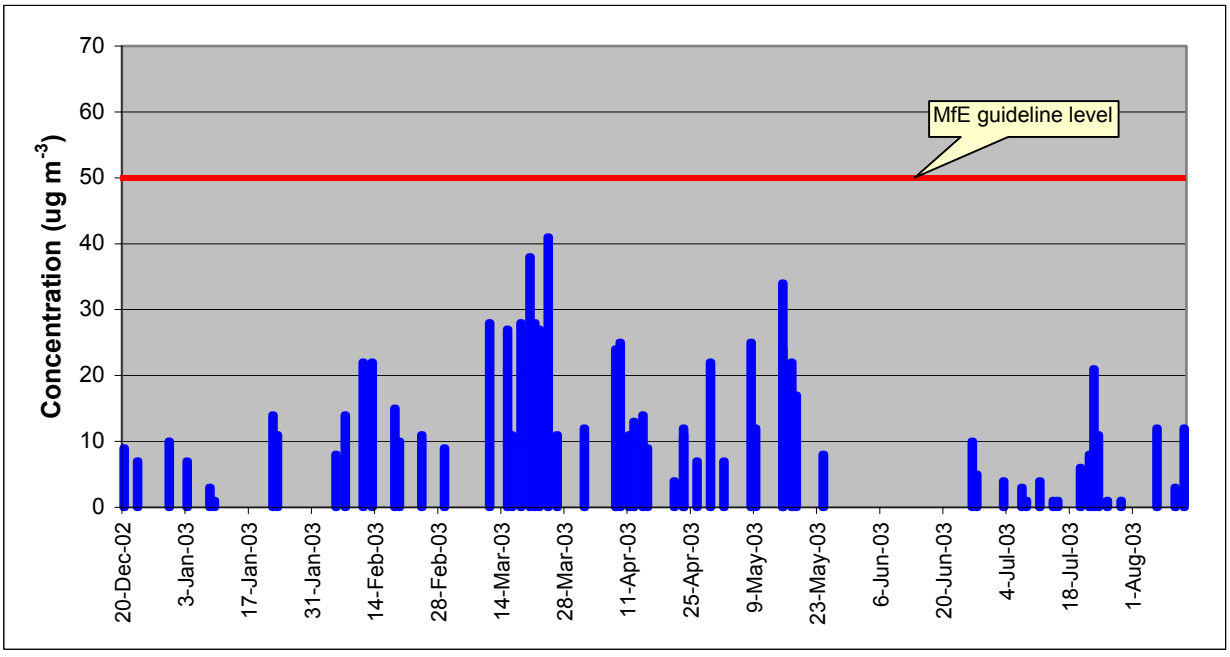

Figure 1-1: PM_{10} concentration measured alongside Awanui Straight, Kaitaia

The concentration of airborne PM_{10} particulates at the Kaitaia site varied from 1 µg m^{-3} to 41 µg m^{-3} (24 hr average) (Figure 1-1). These concentrations are the result of the source activity (mostly traffic and local industry), the influence of meteorological factors (such as wind and rain) and temperature. There is no obvious timing pattern to high vs. lower PM_{10} levels, with regard to either the day of the week, or to season, although elevated concentrations tend to occur during the late summer suggesting windblown terrigenous material may be a significant component of the PM_{10} in Kaitaia.

In addition to the ambient air quality guideline, the Ministry for the Environment also uses air quality categories that are given below:

Category	Percentage of guideline	Colour
Excellent	>5 µg m^{-3} (<10%)	
Good	6-16 µg m^{-3} (10-33%)	
Acceptable	17-32 µg m^{-3} (33-66%)	
Alert	33-50 µg m^{-3} (66-100%)	
Action	>50 µg m^{-3} (>100%)	

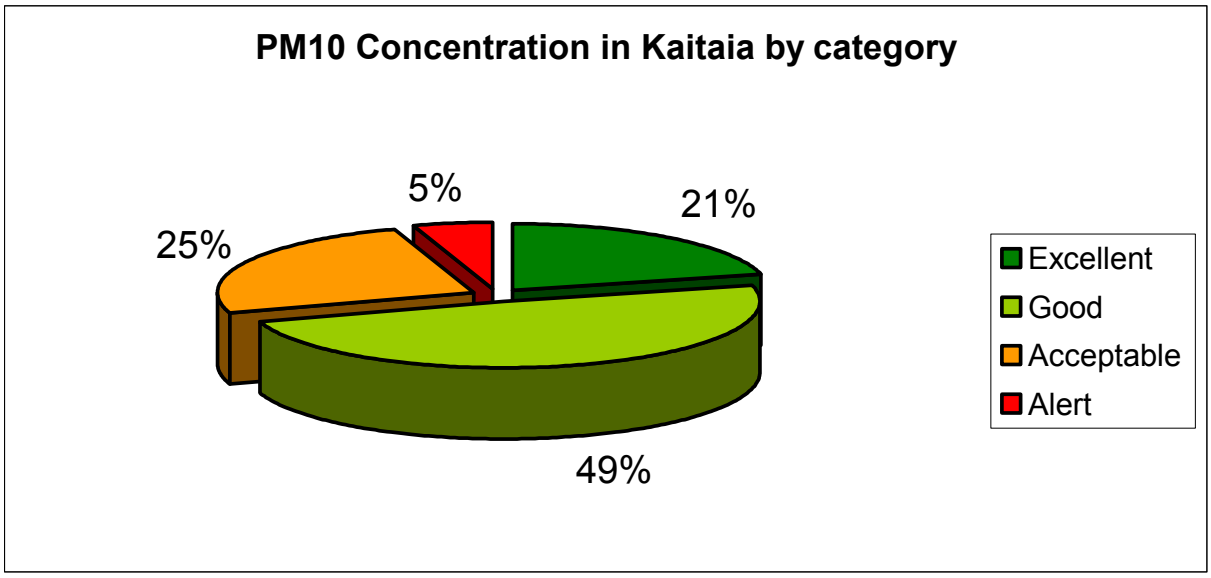

Figure 1-2: Percentage of the time Kaitaia PM_{10} concentration was in each category

Figure 1-2 indicates that, in terms of the air quality categories, the air quality measured is either 'excellent' or 'good' approximately 70 % of the time. However, the results also indicate that (at times) the PM_{10} concentration is approaching the recommended guidelines. These elevated results are unlikely to manifest themselves as health effects; even for sensitive individuals given that they are relatively infrequent events.

The levels and pattern measured during 2002 and 2003 along the Awanui Straight in Kaitaia differ from those measured in Whangarei, in that the peak events that approach or even exceed the guidelines in Whangarei are due to winter inversions. In Kaitaia, the lower population density does not produce sufficient quantity of smoke from domestic wood fires to significantly impact on PM_{10} concentrations.

The levels of PM_{10} in Kaitaia are not as high as those measured in centres like Christchurch and Nelson, where the guideline is exceeded on more than 30 days a year, and maximum concentrations of 183 µg m^{-3} and 165 µg m^{-3}, respectively, have been recorded. However the occasional high result does indicate on-going monitoring is warranted, to ensure PM_{10} concentrations do not pose any significant risk to public health.

1.3 Deposited Particulate Monitoring Programme

On-going deposited particulate (dust) investigations are carried out at two monitoring sites. One site is located at Robert Street, Whangarei and the other site at Whangarei Airport.

Monitoring is carried out using a deposition gauge, which is essentially an elevated 'bucket' with a known surface area. The gauges are installed and a chemical solution is added, before the gauges are left for a 30-day period (± 2 days) during which time they collect particulate material. The gauges are then collected and taken to the laboratory for analysis. The final result is a composite of both soluble and insoluble material.

Figures 1-3 and 1-4 illustrate the deposition gauge results from the Whangarei City (Robert Street) and Onerahi Airport sites respectively.

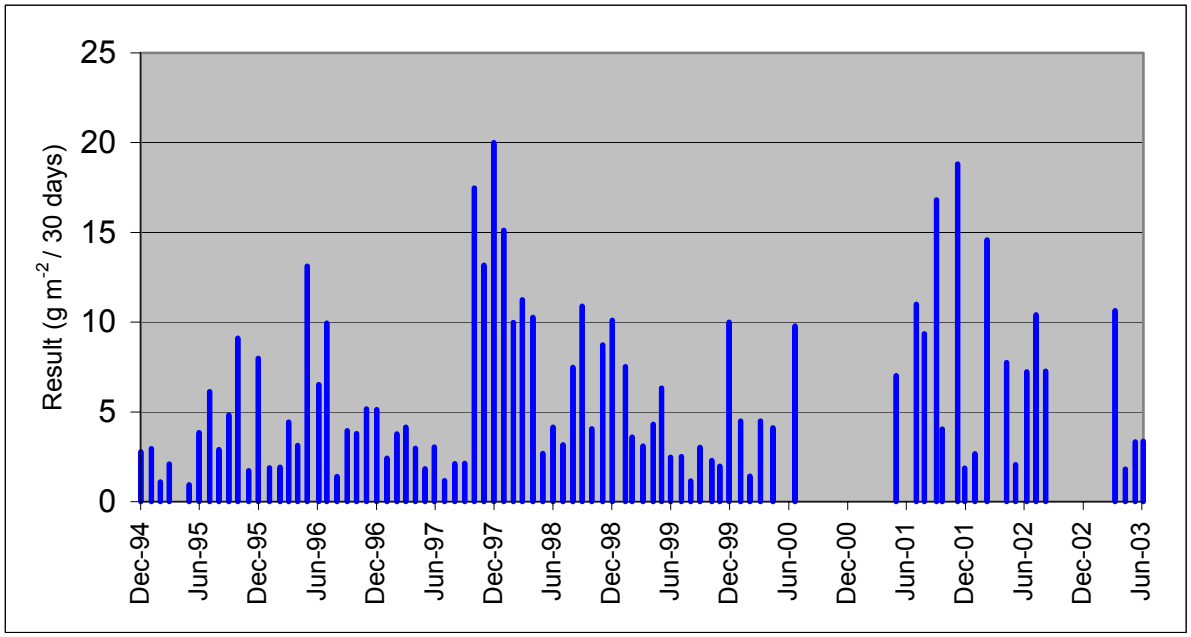

Figure 1-3: Deposition Gauge Results for Whangarei City (Robert Street) 1994-2003

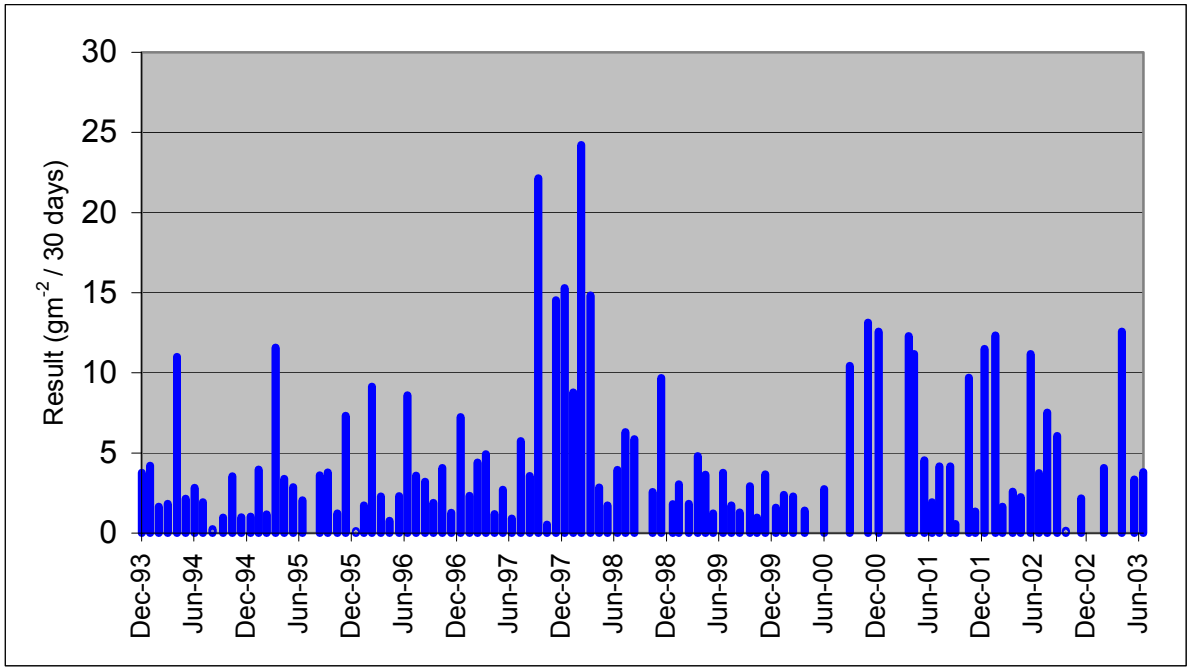

Figure 1-4: Deposition Gauge Results for the Whangarei Airport (Onerahi) 1994-2003

1.3.1 Results

Figures 1-3 and 1-4 show that typical deposited particulate values in Whangarei range between 1 and 25 grams per square metre per 30 days depending upon the time of the year, weather, location, wind speed/direction etc. In general, higher results prevail during the summer and lower results during the winter. This is due to the dust suppression action of the wetter winter weather. Sources of deposited particulates include bare earth, pollen and grass seed, and industrial processes such as fertiliser silos and abrasive blasting.

While there is no specific limit set for deposited particulates, the Ministry of Health previously specified a 'nuisance' guideline value of an average of 4 grams per square metre per 30 days above background concentrations. Values above this have been known to result in dust nuisance complaints, but they would have to be significantly higher before health effects are observed. If values were found to be significantly higher than the typical normal range of between 1 and 12 grams, then the Council would identify the source(s) and take the necessary action.

The high result measured at Whangarei airport in August 1997 resulted from foreign material entering the gauge. It is likely that the gauge was tampered with during this period.

In general, the deposition gauge results suggest that dust nuisance is not a serious issue in Whangarei. While earthworks, excavation and other dust producing activities generate localised dust nuisance problems; these issues are not widespread and are generally dealt with quickly and efficiently through our hotline service.

1.4 Environmental Reporting Programme

To determine the state of our air and the adverse environmental effects of air pollution, we must monitor air quality and track changes in it over time. It is impossible to monitor all the contaminants in the air. So we must select key or priority pollutants that provide a representative picture of air quality. These pollutants are commonly referred to as "indicators". The Ministry for the Environment has developed a set of key indicators, which provide basic information on the state of air quality. The key indicators for air quality include:

Indicator	Description	Why is it important
PM_{10}	Particulate matter having an aerodynamic diameter of 10 μm or less	Particles cause adverse effects on human health and degraded visibility such as regional haze
CO	Carbon monoxide	CO causes adverse effects on human health
NO_2	Nitrogen dioxide	NO_2 causes adverse effects on human health and causes the brown colouration of hazes and smogs
SO_2	Sulphur dioxide	SO_2 causes adverse effects on human health and on vegetation
O_3	Ozone	Ground level ozone formed by reactions of other pollutants in the air can adversely affect human health and vegetation

By collating air quality monitoring data and using air indicators, Northland Regional Council aims to collate sufficient, good quality monitoring data to:

- track changes in ambient air pollution concentrations over time
- determine the potential health and environmental effects of air quality in Northland
- assist with the development of regional policies to improve air quality where it is degraded or degrading, and to maintain air quality where it is good
- compare our regional air quality with different regions in New Zealand and evaluate the effectiveness of our regional polices

1.5 Future Air Monitoring in Northland

The following projects are now underway or are scheduled for the coming year:

- Sulphur dioxide monitoring in Onerahi is due to commence early in the 2003/04 year. This will provide important data of SO_2 concentrations in a residential area
- Two new PM_{10} high volume samplers have been purchased. These will be used to measure ambient particulate levels in Whangarei and particulate emissions from Juken Nissho Ltd in Kaitaia
- Ambient pesticide monitoring will commence in July 2003. This monitoring will continue over the summer of 2003/04