



Ministry for the
Environment
Manatū Mō Te Taiao

2011 Users' Guide
to the revised
National Environmental Standards
for Air Quality

Disclaimer

The 2011 Users' Guide has been prepared, under contract by Emission Impossible Ltd and Greg Hill – Resource Management/Planning Consultant to the Ministry for the Environment. All reasonable measures have been taken to ensure the quality and accuracy of the information contained herein.

Acknowledgements

The authors would like to thank the following people and organisations for contributing to the development of this document.

- Members of the National Air Quality Working Group
- Herb Familton, Auckland Council
- Tim Mallet, Environment Canterbury

This report may be cited as:

Ministry for the Environment. 2011. *2011 Users' Guide to the revised National Environmental Standards for Air Quality*. Wellington: Ministry for the Environment.

Published in August 2011 by the
Ministry for the Environment
Manatū Mō Te Taiao
PO Box 10362, Wellington 6143, New Zealand

ISBN: 978-0-478-37253-3 (print)
978-0-478-37254-0 (electronic)

Publication number: ME 1068

Other publications in this series include: *Clean Healthy Air for All New Zealanders: The national Air Quality Compliance Strategy to Meet the PM₁₀ Standard*

© Crown copyright New Zealand 2011

This document is available on the Ministry for the Environment's website:
www.mfe.govt.nz

Foreword

Clean healthy air contributes to New Zealand's quality of life – not only people's health, but also the natural functioning of and the “beauty of the natural and physical environment” (MfE, 2007a). Air and air quality can be described as both a taonga and a part of the traditional kaitiakitanga for Māori.

The first national environmental standards for air quality were introduced in 2004 to set a guaranteed minimum level of health protection for all New Zealanders. At that time there was a strong need for action on ambient levels of particulate matter less than 10 micrometres (PM₁₀) in most parts of the country, largely due to emissions from solid fuel domestic heating appliances in winter.

Five years later (2009), the Minister for the Environment announced a review of the Regulations relating to PM₁₀. This review addressed concerns regarding the perceived ‘stringency’ of the ambient standard, the lack of equity for industrial air pollution sources, and the difficulty in achieving the original target timeline of 2013.

In response, the standards were revised and the amended Regulations came into force on 1 June 2011. These have been consolidated into the Resource Management (National Environmental Standards for Air Quality) Regulations 2004.

The 2011 Users' Guide is intended to provide assistance on interpreting and implementing all the air quality Regulations. It seeks to promote consistency of application across New Zealand and consequently the earlier delivery of clean healthy air to all New Zealanders.

This document is aimed at a technical rather than a general audience. The primary audience will be regional council officers (and their elected representatives) and air quality practitioners. It will also be of interest to other stakeholders, such as planners, resource managers, lawyers, industry, business, and environmental consultants.

Contents

| | |
|---|-----------|
| Foreword by the Ministry | iii |
| Contents | iv |
| 1 Introduction | 1 |
| 1.1 What is the purpose of the Users' Guide? | 1 |
| 1.2 What are national environmental standards? | 1 |
| 1.3 What is covered by the Users' Guide? | 4 |
| 1.4 Who is the intended audience? | 4 |
| 1.5 How does the Users' Guide fit with other documents? | 5 |
| 1.6 How is the Users' Guide structured? | 7 |
| 2 Dioxin and Other Toxic Substances | 8 |
| 2.1 Background | 8 |
| 2.2 What activities do the standards prohibit? | 10 |
| 2.3 How do the bans work in practice | 17 |
| 2.4 Enforcement | 20 |
| 2.5 Reporting requirements | 22 |
| 3 Ambient Air Quality Standards for Carbon Monoxide, Nitrogen Dioxide, Ozone and Sulphur Dioxide | 23 |
| 3.1 Introduction | 23 |
| 3.2 Adverse effects | 24 |
| 3.3 The ambient air quality standards | 26 |
| 3.4 Where do the ambient standards apply? | 30 |
| 3.5 Monitoring | 33 |
| 3.6 Exceedances | 38 |
| 3.7 Reporting Breaches | 39 |
| 3.8 Exceptional circumstances | 40 |
| 3.9 Ambient standards and resource consents | 47 |
| 3.10 Impacts on regulatory documents | 51 |
| 3.11 Implementing the ambient standards | 53 |
| 3.12 Enforcement | 54 |
| 3.13 Reporting requirements | 54 |
| 4 Ambient Air Quality Standard for PM₁₀ | 55 |
| 4.1 Introduction | 55 |
| 4.2 Adverse effects of PM ₁₀ (and PM _{2.5}) | 56 |
| 4.3 What is the ambient PM ₁₀ standard? | 57 |
| 4.4 Split targets for meeting the ambient PM ₁₀ standard | 58 |
| 4.5 Where do the ambient PM ₁₀ standards apply? | 62 |

| | | |
|----------|--|------------|
| 4.6 | Monitoring of PM ₁₀ | 62 |
| 4.7 | Exceedances | 67 |
| 4.8 | Reporting of breaches | 68 |
| 4.9 | Exceptional circumstances | 68 |
| 4.10 | The PM ₁₀ standard and resource consents | 68 |
| 4.11 | Impacts on regulatory documents | 77 |
| 4.12 | Implementing the ambient PM ₁₀ standard | 79 |
| 4.13 | Enforcement | 84 |
| 4.14 | Reporting requirements | 84 |
| 5 | Domestic Fires | 86 |
| 5.1 | Introduction | 86 |
| 5.2 | Woodburners | 87 |
| 5.3 | Solid-fuel burning open fires | 92 |
| 5.4 | Role of territorial authorities | 98 |
| 5.5 | Enforcement | 99 |
| 5.6 | Education | 100 |
| 5.7 | Reporting requirements | 101 |
| 6 | Greenhouse Gas Emissions at Landfills | 102 |
| 6.1 | Background | 102 |
| 6.2 | Resource Management (Energy and Climate Change) Amendment Act 2004 | 102 |
| 6.3 | What do the landfill gas standards say? | 104 |
| 6.4 | Exclusions from the landfill gas standards | 108 |
| 6.5 | Beneficial re-use of landfill gas | 109 |
| 6.6 | Designing a surface methane monitoring programme | 110 |
| 6.7 | How do the landfill gas standards take effect? | 110 |
| 6.8 | Enforcement | 112 |
| 6.9 | Reporting requirements | 112 |
| | Glossary | 113 |
| | References | 117 |
| | Appendix 1: Basel Convention: Annexes I and III | 121 |
| | Appendix 2: Guidance on Gazetting Airsheds | 124 |
| | Appendix 3: Breach Public Notice Examples | 127 |
| | Appendix 4: PM ₁₀ Monitoring Methods | 128 |
| | Appendix 5: Example Offset Consent Conditions | 136 |
| | Appendix 6: Open Fire Ban Public Notice Example | 138 |

Tables

| | | |
|----------|---|----|
| Table 1: | Regulations and relevant sections of the 2011 Users' Guide | 7 |
| Table 2: | Start dates for prohibited activity standards for dioxin and other toxics | 10 |
| Table 3: | Ambient air quality standards from 1 September 2005 | 28 |
| Table 4: | Ambient air quality standards compared to Ambient Air Quality Guidelines | 29 |
| Table 5: | Split targets for PM ₁₀ | 60 |
| Table 6: | Monitoring methods for ambient PM ₁₀ standard | 66 |
| Table 7: | Timeline for critical dates in complying with the PM ₁₀ standard | 80 |
| Table 8: | Elements of an air quality management framework* | 83 |

Figures

| | | |
|-------------|--|-----|
| Figure 1: | The 2011 Users' Guide and other air quality documents | 6 |
| Figure 2: | Flow diagram for Regulations regarding domestic fires | 87 |
| Figure A2.1 | Process for Gazetting an airshed | 124 |
| Figure A3.1 | Example Notice for a breach of an ambient standard | 127 |
| Figure A6.1 | Example Notice to advise of new solid-fuel burning open fire ban | 138 |

1 Introduction

1.1 What is the purpose of the Users' Guide?

The purpose of the 2011 Users' Guide is to provide practitioners with their 'first port of call' assistance in interpretation and implementation of the Resource Management (National Environmental Standards for Air Quality) Regulations 2004 including the 2011 amendments. It seeks to assist practitioners to apply the Regulations in a streamlined and consistent manner across New Zealand and consequently deliver clean healthy air to all New Zealanders sooner.

Many locations in New Zealand experience poor air quality, primarily due to home heating during winter and to a lesser extent due to emissions from motor vehicles. Air pollution from all sources is estimated to cause more than 1,600 premature deaths, 930 hospitalisations and 2.6 million restricted activity days in urban areas in New Zealand every year¹ (Kuschel & Mahon, 2010). The majority of these health effects are from PM₁₀ emissions.

Air quality management in New Zealand is governed by the Resource Management Act 1991 (RMA) and involves a number of agencies. The Minister for the Environment is responsible for recommending national environmental standards to guarantee a set level of protection for the health of all New Zealanders. Regional councils and unitary authorities are in turn responsible for ensuring that national standards are met in their regions. The Ministry for the Environment liaises between and provides national guidance to councils to assist them with improved air quality management and reports back to the Minister on progress in achieving the air quality standards.

This document updates and supersedes the previous versions of the Users' Guide (2004 and 2005) to incorporate all the amendments to the Regulations that have occurred (2004, 2005, 2008 and 2011).

This document explains how to implement the Regulations and is a hub for directing readers to other sources of guidance. The 2011 Users' Guide is a critical companion document to the Clean Healthy Air for All New Zealanders: National Air Quality Compliance Strategy to meet the PM₁₀ Standard (MfE, 2011) (Compliance Strategy) and links with the other Ministry for the Environment good practice guides on air quality.

The 2011 Users' Guide is not a legal document: it has no legal status. The Ministry for the Environment recommends that specialised legal advice should be sought at any time a regional council (or other user) is unclear on how the Regulations should be implemented.

1.2 What are national environmental standards?

National environmental standards are mandatory technical environmental regulations. They have the force of regulation and are implemented mainly by regional councils.

Regional councils and unitary authorities have the primary responsibility for managing air quality under the RMA. Regional councils have a duty to ensure that the national air quality standards are met within their regions.

¹ For the population living in urban areas in 2006 as taken from the Census

Section 44A(7-8) of the RMA requires that:

- (7) *Every local authority and consent authority must observe national environmental standards.*
- (8) *Every local authority and consent authority must enforce the observance of national environmental standards to the extent to which their powers enable them to do so.*

1.2.1 The original Regulations

In October 2004, the Government introduced the national environmental standards for air quality (the air quality standards). These air quality standards were issued as Regulations in accordance with sections 43 and 44 of the RMA.

They included:

- seven **standards** banning activities that discharge significant quantities of dioxins and other toxics into the air
- five **ambient air quality standards** for carbon monoxide (CO), particulate matter less than 10 micrometres in diameter (PM₁₀), nitrogen dioxide (NO₂), sulphur dioxide (SO₂) and ozone (O₃)
- a **design standard** for new woodburners installed in urban areas
- a requirement for landfills over 1 million tonnes of refuse to collect greenhouse gas emissions

The ambient standards are the minimum requirements that outdoor air quality should meet in order to guarantee a set level of protection for human health and the environment. The phrase 'set level of protection' is used quite deliberately – it does not mean that all adverse health impacts will be avoided. This is because some pollutants (eg, PM₁₀) do not have a 'safe' threshold under which no adverse health impacts are experienced.

The ambient standards are a subset of the ambient air quality guidelines which set the minimum requirements that outdoor air quality should meet for a range of air pollutants in order to protect human health and the environment (MfE, 2002a). Most of the guideline values adopted in New Zealand have been taken from guidance provided by overseas organisations such as the World Health Organisation (WHO, 2006).

1.2.2 Subsequent amendments

The Regulations were subsequently amended in December 2004 (SR 2004/433), July 2005 (SR 2005/214) and November 2008 (SR 2008/375). These amendments were largely made for technical reasons.

1.2.3 The revised Regulations

The Minister for the Environment Hon Dr Nick Smith announced a review of the air quality standards in 2009. This review focussed on the ambient air quality standards, particularly the provisions for PM₁₀. Three potential problems were identified with the PM₁₀ standard:

- perceived stringency of the standard
- equity of current regulations
- compliance with the standard by 2013.

Perceived stringency of the standard

The World Health Organisation (WHO) guideline for PM₁₀ is 50 µg/m³ as a 24-hour average, with three permitted exceedances per year. Different countries have adopted different standards; while many adopt the target standard of 50 µg/m³, the number of permitted exceedances varies. Some countries also provide for the exclusion of ‘exceptional events’ (natural events outside the control of the regional council), from the count of exceedances. There was concern that the New Zealand standard, allowing for only one exceedance and with no provision for ‘exceptional events’, might be too stringent.

Equity of current Regulations

The original Regulations imposed restrictions on the issuing of resource consents in breaching airsheds, and the burden of these restrictions fall on industry, which require consents. The problem is that domestic solid-fuel combustion, not industry, is the primary source of PM₁₀ pollution during winter. As a consequence, the Regulations were not considered equitable.

Compliance with the current standard by 2013

In 2004, when the air quality standards were put in place, it was expected that all airsheds would comply with the PM₁₀ standard by 2013. However, by late 2009, the Ministry estimated that there would be 15 airsheds which would not comply in time, including Auckland, which represents nearly 30 per cent of New Zealand’s population. There was concern that the 2013 deadline was unachievable.

In response, the air quality standards were amended in June 2011 with the main changes being:

- extending the target date for regional councils to meet the ambient PM₁₀ standard. New split target dates are 1 September 2016 (airsheds with between 1 and 10 exceedances of the ambient PM₁₀ standard) and 1 September 2020 (airsheds with 10 or more exceedances of the ambient PM₁₀ standard)
- making provision for the exclusion of exceptional events (eg, dust storms, volcanic eruptions)
- requiring ‘offsets’ from certain new industries with PM₁₀ discharges in ‘polluted’ airsheds from September 2012, replacing the current restrictions on industrial consents
- prohibiting new solid fuel-burning open fires in homes in polluted airsheds from September 2012.

In addition, the Regulations now allow for a rule, resource consent, or bylaw that is more stringent than these Regulations to prevail over the Regulations.

1.2.4 What should the Regulations be referred to as?

The Regulations were originally gazetted in 2004 as the Resource Management (National Environmental Standards Relating to Certain Air Pollutants, Dioxins, and Other Toxics) Regulations 2004. The 2011 amendments have renamed these as the **Resource Management (National Environmental Standards for Air Quality) Regulations 2004**. The Regulations can also be referred to as the **national environmental standards for air quality**.

For a copy of the consolidated Regulations as reprinted on 1 June 2011 (SR 2004/309) please refer to the New Zealand Legislation Website, www.legislation.govt.nz. Copies of the various amending regulations (13 January 2005 – SR 2004/433, 25 August 2005 – SR 2005/214, 6 November 2008 SR/375 and 1 June 2011 – SR 2011/103) can also be found here.

1.3 What is covered by the Users' Guide?

On 29 January 2011, the Minister for the Environment, Hon Dr Nick Smith, announced the outcomes of a review of the national air quality standards. In addition to a series of amendments to the Regulations, the Minister signalled in his Cabinet Paper that the regulatory changes would be supported by a suite of non-regulatory tools (Minister for the Environment, 2011) as follows:

- preparation of a national compliance strategy
- production of additional best practice guidance on air quality management
- future revision of the national ambient air quality standards.

The original intent was for the national compliance strategy to include education on the health impacts of PM₁₀, review existing best practice guidance and replace the Users' Guide prepared for the original Regulations.

However, as part of preparing the national compliance strategy, the 2011 Users' Guide has been separated out to reflect the different content and the different intended audiences of the two documents as follows:

- the *Compliance Strategy* (MfE, 2011e) which sets out the practices that regional councils should adopt to meet the ambient PM₁₀ standard suited to a wide audience
- a *2011 Users' Guide* (this document) which provides a 'plain English' description of how best to implement the air quality regulations in their entirety suited to a more technical audience.

The two documents differ in the contaminants and the breadth of legislation and non-statutory tools they cover.

The Compliance Strategy promotes a toolkit of "compliance activities", ranging from education through to action, to **ensure New Zealand meets the ambient PM₁₀ 24-hour standard**. The ambient PM₁₀ 24-hour standard is only one of many standards covered in the Regulations. However, the generic principles outlined in the Strategy could easily be applied to achieving compliance with standards for other time periods or other contaminants in future. Some of the mandatory requirements which assist compliance are from the Regulations whilst others are from the RMA and other Government legislation, eg, Vehicle Exhaust Emissions Rule.

By comparison, the 2011 Users' Guide **focuses on the Regulations only but in their entirety** so therefore includes contaminants other than PM₁₀. The 2011 Users' Guide includes guidance on prohibited activity standards relating to emissions of toxic air contaminants, control of greenhouse gas emission at landfills and other ambient air quality standards. It outlines how to implement the amended Regulations rather than how to achieve compliance. It is a critical 'companion' document to the Strategy.

A factsheet - Health Effects from PM₁₀ Air Pollution (MfE, 2011d) detailing the health effects of PM₁₀ has also been produced as part of the Compliance Strategy. This factsheet can be used to help educate people on the importance of complying with the ambient PM₁₀ standard to ensure the health of New Zealanders.

1.4 Who is the intended audience?

This 2011 Users' Guide is aimed at practitioners implementing the national environmental standards for air quality. Principally this is regional council officers and their elected

representatives as they are responsible for implementing the national environmental standards. However, it will be of interest to other stakeholders such as planners and resource managers, air quality consultants, lawyers and representatives of industry and business.

It is a technical document and is aimed at air quality specialists. Although some sections may be useful to the general public, hearing commissioners and specialists in areas other than air, the document has not been prepared with this audience in mind.

As noted above, the 2011 Users' Guide is designed to provide assistance, advice and sources of information with the aim of implementing the Regulations in a streamlined and consistent manner around the country. It is not binding, and in some cases the level of detail required will go beyond what has been covered here.

To help prioritise regional council resources, the 2011 Users' Guide contains information on what local government **must** do to comply with the Regulations, as well as what they **could** do in order to achieve best practice management of air quality. The language in the guide is intended to make this distinction clear.

If you require further assistance or have questions regarding the Regulations, the Compliance Strategy or this 2011 Users' Guide, please contact the Ministry for the Environment's air email hotline on air@mfe.govt.nz.

1.5 How does the Users' Guide fit with other documents?

The 2011 Users' Guide fits into a framework of legal and guidance documents for managing air quality in New Zealand, as shown in figure 1.

It should be noted that practitioners implementing the Regulations may need copies of the following standards as these are referenced in the Regulations or in this 2011 Users' Guide:

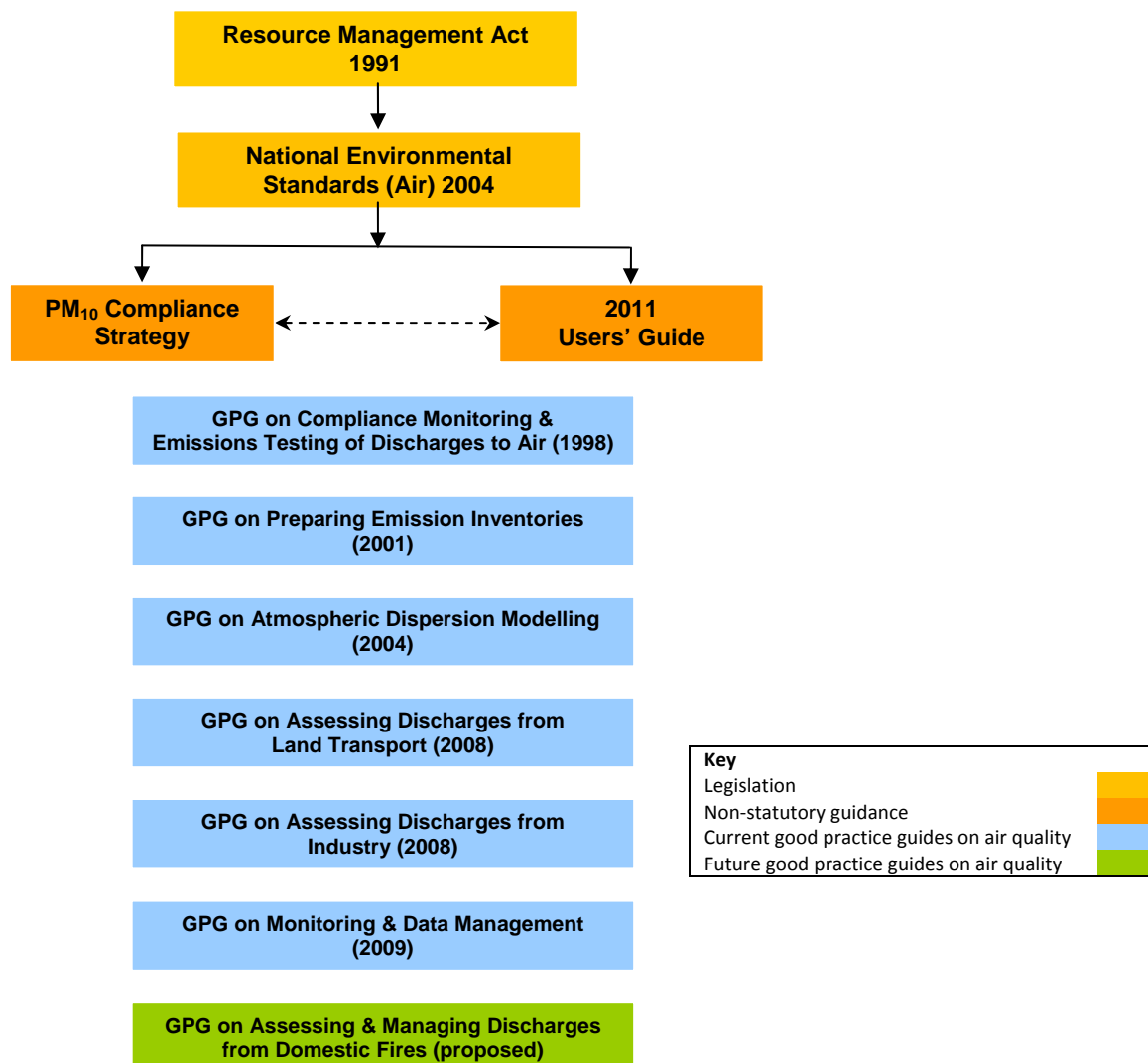
- AS/NZS² 4013:1999, Domestic solid fuel burning appliances - Method for determination of flue gas emissions
- AS/NZS 4012:1999, Domestic solid fuel burning appliances - Method for determination of power output and efficiency
- AS³ 3580.7.1:1992, Methods for sampling and analysis of ambient air - Determination of carbon monoxide - Direct-reading instrumental method
- AS 3580.5.1:1993, Methods for sampling and analysis of ambient air - Determination of oxides of nitrogen - Chemiluminescence method
- AS 3580.6.1:1990, Methods for sampling and analysis of ambient air - Determination of ozone - Direct-reading instrumental method
- United States Code of Federal Regulations, Title 40 - Protection of Environment, Volume 2, Part 50, Appendix J - Reference method for the determination of particulate matter as PM₁₀ in the atmosphere

² AS/NZS refers to Australia Standard and New Zealand Standard

³ AS refers to Australia Standard

- AS/NZS 3580.9.6:2003, Methods for sampling and analysis of ambient air - Determination of suspended particulate matter - PM₁₀ high volume sampler with size-selective inlet - Gravimetric method
- AS 3580.9.8:2008, Methods for sampling and analysis of ambient air - Determination of suspended particulate matter - PM₁₀ continuous direct mass method using a tapered element oscillating microbalance analyser
- AS/NZS 3580.9.11:2008, Methods for sampling and analysis of ambient air - Determination of suspended particulate matter - PM₁₀ beta attenuation monitors
- AS 3580.4.1:2008, Methods of sampling and analysis of ambient air - Determination of sulfur dioxide - Direct reading instrumental method
- AS/NZS 3580.1.1:2007 Methods for Sampling and analysis of ambient air – Guide to siting air monitoring equipment.

Figure 1: The 2011 Users' Guide and other air quality documents



The Ministry for the Environment has also published good practice guides on assessing and managing the effects of dust (MfE, 2001a) and odour (MfE, 2003) but these are not shown in figure 1 as they are not directly related to meeting the Regulations.

1.6 How is the Users' Guide structured?

The 2011 Users' Guide consists of six chapters and is structured to follow the general content of the Regulations as outlined below:

- Seven activity standards that ban various activities that discharge unacceptable quantities of dioxins and other toxics into the air. These are outlined in Chapter 2.
- Five ambient air quality standards for carbon monoxide (CO), particulate matter less than 10 micrometres in diameter (PM₁₀), nitrogen dioxide (NO₂), sulphur dioxide (SO₂) and ozone (O₃). These are outlined in Chapters 3 and 4.
- A design standard for new small-scale domestic wood-burning appliances and an activity standard that bans new solid-fuel burning open fires in polluted airsheds. These are outlined in Chapter 5.
- A design standard for the collection and destruction of landfill gas at large landfills. This is outlined in Chapter 6.

Table 1 indicates where guidance on specific Regulations can be found.

Table 1: Regulations and relevant sections of the 2011 Users' Guide

| Regulation | Section of 2011 Users' Guide |
|---|------------------------------|
| Landfill fires (Regulation 6) | 2.2.1 |
| Burning of tyres in the open (Regulation 7) | 2.2.2 |
| Bitumen burning for road maintenance (Regulation 8) | 2.2.3 |
| Burning of coated wire in the open (Regulation 9) | 2.2.4 |
| Burning of oil in the open (Regulation 10) | 2.2.5 |
| School/healthcare incinerators (Regulation 11) | 2.2.6 |
| High temperature hazardous waste incinerators (Regulation 12) | 2.2.7 |
| Ambient air quality standards – carbon monoxide (Regulations 13 & 20) | 3 & 3.9.1 |
| Ambient air quality standards – nitrogen dioxide (Regulations 13 & 20) | 3 & 3.9.1 |
| Ambient air quality standards – ozone (Regulations 13 & 20) | 3 & 3.9.1 |
| Ambient air quality standards – sulphur dioxide (Regulations 13 & 21) | 3 & 3.9.2 |
| Ambient air quality standards – PM ₁₀ (Regulations 13, 16B, 16C, 16D & 17) | 3 & 4 |
| Woodburner design standards (Regulations 22, 23 & 24) | 5.2 |
| Solid-fuel burning open fire bans (Regulation 24A) | 5.3 |
| Landfill gas (Regulations 25, 26 & 27) | 6 |

2 Dioxin and Other Toxic Substances

2.1 Background

Toxic air pollutants (also called hazardous air pollutants) are those known, or suspected, to cause cancer or other serious health effects (e.g. reproductive effects or birth defects) or adverse environmental effects. Examples of toxic air pollutants include benzene which is found in petrol, perchlorethylene emitted from dry cleaners, and methylene chloride which is used as a solvent and paint stripper by a number of industries. These are all volatile organic compounds (discussed further below). Other examples include dioxin, asbestos, toluene, and metals such as cadmium, mercury, chromium, and lead compounds.

Most air toxics originate from human-made sources such as traffic and industry. Domestic sources can also be significant, for example solid-fuel burners and indoor sources such as building materials and cleaning solvents.

Toxic air pollutants are often present in very low concentrations and significant exposure typically occurs only after long time periods. However, once they enter the body, some persistent toxic air pollutants accumulate in body tissues. This means that predators accumulate higher pollutant concentrations than their contaminated prey. As a result, people and other animals at the top of the food chain who eat contaminated fish or meat can be exposed over shorter time periods to concentrations that are much higher than the concentrations in the water, air, or soil.

The Stockholm Convention on Persistent Organic Pollutants (the Convention) came into force for New Zealand in 2004. Persistent organic pollutants are organic compounds that do not break down readily in the environment, are capable of long-range transport and bioaccumulate in human and animal tissue (and biomagnify in food chains). Persistent organic pollutants, therefore, pose a risk of causing adverse effects to human health and the environment.

There are 21 groups of chemicals listed as persistent organic pollutants under the Stockholm Convention. Dioxins are one of these groups. New Zealand's National Implementation Plan (required under the Convention) sets out how New Zealand proposes to meet its obligations including reducing dioxins.

'Dioxins' are a group of chemicals consisting of polychlorinated dibenzo-p-dioxins (PCDDs, dioxins), polychlorinated dibenzofurans (PCDFs, furans) and polychlorinated biphenols (PCBs). Dioxins are released to the environment in very small amounts through a number of industrial and domestic activities, and through the open burning of wastes. New Zealand is obligated under the Convention to take measures to reduce, and where feasible ultimately eliminate, releases of dioxin. Although levels of dioxins in New Zealand foods (including our meats, dairy products and fish) are low and below the World Health Organisation guidelines, it is prudent to further minimise our exposure to dioxins where practicable.

The Action Plan for Reducing Discharges of Dioxin to Air (MfE, 2001c) identified the development of national environmental standards to ban certain activities that produce dioxins and other air toxins as a key measure. The activity bans (Regulations 6 to 12) under the National Environmental Standards for Air Quality 2004 were promulgated to meet the Action Plan and banned the following:

- lighting fires and burning waste at landfills (landfill fires)

- burning insulated wire, oil or tyres in the open
- burning road seal
- high-temperature incineration of hazardous waste (except for three facilities that had existing resource consents, two of which have now closed)
- low-temperature waste incineration in schools and hospitals from October 2006 (unless the facility has a resource consent).

In 2011, the Ministry published an update of the 2000 evaluation of dioxin releases in New Zealand. The Dioxin Inventory (MfE, 2011a) highlights that between 1998 and 2008 emissions from all sources of dioxins has reduced by almost 50%. Since the introduction of the Regulations in 2004 dioxin emissions from landfill fires (previously the largest source of dioxin emissions) have dropped by approximately 80%.

2.1.1 Adverse Effects of Dioxins

Dioxins are formed by combustion activities including incineration of waste (such as medical and hazardous wastes), crematoria, metallurgical industries (including metal smelting, refining and recycling), industrial and domestic coal and wood combustion, exhaust emissions from vehicles, controlled burn-offs, uncontrolled and accidental fires (including landfill fires) and the burning of plastics and tyres (including coated wire).

Dioxins and furans can adversely affect human and animal health in a number of ways, including affecting the immune and reproductive systems, liver damage, neurobehavioural development, birth defects and cancer. The most noted health effect in people exposed to large amounts of 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD) is a skin effect known as chloracne. The International Agency for Research on Cancer (IARC) has determined that 2,3,7,8-TCDD is a human carcinogen (that is, it can cause cancer in humans).

High levels of PCBs cause chloracne, skin rashes, liver problems and eye irritation. Animal studies have shown developmental effects and there are reports of reduced short-term memory in children of mothers exposed to PCBs through what they eat.

High levels of PCBs cause chloracne, skin rashes, liver problems and eye irritation. Animal studies have shown developmental effects and there are reports of reduced short-term memory in children of mothers exposed to PCBs through what they eat. The United States Environmental Protection Agency (USEPA) has classified PCBs as probable human carcinogens (Group B2).

Humans are most sensitive group to dioxins, furans and PCBs, particularly foetuses and young children, and some animals.

Generally, the concentrations of dioxins, furans and PCBs in New Zealand are low when compared to ambient concentrations found in other countries. Dioxin levels in air were found to be seasonally elevated, however, during colder months due to domestic fires.

2.1.2 Adverse Effects of Other Toxic Substances

There are a variety of other toxic compounds formed by combustion activities including volatile organic compounds and polycyclic aromatic hydrocarbons.

Volatile organic compounds are organic chemicals (ie, chemicals containing carbon) that volatilise easily and can have long-term human health effects. Possible chronic health effects include cancer, central nervous system disorders, liver and kidney damage, reproductive disorders, and birth defects.

Polycyclic aromatic hydrocarbons are widespread in the environment and of concern because some compounds have been identified as carcinogenic (ie, cancer-causing), mutagenic (ie, increases mutations of genetic material) and teratogenic (ie, causes birth defects).

Research suggests that carcinogenic polycyclic aromatic hydrocarbons can result in low birth weights for babies (Šrám, 1999).

2.2 What activities do the standards prohibit?

The Regulations prohibit:

- landfill fires (Regulation 6)
- burning of tyres in the open (Regulation 7)
- bitumen burning (Regulation 8)
- burning of coated wire in the open (Regulation 9)
- burning of oil in the open (Regulation 10)
- school and healthcare incinerators unless a resource consent is obtained (Regulation 11)
- high temperature incinerators (Regulation 12).

The intent of the activity bans was to prohibit activities that produce dioxins and other toxics and were bad practice anyway. Burning of rubber, plastic, rubbish, tyres and oils also causes nuisance due to the dense smoke that is produced so it was also anticipated that there would be a flow on effect from the ban of reducing complaints due to these types of open burning nationally.

The prohibited activity standards and their start dates are summarised in table 2 and discussed individually in the following sections of this chapter.

Table 2: Start dates for prohibited activity standards for dioxin and other toxics

| Prohibited Activity | Start date |
|---|----------------|
| Landfill fires | 8 October 2004 |
| Burning of tyres in the open | 8 October 2004 |
| Bitumen burning for road maintenance | 8 October 2004 |
| Burning of coated wire in the open | 8 October 2004 |
| Burning of oil in the open | 8 October 2004 |
| New high temperature hazardous waste incinerators | 8 October 2004 |
| School/healthcare incinerators unless resource consent obtained | 1 October 2006 |

The activity bans have been in force for several years now and should be complied with. A transitional phase in period was given for school and healthcare incinerators. This was to provide time for organisations that wished to continue to operate these facilities to obtain

resource consent from their local councils. Enforcement action available to councils for non-compliance with the bans is discussed in section 2.4.

Backyard (open) burning

The Regulations and the activity standards banning types of burning (Regulations 6 to 12) do not deal with backyard (open) burning. Backyard (open) burning is covered by rules in regional plans or local bylaws.

2.2.1 Landfill fires

Regulation 6 specifies:

- 6** ***Lighting of fires and burning of waste at landfill***
- (1) *The lighting of fires and the burning of waste at a landfill are prohibited.*
- (2) *Subclause (1) does not apply if –*
- (a) *the lighting of a fire is to control gas formed at the landfill; and*
- (b) *the landfill complies with the requirements of regulations 25 to 27⁴.*

The definition of a landfill is given in Regulation 3 which states:

Landfill means a site where waste is disposed of by burying it, or placing it upon land or other waste.

Implementation

This Regulation bans the burning of any refuse at a landfill and has applied since 8 October 2004. The ban does not apply to the flaring of landfill gas.

If a fire is discovered immediate steps should be undertaken to extinguish the fire. Because of the low burning temperature and incomplete combustion of burning refuse, landfill fires emit a variety of pollutants that have the potential to affect the health of people exposed to the smoke. The main pollutants of concern are:

- smoke and odour
- oxides of nitrogen
- carbon monoxide
- sulphur dioxide (if tyres are being burned)
- particulate matter (PM₁₀ and PM_{2.5})
- dioxins
- heavy metals
- volatile organic compounds (VOCs).

Historically refuse at landfills was set alight to reduce waste volume and hence increase the life and capacity of the landfill. This practice has ceased since the introduction of Regulation 6. The most recent census at the time of writing reported no landfill fires in New Zealand for 2006/07 (MfE, 2007b).

⁴ Regulations 25 to 27 address the control of greenhouse gas emissions at landfills and are discussed in Chapter 6 of this document.

Accidental fires have been caused by sparks from the exhaust systems of site plant or vehicles, smoking on the landfill by staff or users, and uncontrolled dumping of waste materials such as ashes or hazardous substances that can ignite when mixed. The risk of accidental fires around landfills can, therefore, be minimised through good practice landfill management. Good practice management procedures should be specified in resource consent conditions. Further guidance is available in the Guide to Landfill Consent Conditions (MfE, 2001b).

2.2.2 Burning of tyres

Regulation 7 specifies:

- 7 *Burning of tyres***
- (1) *The burning of tyres is prohibited.*
- (2) *Subclause (1) does not apply if the tyres are burnt at industrial and trade premises that have –*
- (a) *a resource consent for the discharge produced; and*
- (b) *emission control equipment that is designed and operated to minimise emissions of dioxins and other toxics from the process.*

Implementation

This Regulation prohibits the burning of tyres and has applied since 8 October 2004. The burning of tyres as a fuel source under appropriate conditions, such as in a cement kiln with appropriate emissions control equipment, is not prevented by this Regulation. For the avoidance of doubt, tyre burn-outs are not intended to be captured by Regulation 7.

Burning of tyres in the open is low temperature combustion. The resulting incomplete combustion produces a variety of pollutants that have the potential to affect the health of people exposed to the smoke. The main pollutants of concern are:

- smoke and odour
- oxides of nitrogen
- carbon monoxide
- sulphur dioxide
- particulate matter (PM₁₀ and PM_{2.5})
- dioxins
- heavy metals
- volatile organic compounds (VOCs).

Councils can still consider whether to grant consents for discharges into air from tyre burning at an industrial and trade premise provided it has appropriately designed process and emissions control equipment. Regulation 5(2) states that this activity would require a discretionary consent⁵.

Regulation 28 also allows for a regional plan that has a more stringent activity status than the Regulations (ie, non-complying or prohibited) to prevail.

⁵ Regulation 5(2) states that ‘*if a resource consent is granted for an activity, the activity is a discretionary activity for the purposes of the Act*’.

2.2.3 Bitumen burning for road maintenance

Regulation 8 specifies:

- 8 Burning of bitumen**
(1) *The burning of bitumen on a road is prohibited.*

Implementation

This Regulation prohibits the burning of bitumen on a road and has applied from 8 October 2004. Consents cannot be issued for road burning of bitumen.

This ban overrides any ‘exemptions’ that may have been agreed between road controlling authorities and local government. Road controlling authorities now remove bitumen by other methods such as high-pressure water blasting or mechanical scraping. When removing bitumen care should be taken to collect and dispose of any debris and wastewater appropriately.

2.2.4 Burning of coated wire in the open

Regulation 9 specifies:

- 9 Burning of coated wire**
(1) *The burning of wire coated with any material is prohibited.*
(2) *Subclause (1) does not apply if the wire is –*
(a) *burnt at industrial and trade premises that have –*
(i) *a resource consent for the discharge produced; and*
(ii) *emission control equipment that is designed and operated to minimise emissions of dioxins and other toxics from the process; or*
(b) *part of a building that is burnt for the purpose of training firefighters.*

The definition of a firefighter is given in Regulation 3 which states:

***Firefighter** means a member of a fire brigade to which the Fire Service Act 1975 applies, including a member of a defence fire brigade or an industrial fire brigade, within the meaning of that Act.*

Amendments

Regulation 9 was amended, and a definition of firefighter added, in November 2008 to permit the burning of coated wire in a building that is burnt for the purposes of training firefighters.

Implementation

This Regulation bans the burning of coated wire in the open air and has applied since 8 October 2004.

Councils can still consider whether to grant consents for discharges into air from burning of coated wire at an industrial and trade premise provided it has appropriately designed process and emissions control equipment. Regulation 5(2) states that this activity would require a discretionary consent.

Regulation 28 also allows for a regional plan that has a more stringent activity status than the Regulations (ie, non-complying or prohibited) to prevail.

2.2.5 Burning of oil in the open

Regulation 10 specifies:

10 Burning of oil

- (1) *The burning of oil in the open air is prohibited.*
- (2) *Subclause (1) does not apply if –*
 - (a) *the burning is for creating special smoke and fire effects for the purposes of producing films; or*
 - (b) *the burning is for the purpose of training firefighters; or*
 - (c) *Revoked*
 - (d) *the burning is*
 - (i) *done by means of a flare; and*
 - (ii) *for the purpose of undertaking health and safety procedures in the petroleum exploration and production industry or the petrochemical industry; and*
 - (iii) *expressly allowed by a resource consent.*
- (3) *For the avoidance of doubt, subclause (1) does not apply if a discharge from the burning oil is directed to the open air by a stack, chimney, or exhaust pipe (for example emissions from a motor vehicle).*

Oil is defined in Regulation 3 which states:

Oil –

- (a) *means petroleum in any form other than gas; and*
- (b) *includes crude oil, fuel oil sludge, oil refuse, and refined oil products (for example, diesel fuel, kerosene, and motor gasoline)*

Amendments

The definition of oil was amended in December 2004 to specifically exclude gas.

Regulation 10 was amended in August 2005 to remove an exception for frost pots and to provide a new exception for flaring of oil in the petroleum and petrochemical industries.

Regulation 10(2)(b) was amended, and a definition of firefighter added, in November 2008 to clarify that the exemption applied to the training of firefighters.

In June 2011 Regulation 10(d)(3) was amended to align with the words of the RMA and to avoid any confusion with permitted activities.

Implementation

This Regulation bans the burning of any oil in the open and has applied since 8 October 2004. This includes the **open** burning of oil in frost pots (the Regulation is silent on frost pots that operate with a stack or chimney).

The ban does not apply (and no consent is required⁶) for the following activities:

- oil burned in the open for fire training
- creating smoke and fire effects for films.

Regulation 10(d) allows councils to continue to consider whether to grant consents for discharges into air from burning oil in a flare for health and safety reasons in the petroleum or petrochemical industries. Regulation 5(2) states that this activity would require a discretionary consent.

⁶ Unless otherwise specified in a regional plan.

Regulation 28 also allows for a regional plan that has a more stringent activity status than the Regulations (ie, non-complying or prohibited) to prevail.

2.2.6 Incinerators at schools and healthcare institutions

Regulation 11 specifies:

11 Incinerators at schools and healthcare institutions

- (1) *The operation of an incinerator at a school or healthcare institution is prohibited unless a resource consent has been granted for the discharge produced.*

The definition of a healthcare institution given in Regulation 3 relates back to the Health and Disability Commissioner Act 1994. This includes (amongst other things) health camps and facilities that provide chiropractic, dental, fertility, geriatric, gynaecological, rehabilitation, obstetric, osteopathy, maternity, medical, mental health, physiotherapy, and surgical services.

Healthcare institution has the same meaning as in section 2(1) of the Health and Disability Commissioner Act 1994.

Implementation

This Regulation bans the operation of an incinerator at a school or hospital unless a resource consent has been obtained. Regulation 5(2) states that this activity requires a discretionary consent, unless a rule in a regional plan is stricter in which case the regional rule status will prevail (Regulation 28).

The Regulation was intended to eliminate, where feasible, school and hospital incinerators. This is because the majority of these incinerators:

- have no emissions control equipment
- are poorly maintained
- have minimal (if any) fuel controls
- are rarely inspected
- can be significant sources of dioxins and other toxics
- are located close to highly sensitive receptors (i.e. children and sick people).

The Regulation does not apply to school or hospital **boilers**. Waste should not be used as a fuel source or disposed of in boilers.

Councils considering a consent application for an incinerator at a school or hospital **must** consider the application in the context of the ambient air quality standards.

In addition to this, councils should also consider all other products of combustion including:

- visible smoke
- oxides of nitrogen
- carbon monoxide
- sulphur dioxide (depending upon the fuel)
- particulate matter (PM₁₀ and PM_{2.5})
- heavy metals

- volatile organic compounds (VOCs)
- dioxins.

It may be necessary to undertake a health risk assessment from these sources.

Schools

There are 2,570 schools in New Zealand; 2,142 of these are state schools, 332 integrated schools (eg Catholic schools) and approximately 96 are privately run schools (Ministry of Education, 2011).

The Dioxin Inventory (MfE, 2011a) estimates about 90% of school incinerators closed down due to the Regulations banning their use. The 2008 Report on Progress: National Environmental Standards (MfE, 2009b), identified that only 68 schools hold consent for an incinerator. Most of these incinerators are in small rural schools without easy access to waste collection services or a local waste transfer station.

The cost of obtaining a consent for an incinerator can be considerable. This is because toxic emissions typically require a significant level of assessment. The cost of preparing an assessment of environmental effects therefore can be as high (or higher) than the cost of changing to alternative disposal techniques. The majority of schools now use alternative recycling or disposal options.

Healthcare institutions

Medical wastes can be successfully treated by new technologies such as steam sterilisation and autoclaving. For the reasons stated above, hospitals have been strongly encouraged to cease incinerating waste. Subsequent to the ban coming into force in 2006 there are now no incinerators at public hospitals in New Zealand.

2.2.7 High-temperature hazardous waste incinerators

Regulation 12 specifies:

- 12 High-temperature hazardous waste incinerators**
- (1) *The operation of a high-temperature hazardous waste incinerator is prohibited.*
 - (2) *Subclause (1) does not apply if the incinerator –*
 - (a) *is a crematorium; or*
 - (d) *is operating at the following places:*
 - (i) *89 Paritutu Road, New Plymouth;*
 - (ii) *816 Wairakei Road, Christchurch;*
 - (iii) *Hape Drive (perimeter road), Auckland International Airport.*

Regulation 3 defines a high temperature hazardous waste incinerator as:

- High temperature hazardous waste incinerator** *means an incinerator that is designed and operated principally for burning hazardous waste at a temperature greater than 850°C as measured –*
- (a) *near the inner wall of the incinerator; or*
 - (b) *at another point in the combustion chamber where the temperature is likely to represent the temperature in the incinerator*

Hazardous waste is also defined in Regulation 3 as:

- Hazardous waste** *means waste that –*
- (a) *belongs to 1 or more of the categories in Annex I of the Basel Convention; and*

(b) *has 1 or more of the characteristics in Annex III of that Convention.*

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal and its Annexes are given in Appendix 1 of this report and can be viewed at www.basel.int/text/17Jun2010-conv-e.pdf (Secretariat of the Basel Convention, 1992).

Amendments

The definition of hazardous waste was amended in August 2005 to align with the definition of hazardous waste in the Basel Convention.

Implementation

This Regulation prohibits any **new** high temperature hazardous waste incinerators operated for the principle purpose of the destruction of hazardous wastes. It has applied since 8 October 2004. Low temperature incinerators are not included within the Regulation.

An exemption was provided for three high temperature hazardous waste incinerators operating in New Zealand at the time of the Regulation coming into force in 2004. Since then the Christchurch and Auckland incinerators have both closed. The Regulations do not allow any new facilities on other sites. The remaining incinerator in New Plymouth will continue to operate under the terms of its resource consent. Upon the expiry of this consent, the operators can apply for a new consent to continue operating – this is not prohibited by the Regulations. Regulation 5(2) states that the incinerator requires a discretionary consent, unless a rule in the regional plan for Taranaki is stricter in which case the regional rule status will prevail (Regulation 28).

The definition of incinerator is ‘*an incinerator that is designed and operated principally for burning hazardous waste...*’. This Regulation does not apply to metal plants, cement kilns and other industries that burn waste (eg tyres, used oil and pot liners from aluminium smelters) at high temperatures as a fuel source.

The Regulation also does not apply to crematoria, incinerators converting municipal waste to energy, or the vitrification of sewage sludge. Any of these activities are subject to the relevant regional plan rules.

Part 6 of the Biosecurity Act 1993 makes emergency provisions for events such as exotic animal disease outbreaks and other biosecurity risks, such as foot and mouth disease. Accordingly, the Ministry of Agriculture and Forestry can be exempted from Regulation 12.

Similarly, the New Zealand Defence Force has exemption provisions under the RMA. This would include the operation of a specialist ammunition and explosives disposal facility.

2.3 How do the bans work in practice

Regulations 4, 5 and 28 outline how the bans apply.

4 Prohibition on discharges from certain activities

A discharge of a contaminant to air from an activity specified in any of regulations 6 to 12 is prohibited, except to the extent that the regulation provides otherwise.

5 Prohibition on granting of resource consents for certain activities

(1) *A resource consent may not be granted for a discharge of a contaminant to air from an activity specified in any of regulation 6 to 12, except to the extent that the regulation provides otherwise.*

- (2) *If a resource consent is granted for an activity, the activity is a discretionary activity for the purposes of the Act.*

28 *More stringent rule, resource consent or bylaw prevails*

A rule, resource consent, or bylaw that is more stringent than these regulations prevails over the regulations.

National environmental standards are mandatory regulations under the RMA. They automatically supersede controls by local government unless the local government controls are stricter (as provided for by Regulation 28). Regulation 4 states that all activities listed in Regulations 6 to 12 are prohibited except the following:

- school and hospital incinerators
- oil burning in a flare in the petrochemical industry for health and safety
- burning of coated wire at an industrial site provided control equipment is used
- burning of tyres at an industrial site provided control equipment is used.

These activities may be undertaken provided resource consent is obtained. Regulation 5(2) defines the activity status for these activities as requiring a discretionary consent.

Local controls through plan rules, resource consents or bylaws can vary from the national environmental standards – if the local controls are stricter. For example, a council may consider that school incinerators should be banned in its region, rather than be able to operate under a discretionary resource consent.

The status of a resource consent can only be amended by rules in a regional (or unitary) plan. This means that if a council wishes to make an activity non-complying or prohibited (when that activity would normally require a discretionary consent under Regulation 5(2)) then this must be done through a regional plan.

Example 2.1

The operative Splendid Regional Council Air Plan requires burning of tyres outdoors to obtain a discretionary consent and prohibits the use of school incinerators. Therefore:

- *Prior to 8 October 2004*
 - *status of activities is as per the Splendid Regional Council Air Plan*
- *From 8 October 2004*
 - *burning of tyres outdoors is prohibited (by the Regulations)*
 - *use of school incinerators is prohibited (by the regional plan)*
 - *the Splendid Regional Council Air Plan must be amended to reflect the new status of burning of tyres outdoors.*

As a result of the 2009 amendments to the RMA, section 44A(5) of the RMA requires that regional councils **must** remove regional plan rules that are more lenient than the national environmental standards for air quality. Removal of such rules may be carried out without using the detailed processes for plan changes normally required by Schedule 1 of the RMA and must be done as soon as practicable.

The activity bans have been in force for several years now and the National Environment Standard Progress Report (MfE, 2009b) found that *'the implementation of the prohibited activity standards is very good... Councils identified few barriers to implementation, and the*

majority felt that nothing further was needed from the Ministry to assist with effective enforcement.”

2.3.1 Who do the bans affect?

The bans apply to all people undertaking the relevant activities, unless exemptions or resource consent requirements are specified in the Regulations.

Regional councils and unitary authorities are responsible for monitoring and enforcing the bans.

2.3.2 What is the impact on regional plans?

The Regulations are mandatory under the RMA. They automatically supersede any relevant regional plan rules (unless the local government controls are stricter).

As a result of the 2009 amendments to the RMA, section 44A(5) of the RMA requires that regional councils **must** remove regional plan rules that are more lenient than the national environmental standards for air quality. A regional plan cannot allow resource consent for an activity that discharges ambient pollutants that is less stringent than, or conflicts with, the Regulations. Removal of the rule/s must be carried out without using the consultation, notification, hearings and decision processes for plan changes in Schedule 1 of the RMA and must be done as soon as practicable.

Regulation 28 allows for more stringent rules, resource consents or bylaws than Regulation 6 to 12. For example, this means regional plans could prohibit:

- all burning of wire, irrespective of whether it is on an industrial premise or not
- school incinerators and not enable resource consent to be obtained.

This policy advice is true only for the national environmental standards for air quality. Other national environmental standards will have a different relationship with regional plans.

2.3.3 What is the impact on existing resource consents?

The impact the Regulations have on existing resource consents varies depending on:

- the nature of the consent
- when and if a decision has been made
- when it is due for review
- whether the decision (and conditions of consent) are more stringent than the Regulations.

This is set out below – note that these Regulations are not retrospective.

In general regulations override rules in a regional plan or a resource consent unless the plan or resource consent has stricter controls (section 43B(1) of the RMA). The following sub sections of section 43B are relevant in terms of resource consents:

- (5) *A land use consent or a subdivision consent **granted before the date** on which a national environmental standard is notified in the Gazette **prevails over the standard.***

- (6) A coastal, water, or discharge permit **granted before the date** on which a national environmental standard is notified in the Gazette **prevails over the standard until** a review of the permit's conditions under section 128(1)(ba) results in some or all of the standard prevailing over the permit.
- (7) This subsection applies to a resource consent not covered by subsection (5) or (6). The consent **prevails over a national environmental standard** if the application giving rise to the consent was the subject of a decision on whether to notify it before the date on which the standard is notified in the Gazette. However, the consent **does not prevail** if the standard expressly provides otherwise.

2.4 Enforcement

Section 30(1)(f) of the RMA requires regional councils to control the discharges of contaminants into air. In relation to the Regulations sections 44A(7) and (8) of the RMA require that:

- (7) Every local authority and consent authority must observe national environmental standards.
- (8) Every local authority and consent authority must enforce the observance of national environmental standards to the extent to which their powers enable them to do so.

There is therefore an obligation on regional councils to control discharges to air so as to comply with the Regulations. Any council that does not undertake the requirements in the Regulations, or fails, without good reason, to address the issue of enforcement, will be considered to be failing to meet its responsibilities under the RMA.

2.4.1 What enforcement tools are available to councils?

A summary of the enforcement tools available to councils is given below. This list is not exhaustive and any council considering enforcement action should always seek legal advice prior to undertaking the enforcement action.

Abatement Notices (Local Authority)

Section 322 enables Abatement notices to be issued as set out below:

Scope of abatement notice

- (1) An abatement notice may be served on any person by an enforcement officer—
 - (a) requiring that person to cease, or prohibiting that person from commencing, anything done or to be done by or on behalf of that person that, in the opinion of the enforcement officer,—
 - (i) contravenes or is likely to contravene this Act, **any regulations**, a rule in a plan, or a resource consent; or
 - (ii) is or is likely to be noxious, dangerous, offensive, or objectionable to such an extent that it has or is likely to have an adverse effect on the environment

Accordingly regional councils can issue an abatement notice in respect of a contravention of the Regulations.

Enforcement Order (Environment Court)

Section 319 of the RMA enables an application to be made for an Enforcement Order. If an Enforcement Order is made under section 214 of the RMA the Environment Court can require:

314 Scope of enforcement order

- (1) An enforcement order is an order made under section 319 by the Environment Court that may do any 1 or more of the following:
- (a) require a person to cease, or prohibit a person from commencing, anything done or to be done by or on behalf of that person, that, in the opinion of the court,—
 - (i) contravenes or is likely to contravene this Act, **any regulations**, a rule in a plan, a rule in a proposed plan, a requirement for a designation or for a heritage order, or a resource consent, section 10(certain existing uses protected), or section 20A (certain existing lawful activities allowed); or
 - (ii) is or is likely to be noxious, dangerous, offensive, or objectionable to such an extent that it has or is likely to have an adverse effect on the environment.

Environmental Infringement Notices (Local Authority)

Environmental Infringement Notices (EINs) are instant fines under the RMA.

343A Infringement offences

In sections 343B to 343D —

infringement offence means an offence specified as such in regulations made under section 360(1)(ba).

Section 360 - Regulations

- (1) The Governor-General may from time to time, by Order in Council, make regulations for all or any of the following purposes
- (ba) prescribing those offences under this Act that constitute infringement offences against this Act

Schedule 1 of the Resource Management (Infringement Offences) Regulations 1999 states that EINs can be issued for contravening section 15 of the RMA. Section 15 of the RMA states:

15 Discharge of contaminants into environment

- (1) No person may discharge any—
- (a) contaminant or water into water; or
 - (b) contaminant onto or into land in circumstances which may result in that contaminant (or any other contaminant emanating as a result of natural processes from that contaminant) entering water; or
 - (c) contaminant from any industrial or trade premises **into air**; or
 - (d) contaminant from any industrial or trade premises onto or into land—
unless the discharge is **expressly allowed by a national environmental standard** or other regulations, a rule in a regional plan as well as a rule in a proposed regional plan for the same region (if there is one), or a resource consent.
- (2) No person may discharge a contaminant **into the air**, or into or onto land, from a place or any other source, whether moveable or not, in a manner that contravenes a **national environmental standard** unless the discharge—
- (a) is expressly allowed by other regulations; or
 - (b) is expressly allowed by a resource consent; or
 - (c) is an activity allowed by section 20A.
- (2A) No person may discharge a contaminant **into the air**, or into or onto land, from a place or any other source, whether moveable or not, in a manner that contravenes a regional rule unless the discharge—
- (a) is expressly allowed by a **national environmental standard** or other regulations; or
 - (b) is expressly allowed by a resource consent; or
 - (c) is an activity allowed by section 20A.

The National Environmental Standard Progress Report (MfE, 2009b) identified that councils around New Zealand had issued 18 abatement notices, 81 EINs and undertaken two prosecutions for non-compliance with Regulations 6 to 12.

2.5 Reporting requirements

The Minister for the Environment may, under section 27 of the RMA, request information on the implementation of the Regulations from regional councils at any time. Councils have 20 working days to respond.

3 Ambient Air Quality Standards for Carbon Monoxide, Nitrogen Dioxide, Ozone and Sulphur Dioxide

3.1 Introduction

This section discusses the national ambient air quality standards (ambient standards) for New Zealand and provides guidance on how they should inform management of air quality under the RMA. The primary purpose of the ambient standards is to provide a guaranteed level of protection for the health of all New Zealanders. The ambient standards (see section 3.3) were based largely upon the 2002 Ambient Air Quality Guidelines (MfE, 2002a) and the relationship between the two is discussed in section 3.3.2.

The PM₁₀ Regulations were significantly modified by the 2011 amendments. To highlight the revisions, PM₁₀ has been removed from this chapter and placed in a separate chapter (Chapter 4). The revisions include split dates for achieving the PM₁₀ ambient standards (section 4.4), ‘offset’ conditions for new consents (section 4.10.2) that discharge PM₁₀ in ‘polluted’ airsheds (section 4.10.1) and detailed monitoring requirements (section 4.6).

The ambient standards are the minimum requirements that outdoor air quality should meet in order to guarantee a set level of protection for human health and the environment. The standards are *ambient*, that is, they apply outdoors. Details of where the ambient standards do and do not apply are given in section 3.4.

The Regulations place a requirement on regional councils to monitor air quality and to report exceedances to the public. Regional councils are not required to monitor for each of the five ambient standards everywhere; councils only need to monitor those contaminants likely to be exceeded in each airshed. Minimum monitoring requirements for effective air quality management are outlined in section 3.5.

In August 2005, the definition of an airshed was amended so that all regions of New Zealand are airsheds and the ambient standards apply everywhere. In addition to this, the Minister of the Environment has gazetted separate airsheds inside each region on behalf of the regional councils and unitary authorities (see section 3.4.1). Generally, these separate airsheds are areas that are known, or likely, to breach the ambient standards and to which resource consent restrictions apply.

The Regulations have different requirements for different pollutants when making decisions on resource consent applications. Details of the regulatory requirements for each contaminant are given in section 3.9.1 (carbon monoxide, nitrogen dioxide and ozone) and section 3.9.2 (sulphur dioxide).

The June 2011 amendments changed the definition of permissible exceedances and made explicit provision for exceptional events.

Section 3.11 focuses on the implementation of the Regulations and outlines how they will work in practice for regional councils and territorial authorities. Additional discussion on resource consents is provided in section 3.10.4 (existing consents) and section 3.10.5 (new consents).

3.2 Adverse effects

3.2.1 Carbon monoxide (CO)

Carbon monoxide is a colourless, odourless and tasteless gas and is produced both by natural processes (eg, volcanoes, fires and metabolism of organisms) and by human activities (eg, incomplete combustion of carbon-containing fuels and industrial processes). The most common sources of carbon monoxide are from the incomplete combustion of fossil fuels such as petrol used by cars, and from wood and coal, which is commonly burnt in fires for home heating (domestic fires). Tobacco smoke and indoor gas fires are also common sources of carbon monoxide.

Carbon monoxide interferes with the blood's ability to absorb and circulate oxygen in the body. It is relatively toxic. Low exposure to carbon monoxide can cause dizziness, nausea, confusion and disorientation and can also reduce performance while doing exercise. At very high levels loss of consciousness, collapse, coma and death can occur. Middle-aged and elderly people with heart disease and the foetuses of pregnant women are the groups most sensitive to carbon monoxide.

Carbon monoxide levels are generally highest in urban areas along, or close to, busy roads. Carbon monoxide can cause localised effects along congested roads and urban-wide effects during winter temperature inversion conditions.

3.2.2 Nitrogen dioxide (NO₂)

Nitrogen dioxide is a reddish-brown, pungent, acidic gas that is corrosive and strongly oxidising. Nitrogen dioxide is not usually discharged directly into air. Rather, nitrogen dioxide forms when nitrogen oxide (NO) and other nitrogen oxides (NO_x) react with other chemicals in the air to form nitrogen dioxide (NO₂). The main source of anthropogenic nitrogen dioxide is the combustion of fossil fuels (coal, gas and oil), especially petrol used in cars. In Auckland, transport contributes 83% of ambient nitrogen dioxide (ARC, 2006).

The main health effect of nitrogen dioxide is on the respiratory system. Nitrogen dioxide can decrease the lungs' defences against bacteria, making them more susceptible to infections, and can also aggravate asthma. Young children, asthmatics of all ages (but especially children), and adults with heart and respiratory disorders are most sensitive to nitrogen dioxide.

Research shows there is an association between nitrogen dioxide concentrations in the air and increases in daily mortality and hospital admissions for respiratory disease. However, the health effects of nitrogen dioxide can be difficult to separate from those of particulate matter because they come from the same sources and are generally always present together (i.e, they are highly correlated). The World Health Organisation (2006) concluded that:

The Southern California Children's Health Study provides evidence of the effect of nitrogen dioxide on lung function growth, and suggests that lung function values below the 80% predicted might be as much as five times more likely in polluted communities than in communities with low pollution. Given the fact that lung function values persist throughout life, these decrements will have a lifelong impact on the health of those affected. Evidence from Europe supports an association between nitrogen dioxide and lung function in adults. However, doubt remains as to whether those effects are attributable to nitrogen dioxide per se, as other highly correlated measures of traffic-related PM showed associations of similar strength.

Nitrogen dioxide can cause brown haze and reduce visibility. Nitrogen dioxide at high concentrations is also toxic to plants and can be corrosive to building materials.

Nitrogen dioxide can be both a localised problem around congested roads and also an urban-wide problem from a variety of combustion sources.

3.2.3 Ozone (O₃)

Ozone is a secondary pollutant formed by the photochemical reaction of primary pollutants nitrogen oxides and volatile organic compounds (VOCs) and often produces photochemical smog. The primary pollutants are produced mainly from motor-vehicle emissions, other combustion sources, and industrial and domestic use of solvents and coatings.

Studies show a wide variety of health effects from exposure to ozone including increased daily mortality, respiratory and cardiovascular disease.

In the short term (up to 8 hours) ozone induces lung function decrements including cough, pain on deep inspiration and shortness of breath. These effects are reversible, with improvement and recovery to baseline varying from a few hours to 24 to 48 hours after an elevated ozone exposure. Ozone can also cause irritation to eyes, nose and throat, headaches and it contributes to asthma.

Current thinking is that both symptom and lung function changes are due to stimulation of airway neural receptors and transmission to the central nervous system via afferent vagal nerve pathways (USEPA, 2011a). Although ozone exposure results in some airway narrowing, neural inhibition of inspiratory effort at high lung volumes is believed to be the primary cause of the predominant physiological effect, being unable to inhale to total lung capacity.

The groups most sensitive to ozone are people with asthma and lung disease, healthy adults exercising for long periods of time outdoors, and older people, particularly those with heart disease.

There is some preliminary epidemiologic evidence that long-term ozone exposure may result in the induction of new asthma (USEPA, 2011a). This is supported by animal toxicological evidence that co-exposure to ozone can enhance sensitisation to known allergens. New data in nonhuman primates also indicate that exposure very early in life during respiratory tract maturation may have profound effects upon the distribution and function of various cell types in the airway. This suggests that young children may be especially susceptible to effects of ozone on lung development.

Ozone and other chemicals formed by photochemical reactions are also toxic to plants in high concentrations. They can affect photosynthesis and plant respiration, reduce growth rates, and affect reproduction. Ozone is corrosive to most materials at high concentrations, including plastics and metals. Photochemical reactions in the atmosphere produce fine particles, such as sulphates, nitrates and organic aerosols in the air. These contaminants scatter light and can affect visibility.

Because ozone forms over time, the highest concentrations are usually found in areas away from the urban areas such as major cities where the primary pollutants are released.

3.2.4 Sulphur dioxide (SO₂)

Sulphur dioxide is a colourless, soluble gas with a characteristic pungent smell, which forms sulphuric acid when combined with water. Sulphur dioxide is produced mainly from the combustion of sulphur containing fossil fuels such as coal and oil (eg, ships burning heavy fuel oil or coal being burnt in a domestic fire). Sulphur dioxide is also produced from some industrial processes, such as fertiliser manufacturing, aluminium smelting and steel making. Natural sources of sulphur dioxide include geothermal activity and volcanoes.

Sulphur dioxide can cause respiratory problems, such as bronchitis, and it can irritate the nose, throat and lungs. It may cause coughing, wheezing, phlegm and asthma attacks. The effects are exacerbated by exercising. Healthy children, adults with lung disease and asthmatics are the groups most sensitive to sulphur dioxide.

Historically, day-to-day changes in mortality, morbidity or lung function associated with 24-hour average concentrations of sulphur dioxide were based on epidemiological studies in which people were exposed to a mixture of pollutants. It was difficult, therefore, to separate the contributions of each to the effects. More recent evidence, however, shows separate and independent adverse public health effects for particulate matter and sulphur dioxide. An important Hong Kong study showed a substantial reduction in all-age mortality and childhood respiratory disease following a reduction in short-term sulphur dioxide levels due to major reductions in the sulphur content of fuel (WHO, 2006). Other studies in Canada and the US show no evidence for a sulphur dioxide threshold concentration (ie, levels below which no effects were observed). This has led to a significant revision downwards of the World Health Organisation guideline for sulphur dioxide (WHO, 2006).

Sulphur dioxide can cause problems over urban areas or more locally around industrial discharges.

3.3 The ambient air quality standards

3.3.1 What are the ambient standards?

13 *Ambient air quality standards*

- (1) *The ambient air quality standard for a contaminant specified in the first column of the table in Schedule 1 is that the contaminant must not exceed its threshold concentration in an airshed unless the exceedance is a permissible exceedance.*
- (2) *The ambient air quality standard for a contaminant is breached if the contaminant exceeds its threshold concentration in an airshed and the exceedance is not a permissible exceedance.*
- (3) *In these regulations, -*
 - exceedance**, for a contaminant, means an instance where the contaminant exceeds its threshold concentration in an airshed*
 - permissible exceedance**, for a contaminant, means 1 of the number of exceedances allowed for the contaminant in an airshed as specified in the third column of the table in Schedule 1*
 - threshold concentration**, for a contaminant, means the concentration of the contaminant specified in the second column on the table in Schedule 1 calculated as a mean for the time period specified in the column.*

Schedule 1

Ambient air quality standards for contaminants

In the following table,---

1-hour mean---

- (a) means a mean calculated every hour on the hour for the preceding hour; and
- (b) in relation to a contaminant at a particular location for a particular hour, means the mean of not more than 10-minute means, collected not less than once every 10 seconds, for the contaminant at that location during that hour

24-hour mean---

- (a) means a mean calculated every 24 hours at midnight for the preceding 24 hours; and
- (b) in relation to a contaminant at a particular location for a particular 24-hour period, means---
 - (i) the mean level at which the contaminant is recorded in the air, by continuous sampling of the air at that location, throughout that 24-hour period; or
 - (ii) the mean of the 1-hour means for that contaminant at that location for the preceding 24 hours

running 8-hour mean---

- (a) means a mean calculated every hour on the hour for that hour and the preceding 7 hours to give 1 running 8-hour mean per hour; and
- (b) in relation to a contaminant at a particular location for a particular hour, means the mean of the 1-hour means for that contaminant at that location for that hour and the preceding 7 hours.

| Contaminant | Threshold concentration | Number of exceedances allowed |
|-------------------------------------|--|--------------------------------------|
| Carbon monoxide (CO) | 10 milligrams per cubic metre expressed as a running 8-hour mean | 1 in a 12-month period |
| Nitrogen dioxide (NO ₂) | 200 micrograms per cubic metre expressed as a 1-hour mean | 9 in a 12-month period |
| Ozone (O ₃) | 150 micrograms per cubic metre expressed as a 1-hour mean | None |
| PM ₁₀ | 50 micrograms per cubic metre expressed as a 24-hour mean | 1 in a 12-month period |
| Sulphur dioxide (SO ₂) | 350 micrograms per cubic metre expressed as a 1-hour mean 570 micrograms per cubic metre expressed as a 1-hour mean | 9 in a 12-month period None |

Schedule 1 of the Regulation sets out ambient air quality concentration limits for the following pollutants:

- carbon monoxide (CO)
- nitrogen dioxide (NO₂)
- ozone (O₃)
- particulate matter that is less than 10 micrometres in diameter (PM₁₀), discussed in Chapter 4
- sulphur dioxide (SO₂).

As detailed in Regulation 13, the ambient air quality standards comprise these concentrations specified for a particular time average with a specified number of permissible exceedances each year. Table 3 summarises the ambient air quality standards that apply.

Table 3: Ambient air quality standards from 1 September 2005

| Pollutant | Threshold concentration | Time average | Allowable exceedances in 12-month period |
|-------------------------------------|-------------------------|------------------------|--|
| Carbon monoxide (CO) | 10 mg.m ⁻³ | 8-hours (running mean) | 1 |
| Nitrogen dioxide (NO ₂) | 200 µg.m ⁻³ | 1-hour | 9 |
| PM ₁₀ | 50 µg.m ⁻³ | 24-hours | 1 |
| Ozone (O ₃) | 150 µg.m ⁻³ | 1-hour | 0 |
| Sulphur dioxide (SO ₂) | 350 µg.m ⁻³ | 1-hour | 9 |
| | 570 µg.m ⁻³ | 1-hour | 0 |

The Regulations summarised in table 3 specify the following:

- an ambient air quality concentration of 10 mg.m⁻³ (eight hour average) for carbon monoxide (CO) to be met for all but one running eight-hour period each year.
- an ambient air quality concentration limit of 200 µg.m⁻³ (one hour average) for nitrogen dioxide (NO₂) to be met for all but nine hours each year
- an ambient air quality concentration limit of 150 µg.m⁻³ (one hour average) for ozone (O₃) to be met 100% of the time with no allowable exceedances
- an ambient air quality concentration limit of 50 µg.m⁻³ (24 hour average) for PM₁₀, to be met for every day of the year but one
- an ambient air quality concentration limit of 350 µg.m⁻³ (one hour average) for sulphur dioxide (SO₂) to be met for all but nine hours each year
- an ambient air quality concentration limit of 570 µg.m⁻³ (one hour average) for SO₂ to be met 100% of the time with no allowable exceedances.

The ambient standards came into force on 1 September 2005.

Amendments

In June 2011, Regulation 13 and Schedule 1 were amended to clarify permissible exceedances. These impact on the PM₁₀ ambient standards and are discussed further in Chapter 4.

3.3.2 What about the *Ambient Air Quality Guidelines*?

The ambient standards were based on the current 2002 Ambient Air Quality Guidelines (MfE, 2002a). These guidelines were developed following a comprehensive review of international and national research, and were widely accepted amongst New Zealand practitioners at the time of publication. It is important to understand how the ambient standards and guidelines fit together in the regulatory framework.

The Ambient Air Quality Guidelines were published by the Ministry for the Environment as guidance under the RMA. They detail the minimum requirements that outdoor air quality should meet in order to protect human health and the environment.

Recommended levels in the *Ambient Air Quality Guidelines* still apply for pollutants (and averaging periods) not covered by the ambient standards. However, the ambient standards replace any previous guidelines for that particular pollutant and averaging period.

Table 4 below shows how the ambient standards for CO, NO₂, SO₂ and O₃ compare with the Ambient Air Quality Guidelines.

Table 4: Ambient air quality standards compared to Ambient Air Quality Guidelines

| Pollutant | Averaging Time | Ambient Standard from the National Environmental Standards for Air Quality 2004 | | Ambient Air Quality Guidelines (2002) |
|-------------------------------------|----------------|---|--|---------------------------------------|
| | | Value | Permissible Exceedances in a 12-month period | Value |
| Carbon Monoxide (CO) | 1-hour | - | - | 30 mg.m⁻³ |
| | 8-hour | 10 mg.m ⁻³ | 1 | 10 mg.m ⁻³ |
| PM ₁₀ | 24-hour | 50 µg.m ⁻³ | 1 | 50 µg.m ⁻³ |
| | Annual | - | - | 20 µg.m⁻³ |
| Nitrogen Dioxide (NO ₂) | 1-hour | 200 µg.m ⁻³ | 9 | 200 µg.m ⁻³ |
| | 24-hour | - | - | 100 µg.m⁻³ |
| Ozone (O ₃) | 1-hour | 150 µg.m ⁻³ | 0 | 150 µg.m ⁻³ |
| | 8-hour | - | - | 100 µg.m⁻³ |
| Sulphur Dioxide (SO ₂) | 1-hour | 350 µg.m ⁻³ | 9 | 350 µg.m ⁻³ |
| | 1-hour | 570 µg.m ⁻³ | 0 | 570 µg.m ⁻³ |
| | 24-hour | - | - | 120 µg.m⁻³ |

Where air pollution levels exceed guideline values, emission reduction strategies should be implemented to improve air quality. Where levels do not exceed the values, efforts should be made to maintain air quality and, if possible, reduce emissions. These recommendations still apply to pollutants not included within the ambient standards.

In addition to setting quantitative guidelines, the Ambient Air Quality Guidelines outline good practice guidance on the amount and location of monitoring, evaluating reduction strategies and so on. This guidance is still valid but it has been expanded with the introduction of the ambient standards.

3.3.3 What about other documents?

The ambient standards provide a mandatory baseline for air quality protection for all New Zealanders. They override any *less stringent* requirements in other documents including regional plans and other Ministry Good Practice Guides (GPGs). However, in the interests of protecting public health, councils may wish to make more stringent provisions in regional plans or apply more stringent criteria to resource consent applications, based on other research, guidelines or publications.

Regional Plans

Regulation 28 allows for a regional plan that has more stringent rules than the Regulations to prevail. That is, lower concentration levels or different averaging times that are given in regional plans will apply. Several regional councils (eg, Auckland Council, Otago Regional Council, and Greater Wellington) have more stringent regional requirements for ambient pollutants.

Guideline levels in regional plans for pollutants (and averaging periods) if more stringent, or not covered by, the ambient standards still apply.

As a result of the 2009 amendments to the RMA, section 44A(5) of the RMA requires that regional councils **must** remove regional plan rules that are more lenient than, or are in conflict with, the national environmental standards for air quality (ie, guideline levels more lenient than the ambient standards must be removed). Removal may be carried out without using the detailed processes for plan changes normally required by Schedule 1 of the RMA and must be done as soon as practicable.

Review of ambient standards

During the review of the PM₁₀ Regulations in 2009 and 2010, the Technical Advisory Group and various submitters requested consideration of **additional ambient standards**. The principal requests were to consider:

- an annual average standard for PM₁₀ to reflect long-term health effects
- ambient standards for PM_{2.5} (which has stronger associations with adverse health effects and less natural sources than PM₁₀⁷).

The Minister for the Environment signalled the possibility of future consideration of the standards (Minister for the Environment, 2011) and a review of the national ambient air quality guidelines.

In 2006, the World Health Organisation (WHO) revised downwards the global daily guideline for sulphur dioxide to reflect new epidemiological findings which show severe adverse effects at lower concentrations (WHO, 2006). The WHO guideline is 20 µg.m⁻³ (24-hour average).

3.4 Where do the ambient standards apply?

Regulation 14 states where the ambient standards apply.

14 Application of standards

- (1) *The ambient air quality standard for a contaminant applies at any place –*
 - (a) *that is in an airshed; and*
 - (b) *that is in the open air; and*
 - (c) *where people are likely to be exposed to the contaminant.*
- (2) *However, if the discharge of a contaminant is expressly allowed by a resource consent, the ambient air quality standard for the contaminant does not apply to the site on which the resource consent is exercised.*

The Regulations define an airshed as follows:

airshed means –

- (a) *the region of a regional council excluding any area specified in a notice under paragraph (b);*
- (b) *a part of the region of a regional council specified by the Minister by notice in the Gazette to be a separate airshed.*

The ambient standards apply to all regions of New Zealand. The ambient standards **apply in the open air everywhere people may be exposed**. They do not apply indoors.

Areas which are in the open air and where the ambient standards **do apply** include:

⁷ Despite its very small size PM₁₀ includes a variety of natural sources such as pollen, sea salt and wind-blown dusts. The majority (but not all) of these sources are larger than PM_{2.5}.

- residential areas *outside* houses
- roadside verges
- rural areas
- parks, beaches, lakes and coastal marine area
- central business areas *outside* offices and shops
- industrial areas.

Areas which are not in the open air and where the ambient standards **do not apply** include:

- *inside* buildings such as houses, offices, schools or day care centres
- *inside* tunnels
- *inside* vehicles.

Sites which have resource consents

The ambient standards **do not apply on-site** to sites to which resource consents apply for that discharge. The ambient standards **do apply off-site** to sites to which resource consents apply, ie, they apply everywhere other than on the site on which the consent is exercised.

Example 3.1

Acme Cement operate a cement kiln with emission limits specified in their resource consent for discharges of carbon monoxide (CO). Therefore:

- *the ambient standard for CO does not apply within the area to which Acme's resource consent applies (typically this is the site boundary). The workers on the Acme site are protected under health and safety legislation*
- *at the garden centre next door (which does not have a resource consent condition relating to CO), the ambient standard for CO does apply. This protects the health of everyone at the garden centre (eg, garden centre employees and customers) from any exposure to emissions of CO from Acme.*

Amendments

The definition of airsheds and Regulation 14 were amended in August 2005 to clarify the application of the ambient standards.

Regulation 14(2) was amended in June 2011 to align with the words of the RMA and to avoid any confusion with permitted activities.

3.4.1 Airsheds

The Regulations attach monitoring, reporting, and consent decision requirements to airsheds. In this context, the term 'airshed' as used in the Regulations is more like an 'air quality management area' rather than a strictly science-based concept of an airshed (although in many instances the two are equivalent).

Regional councils and unitary authorities have identified and made public (through the *New Zealand Gazette*) areas to be managed as airsheds for the purposes of the Regulations. The majority of these are known, or likely, to have levels of pollutants that exceed the national environmental standards for air quality. Some airsheds are also identified based on factors such as:

- the number of people living in the airshed now or in the future
- the airsheds unique weather patterns and geography
- because local air emissions (eg, local industrial activity) need to be managed separately.

Generally, these gazetted airsheds are very close to the strict science-based definition of an airshed (ie, a geographical area within which air pollution can be retained for an extended period). However, regional councils can group together areas with similar meteorological and emission characteristics for management purposes and to minimise monitoring costs. Otago Regional Council used this approach in 2005 when it gazetted four airsheds that each contained a number of geographically separate towns and cities (eg, Otago Airshed 1 includes Arrowtown, Alexandra, Clyde, Cromwell, Naseby, Ranfurly and Roxburgh).

At the time of writing (July 2011), there are 71 airsheds that have been created by notice in the *New Zealand Gazette*. Of these 71 airsheds:

- 22 currently exceed the PM₁₀ standard
- one to four exceed, or may exceed, the nitrogen dioxide standard (eg, Auckland and Hamilton)
- around five have exceeded the sulphur dioxide standard on occasion or require management of sulphur dioxide (eg, Marsden Point, Tauranga, and Christchurch)

The remainder are gazetted to manage PM₁₀ either now, or in the future. There are no airsheds that have been gazetted to manage ambient carbon monoxide or ozone.

These airsheds were designated through recommendations by regional councils and unitary authorities to the Minister. They extend upwards from ground level, with no specified upper limit, and include coastal marine areas. To date, approximately 1.5 per cent of New Zealand's total land area has been gazetted as an airshed. This equates to an area in which an estimated two-thirds of New Zealand's population live. Areas outside airsheds are generally sparsely populated, and, as a result, little monitoring occurs in the rural environment and areas free from emissions caused by human activity.

Detailed maps of all gazetted airsheds are held in Landonline, New Zealand's authoritative database for land title and survey information.⁸ Copies of the plans are available to the public via Landonline terminals in Land Information New Zealand (LINZ) offices, or through anyone with online access, such as property professionals (eg, surveyors and lawyers). Many territorial authorities have access to Landonline. Additionally, copies are available from LINZ in pdf format for a small fee.

Summary maps of gazetted airsheds are available on the Ministry for the Environment website at www.mfe.govt.nz

Can airsheds be amended?

It is possible to amend airsheds, or create new ones, and this has occurred in a number of regions. All amendments to airsheds must be published in the *New Zealand Gazette* managed by the Department of Internal Affairs. Should a regional council wish to amend their regions airsheds then provision of the new airsheds in format suitable for Landonline needs to be

⁸ Note that under the *Cadastral Survey Act 2002*, "land" includes subsoil, airspace and water and marine areas, and also includes interests in or over land. Official website for landonline: www.landonline.govt.nz

provided to the Ministry for the Environment. The Ministry will then request this is notified in the *Gazette*. The full process for gazetting airsheds is given in Appendix 2.

For up to date information on airsheds (including any potential changes to airsheds), readers are referred to the regional council in question.

Gazetted airsheds are purely for management purposes. The Regulations state that everywhere is an airshed within a regional council's boundaries. However, monitoring is not required where it is unlikely that an airshed will breach an ambient standard (Regulation 15). This is the case for areas outside those that have been gazetted as separate airsheds.

It is important for clarity for the public that where a regional plan refers to airsheds that the boundaries of the airsheds are the same for both the regional plan and those gazetted under the Regulations. At time of writing this was not the case of Otago Regional Council which has differences between airsheds gazetted for the purposes of the Regulations to those promulgated in the regional plan.

3.5 Monitoring

Regulation 15 requires the following:

- 15 Regional council must monitor air quality if standard breached**
If it is likely that the ambient air quality standard for a contaminant will be breached in an airshed, the regional council must –
- a. *monitor the airshed in relation to that contaminant; and*
 - b. *conduct the monitoring –*
 - (i) *in that part of the airshed where –*
 - A. *there are one or more people; and*
 - B. *the standard is breached by the greatest margin or the standard is breached the most frequently, whichever is more likely; and*
 - (ii) *in accordance with the relevant method listed in Schedule 2.*

Councils must undertake an assessment of each airshed within their region for each contaminant within the ambient standards to determine:

- a. whether the ambient standard is likely to be 'breached'
- b. who is likely to be exposed if a breach occurs
- c. where the most appropriate location for a representative monitor is.

Further guidance on monitoring is provided in the Ambient Air Quality Guidelines (MfE 2002a) and the Good Practice Guide for Air Quality Monitoring and Data Management 2009 (MfE, 2009a).

3.5.1 Is the ambient standard likely to be 'breached'?

Regional councils, if they have not already, need to undertake an assessment of each airshed within the region for each ambient contaminant to determine whether the relevant ambient standard given in Schedule 1 of the Regulation is likely to be breached.

Where possible, it is preferable that ambient monitoring data is used to determine the status of each airshed. However, ambient monitoring is expensive and may not be efficient and cost

effective especially where pollutant levels are unlikely to be high. Alternative methods to determine the status of an airshed include:

- Short-term ambient monitoring
- Emission inventories
- Proxy monitoring
- Modelling

If an airshed is likely to breach an ambient standard then Regulation 15 requires ambient monitoring to be undertaken until such time as it can be shown that a breach is no longer likely.

If it is unlikely that the airshed will breach an ambient standard concentration limit, then the airshed does not have to be monitored for the purposes of the Regulation.

3.5.2 Who would be exposed?

Monitoring for compliance with the ambient standards must be undertaken **where people are likely to be exposed**.

In terms of population exposure, consideration should be given to both **intensity** and **duration** of exposure and **how many people** are exposed. For example, an area with only a small population may experience extremely high levels but only on odd occasions, whereas another area with a large population may have lower levels of pollution but be consistently elevated. In such cases, assessing the ‘worst’ exposure requires a judgement call by the council.

It is recommended that regional councils undertake a review of each monitoring site to determine what type of exposure is occurring at each site and justifying any judgement calls they have made. The review should also include a review of whether monitors are appropriately located, whether new locations are required, and whether there are sufficient monitors within the airshed to determine population exposure.

3.5.3 Location of representative ‘worst’ monitoring sites

The Regulations stipulate that monitoring must be carried out where:

- **people are exposed**
- the ambient standards are most likely to be **breached by the greatest margin or** with the **most frequency**, whichever is more likely.

The most common interpretation of this is that the Regulations place an onus on councils to monitor in the ‘**worst**’ location. That is, the monitor must be located at a site that is representative of where air pollution for the contaminant being monitored is likely to cause the *most* effects on people.

In reality, however, practical considerations such as site security and access to electricity can significantly narrow the eligibility of monitoring site locations. It is recommended that site selection be documented in a transparent way and include, where necessary, the reasons why a chosen site varies from an optimal site and what the potential impact on the results may be.

All monitoring locations should comply, as far as practicable, with the recommended site categories described in the Ministry for the Environment’s Good Practice Guide for Air Quality

Monitoring and Data Management 2009 (MfE, 2009a). More guidance on worst locations and potential conflicts when siting instruments is given in Australian/New Zealand Standard AS/NZS 3580.1.1:2007 *Methods for Sampling and analysis of ambient air – Guide to siting air monitoring equipment*.

Bay of Plenty Regional Council's selection process for the Edmund Road monitoring site in Rotorua is a good example of finding a representative 'worst' monitoring location. This site was determined using preliminary monitoring supported by a domestic heating survey, Rotorua's emission inventory and dispersion modelling (Iremonger, 2010).

Proxy airshed monitoring

Regions may be split into multiple airsheds or, conversely, multiple areas that are geographically separate can be designated as one airshed. If a council chooses to classify a number of differing parts of its region as one airshed area (eg, three towns of a similar size and nature), monitoring will need to be undertaken in the town that is likely to breach the ambient standard by the greatest margin or where it is breached most frequently (the 'proxy' monitor). Monitoring data from this town will then be representative of the air quality in the other towns included within the same airshed.

Otago Regional Council's Airshed 1 (which includes the towns of Arrowtown, Alexandra, Clyde, Cromwell, Naseby, Ranfurly and Roxburgh) is an example of proxy airshed monitoring. At the time of writing, PM₁₀ monitors were only located in Arrowtown, Alexandra, Clyde and Cromwell. The results from these monitors are therefore used as proxy results for Naseby, Ranfurly and Roxburgh.

If two or more of the towns within the airshed have a monitor then these must be dealt with as multiple monitors within an airshed as discussed below.

Example 3.2

The Super Hot Regional Council has created the Combined Airshed, which includes Funtown and Sleepytown. The airshed only has one PM₁₀ monitor - in Funtown. The monitor recorded 15 exceedances of the ambient PM₁₀ standard of 50 µg.m⁻³ (24-hour average) in Funtown. The standard only allows 1 exceedance in a 12-month period. Therefore:

- *the monitor has recorded breaches of the ambient PM₁₀ standard*
- *the Combined Airshed has recorded 14 breaches (15 recorded - 1 allowed = 14 breaches) of the ambient PM₁₀ standard and is not complying with the Regulations*
- *both Funtown and Sleepytown are deemed to have 15 exceedances (or 14 breaches) of the ambient PM₁₀ standard*
- *the breaches must be notified in accordance with Regulation 16.*

Multiple monitors within an airshed.

Large airsheds (eg, Auckland) or airsheds with complex terrain or source characteristics (eg, Nelson) may require several monitors. This can mean that several monitors within an airshed may record exceedances of the ambient standard on the same (or different) averaging periods.

Airsheds with multiple towns (proxy airsheds) as discussed above may also have two, or more, towns that have monitors in them. These are still considered to be multiple monitors within an airshed.

For the purpose of compliance with the Regulations the airshed is deemed to have exceeded the standard if **one or more monitors within the airshed exceed the standard on any one averaging period**. This is recorded as only one exceedance for each averaging period irrespective of how many monitors record the exceedance (at the same time). In accordance with the intent of Regulation 15(b)(i)(B), the value to be used should be the highest recorded by any monitor during the averaging period.

Example 3.3

The Blistering Hot Regional Council has created the Mega Airshed. The airshed has three PM₁₀ monitors (Monitor1, Monitor2 and Monitor3) located in three densely populated centres within the airshed. In a 12-month period, Monitor1 recorded an exceedance of the ambient PM₁₀ concentration standard of 50 µg.m⁻³ (24-hour average) on 5 July (63 µg.m⁻³); Monitor2 recorded no exceedances; and Monitor3 recorded 3 exceedances on 24 June (53 µg.m⁻³), 5 July (55 µg.m⁻³) and 17 August (57 µg.m⁻³). The ambient PM₁₀ standard only allows 1 exceedance in a 12-month period. Therefore:

- *there were a total of 3 exceedances of the ambient PM₁₀ standard within the Mega Airshed for the 12-month period*
- *the exceedances were on 24 June (53 µg.m⁻³) at Monitor3, 5 July (63 µg.m⁻³) at Monitor1 and 17 August (57 µg.m⁻³) at Monitor3*
- *the Mega Airshed has experienced 2 breaches (3 recorded-1 allowed =2 breaches) of the ambient PM₁₀ standard and is not complying with the Regulations*
- *the two breaches must be publicly notified in accordance with Regulation 16 within one month of each breach being recorded.*

Monitors that are not part of the ‘ambient standard network’

Not all ambient monitors within an airshed are operated for assessing compliance with the ambient standards. Some monitors may be used for other air quality management purposes (eg, managing emissions from local industries or roading networks) and would not generally be considered part of the ‘ambient standard network’.

For example, some resource consent conditions require ambient monitoring to measure the impacts, if any, of the consented activities off-site (‘consent compliance monitoring’). Regulation 14(2) states “*if the discharge of a contaminant is expressly allowed by a resource consent, the ambient standard for the contaminant does not apply to the site on which the resource consent is exercised*”. However, the ambient standards apply off-site so if an exceedance is measured it may be ‘counted’.

However, this premise could be negated if the exceedance resulted from an exceptional event (eg, a large-scale industrial incident). This would depend on a number of factors including the type of incident, whether the incident was foreseeable and the measures undertaken to prevent the incident occurring in the first place. Further discussion on ‘exceptional events’ is given in section 3.8.

Councils may need to consider reviewing consent conditions for sites where ambient consent compliance monitoring is undertaken in order to enable the monitoring data to be obtained in time to enable the council to meet the notification requirements of Regulation 16.

Councils should specify and document what monitors within an airshed are being used for (ie, whether they are part of the ambient standard network or not). Irrespective of this, in general terms, all **breaches should be notified** (providing the monitoring has been done in accordance with the test methods specified in Schedule 2 of the Regulations.)

Example 3.4

The Sub-Zero Regional Council was undertaking some investigative nitrogen dioxide (NO₂) monitoring alongside a major arterial road in the Going to Town Airshed. The monitor was not specified by the Sub-Zero Regional Council as part of the ambient monitoring network. The monitoring was undertaken for 3 months and recorded 15 exceedances of the ambient NO₂ standard of 200 µg.m⁻³ (1-hour average). The standard only allows 9 exceedances in a 12-month period. Therefore:

- the monitor has recorded breaches of the ambient NO₂ standard
- the breaches must be notified in accordance with Regulation 16.

Example 3.5

Acme Fertiliser operates a super phosphate plant in the CoolCity Airshed. The plant is a large source of sulphur dioxide (SO₂). As part of their consent monitoring required by Superb Regional Council, they have installed two SO₂ monitors - Monitor1 is inside Acme's site boundary (on-site) and Monitor2 is outside Acme's boundary (off-site) downwind in the prevailing wind direction. Whilst the plant was operating and the wind was blowing towards Monitor2, Monitor1 recorded an SO₂ concentration of 600 µg.m⁻³ (1-hour average) and Monitor2 recorded a concentration of 590 µg.m⁻³. The ambient SO₂ standard is 570 µg.m⁻³ with no allowed exceedances. Therefore:

- Monitor1 has recorded a breach of the ambient SO₂ standard but, due to Regulation 14(2), the ambient standard does not apply on this site
- Monitor2 has recorded a breach of the ambient SO₂ standard and, as the monitor was off-site, the ambient standard applies
- the Superb Regional Council must notify the breach in accordance with Regulation 16.

Reporting

In order to provide surety to the general public regarding potential health impacts, councils should, as a matter of best practice, publish the rationale behind their choice of ambient standard monitoring sites and why each site is considered representative of 'worst' case emission levels. This assessment should include:

- the methods to assess whether each airshed is likely to breach the ambient standards
- a discussion of the potential levels of population exposure
- the rationale for choosing the monitoring location including any deviations from 'worst' location or from standard site location requirements
- whether the monitor is for assessing compliance with the ambient standards or for local air quality management.

Waikato Regional Council has undertaken an assessment of all PM₁₀ monitoring sites within the Waikato region, PM₁₀ in towns monitored by Waikato Regional Council to year ending 2010 – air quality, sources and trends (Waikato Regional Council, 2010). This report is an example of best practice.

In the event a regional council does not publish a monitoring site assessment, an internal report should still be available in the event that the Minister for the Environment, or other third party, requests evidence of compliance with Regulation 15.

3.5.4 Monitoring Methods

Schedule 2 of the Regulations provides standard methods for ambient air quality monitoring as summarised in table 5 (PM₁₀ is discussed in Chapter 4.). These methods must be used for determining compliance with the ambient standards.

Table 5: Monitoring methods for ambient standards (excluding PM₁₀)

| Contaminant | Method |
|-----------------|--|
| CO | Continuous infrared absorption in accordance with AS 3580.7.1.1992 "Methods for sampling and analysis of ambient air – Determination of carbon monoxide – Direct reading instrumental method". |
| NO ₂ | Continuous ozone chemiluminescence in accordance with AS 3580.5.1.1993 "Methods for sampling and analysis of ambient air – Determination of oxides of nitrogen – Chemiluminescence method". |
| O ₃ | Continuous ultraviolet absorption in accordance with AS 3580.6.1.1990 "Methods for sampling and analysis of ambient air – Determination of ozone – Direct reading instrumental method". |
| SO ₂ | Continuous fluorescence in accordance with AS 3580.4.1.2008 "Methods for sampling and analysis of ambient air – Determination of sulphur dioxide – Direct reading instrumental method". |

Only the methods specified in table 5 may be used for monitoring carried out **for the purposes of the Regulations**.

To ensure results can be compared however, monitoring for resource consent compliance should also be in accordance with these monitoring methods. If investigative, research or screening monitoring utilises methods not specified in the Regulations then these results cannot be used to confirm compliance with the ambient standards in the Regulations and any results above the ambient standards cannot be counted as exceedances.

In most instances, meteorological monitoring will be needed alongside the ambient monitor. This is because good meteorological information is essential in analysing and interpreting ambient monitoring data and thereby providing information for effective regional air quality management. Meteorological evidence will also be important to substantiate applications for exceedances to be classified as exceptional circumstance under Regulation 16A.

Current best practice is for monitoring to be accredited with International Accreditation New Zealand (IANZ).

Currently, the Australian Standard test methods for carbon monoxide, nitrogen dioxide and ozone are in the process of being updated. Once these methods are changed the Regulations may be amended to reflect this.

Amendments

In June 2011 the test method for sulphur dioxide was updated to refer to the 2008 version of Australian Standard.

3.6 Exceedances

Schedule 1 of the Regulations (given in table 4) refers to the number of exceedances of each ambient standard that are allowed within a 12-month period. Where:

exceedance, for a contaminant, means an instance where the contaminant exceeds its threshold concentration in an airshed

permissible exceedance, for a contaminant, means an exceedance of the standard that is allowed

threshold concentration, for a contaminant, means the concentration of the contaminant specified in the second column of the table in Schedule 1 calculated as a mean for the time period specified in the column.

In simple terms:

An **exceedance** is any monitoring result that is above the limit given for a contaminant in Schedule 1 of the Regulation.

A **permissible exceedance** is any monitoring result that is above the limit but is within the number of exceedances allowed in Schedule 1.

A **breach** of the ambient standard is the first exceedance above the number of permissible exceedances in any 12-month period.

Example 3.6

A nitrogen dioxide (NO_2) monitor in Wonderfultown's Airshed commences operation. On the first day of monitoring, two results stand out – maximum hourly averages of 198 and 202 $\mu\text{g.m}^{-3}$. The ambient NO_2 standard is 200 $\mu\text{g.m}^{-3}$ with only 9 exceedances allowed in a 12-month period. Therefore:

- only the second result of 202 $\mu\text{g.m}^{-3}$ is an exceedance

this exceedance is permissible as it was the first out of 9 allowed in a 12-month period.

Example 3.7

A carbon monoxide (CO) monitor in Wonderfultown's Airshed measures two 8-hour running mean results of 11 and 14 mg.m^{-3} within a 12-month period. The ambient CO standard is 10 mg.m^{-3} with one exceedance allowed in a 12-month period. Therefore:

- both results are exceedances of the standard
- the first result is a permissible exceedance
- the second exceedance is a breach and should be notified in accordance with Regulation 16.

A **12-month period** is a rolling consecutive 12 month period. It does not relate to a calendar year. In practice, most councils report monitoring data on a calendar year as it is easier to understand and easily captures an entire winter season (the period in which exceedances are most likely to occur).

It is important to note that, whilst several Regulations have the dates of entry into force of 1 September, this is not a required monitoring period for the purposes of the remainder of the Regulations. The Regulations have not changed since they were introduced in 2004 in requiring continuous monitoring on a rolling consecutive 12-month period.

3.7 Reporting Breaches

Regulation 16 requires the following:

16 Regional council must give public notice if standard breached

1. A regional council must give public notice if the ambient air quality standard for a contaminant is breached in an airshed in its region.

2. *The notice must –*
 - (a) *be given periodically, at least once a month, until the standard is no longer being breached; and*
 - (b) *be given in accordance with the Act; and*
 - (c) *include –*
 - (i) *the name of the contaminant to which the notice relates; and*
 - (ii) *the time and place at which the standard was breached; and*
 - (iii) *the extent to which the standard was breached.*

This Regulation requires councils to give public notice if an ambient standard is breached in an airshed within its region. Notice must be given in accordance with the definition of public notice within the RMA:

public notice –

- (a) *means a notice published in a newspaper circulating in the entire area likely to be affected by the proposal to which the notice relates; and*
- (b) *if a local authority also publishes a notice on an Internet site to which the public have free access, includes that notice*

This requires a notice published in a daily newspaper circulating in the region and can include internet notices as well. An examples of a notice is given in Appendix 3.

The minimum requirement is to give notice (notify the breach) within one month of the date of the breach occurring. The council would **not** have to give notice each month from then on for the same breach. The council does, however, have to similarly report any **further** breaches of the ambient standard that may occur after this time (on a rolling 12-month period).

As noted above, a breach requires each of the following, as defined in Schedule 1 of the Regulations, to be exceeded:

- the threshold concentration (limit) of the contaminant (over the relevant time average) **and**
- the permissible number of exceedances each year.

For example, one exceedance of the daily PM₁₀ threshold concentration is permitted. It is only when the daily PM₁₀ threshold concentration is exceeded for the second time (ie, the standard is breached) that a council would be required to report publicly. In this case the council would report the second exceedance for that airshed, within one month of it occurring. The council does not have to report the first exceedance as the standard was not breached.

Section 3.6 and examples 3.6 and 3.7 detail how exceedances are determined.

3.8 Exceptional circumstances

The 2011 amendments have inserted a new Regulation 16A to explicitly provide for exceedances of the ambient air quality standards under exceptional circumstances ('exceptional events'). The Regulation states:

16A *Exceptional circumstances causing breach of standard*

- (1) *The Minister may, on written application by a regional council, decide that an exceedance of a contaminant in an airshed in the region of the council was caused by exceptional circumstances.*
- (2) *The application must be received by the Minister no later than 3 months after the day of the exceedance.*

- (3) *The Minister may decide that the exceedance was caused by exceptional circumstances only if he or she is satisfied that the exceedance was caused by exceptional circumstances beyond the regional control of the regional council.*
- (4) *The Minister must give written notice to the regional council of his or her decision no later than 3 months after the day on which the application was received.*
- (5) *If the decision in the notice is that the exceedance was caused by exceptional circumstances, the exceedance must be ignored in determining whether the ambient air quality standard for the relevant contaminant has been breached in the airshed.*
- (6) *However, the exceedance must not be ignored in determining whether the standard has been breached for the purposes of regulation 16 (regional council must give public notice if standard is breached).*

3.8.1 What is an exceptional event?

Exceptional circumstances (exceptional events) are not defined in the Regulations and will be decided by the Minister for the Environment on a case by case basis.

The Ministry has reviewed overseas literature and considers that the following five criteria based on the USEPA CFR⁹ provide good guidance on how an exceedance may be reclassified as an ‘exceptional event’(USEPA 2011). These five criteria will be used to assist the Minister when making his/her decision. The criteria are:

1. The event affected air quality **and**
2. The event was not reasonably controllable or preventable and was beyond the control of the regional council¹⁰ **and**
3. There exists a clear causal relationship between the specific event and the monitored concentration **and**
4. The event was caused by human activity that is unlikely to recur at a particular location, or was a natural event **and**
5. There would have been no exceedance or violation but for the event.

It is important to note that **all** of the above criteria must be satisfied.

The event affected air quality

Irrespective of how severe or significant the event is, if it does not affect air quality within the airshed then it cannot be classified as an exceptional event.

Example 3.8

A large bush fire raged outside the Fabulous City Airshed for a week. Fortunately, the wind conditions were such that the PM₁₀ emissions from the bush fire did not blow towards the Fabulous City Airshed at all. Monitoring indicated that concentrations during the week did not exceed the ambient PM₁₀ standard of 50 µg.m⁻³ (24-hour). Therefore:

- *no exceptional events could have occurred within the Fabulous City Airshed due to the bush fire.*

⁹ Code of Federal Regulations Part II, Environmental Protection Agency, Treatment of Data Influenced by Exception Events; Final Rule (22 March 2007).

¹⁰ This aligns with the jurisdictional responsibilities of regional councils under the RMA for air quality management. It assumes that the regional council has placed controls on all preventable or controllable events within their jurisdiction through regional plans, resource consents or other methods.

The event was not reasonably controllable or preventable

All reasonable efforts by the regional council, or other parties responsible for the event, should have been taken to control the effects of the event, or prevent the event occurring in the first place. Generally, unforeseeable emergencies and natural disasters cannot be prevented or controlled and thus will satisfy this criteria.

Example 3.9

Acme Construction is undertaking controlled demolition of a large multi storey building. Monitoring of PM_{10} indicates that levels have exceeded the ambient standard of $50\mu\text{g.m}^{-3}$ with levels of between 55 and $60\mu\text{g.m}^{-3}$ during a 4-day period during demolition. Investigation by the contractor and regional council staff determines that the cause of these four exceedances was inadequate dust control measures due to a failure of the water supply. Therefore:

- *the exceedances cannot be classified as exceptional events as the failure of the water supply for 4 days was reasonably foreseeable and preventable (a good management plan with backup water carts or other water sources should have been in place).*

Example 3.10

Acme Construction is undertaking emergency demolition of a large multi storey building to prevent the buildings immediate collapse. Monitoring of PM_{10} indicates that PM_{10} levels have exceeded the ambient standard of $50\mu\text{g.m}^{-3}$ with a level of $60\mu\text{g.m}^{-3}$ on the day of demolition. Therefore:

- *the exceedance can be classified as an exceptional event as the need for immediate demolition to protect public safety prevented dust suppression measures being able to be implemented in time.*

Example 3.11

Ministry of Agriculture and Forestry (MAF) is undertaking an emergency carcass destruction to prevent an outbreak of foot and mouth disease. The open fire causes elevated PM_{10} levels of between 60 and $70\mu\text{g.m}^{-3}$ (24-hour average) for three 24-hour periods in the Sunshine Airshed of the Sunny Regional Council. The Sunshine Airshed has already breached the PM_{10} standard in the last 12 months. MAF invokes the emergency provisions under Part 6 of the Biosecurity Act 1993. Therefore:

- *The Regulations do not apply.*
- *It is not mandatory to notify the breaches under Regulation 16. However the Sunny Regional Council can still choose to notify the three breaches in the interests of full public disclosure.*

Clear causal relationship between the event and the monitored concentration

The base assumption for considering monitoring data is that all exceedances are ‘real’ unless proven otherwise. This requires a scientifically robust level of proof, hence the detailed requirements for Schedule 2 and ‘meaningful data’. Monitoring information beyond that directly required by Regulations may be vital to demonstrate that an exceedance was an ‘exceptional event’.

Exceptional events are, by definition, a deviation from normal concentration levels. Accordingly, sufficient baseline data to ascertain what ‘normal’ concentrations can be expected for a pollutant within an airshed will generally need to be developed. At time of writing (2011), this is satisfied for most airsheds.

It may be useful to enhance monitoring networks by co-locating meteorological sites with ambient monitors. The addition of web cameras to enable real time recording of activities occurring within the immediate vicinity of monitoring sites may also be helpful.

If considerable debate is likely to occur (eg, whether sea salt is an exceptional event or a proportion of background) then councils may consider the use of source speciation analysis or other forms of analysis. Some of these techniques require additional sampling technology or different forms of monitoring equipment and therefore would need to be in place prior to an exceptional event potentially occurring.

When trying to determine a causal relationship a council should consider all available information media. This could include photographs, eye witness reports, newspaper accounts and information on similar events that have occurred elsewhere. Any technique used should be referenced.

Example 3.12

A monitor records an exceedance of the ambient NO₂ standard with a concentration of 232 µg.m⁻³ (1-hour average) in the Bypass Airshed. The Vroom Vroom Regional Council suspects that a truck parked directly under the monitor inlet and left its motor running. However no record of the truck being there (either through observation or web camera) is available. Therefore:

- *the idling truck cannot be proven to have caused the exceedance*
- *the exceedance cannot be classified as an exceptional event.*

Example 3.13

A monitor records an exceedance of the ambient PM₁₀ standard with a concentration of 66 µg.m⁻³ (24-hour average) in the Beachy Airshed. Speciation of the filter sample finds that the concentration of sea salt is 43 µg.m⁻³. Previous speciation analysis of PM₁₀ at the monitoring site has indicated that the sea salt component is typically between 7 µg.m⁻³ and 13 µg.m⁻³, with a maximum of 20 µg.m⁻³. Therefore:

- *a clear causal relationship exists between the event and the monitored concentration*
- *the concentration due to sea salt is well above what could reasonably be expected to occur*
- *all other criteria are satisfied (ie, a natural event, was not reasonably controllable or preventable and there would have been no exceedances but for the event)*
- *the exceedance can be classified as an exceptional event.*

Example 3.14

A monitor records an exceedance of the ambient PM₁₀ standard with a concentration of 66 µg.m⁻³ (24-hour average) in the Beachy Airshed. Speciation of the filter sample finds that the concentration of sea salt is 19 µg.m⁻³. Previous speciation analysis of PM₁₀ at the monitoring site has indicated that the sea salt component is typically between 7 µg.m⁻³ and 13 µg.m⁻³, with a maximum of 20 µg.m⁻³. Therefore:

- *a clear causal relationship exists between the event and the monitored concentration*
- *the concentration due to sea salt is within what could reasonably be expected to occur*
- *there may have been an exceedance without the sea salt*
- *the exceedance cannot be classified as an exceptional event.*

Example 3.15

A monitor records an exceedance of the ambient PM₁₀ standard with a concentration of 66 µg.m⁻³ (24-hour average) in the Harbour Airshed. The Seaside Regional Council suspects the breach is a result of high levels of sea salt. However, no data is available to confirm this. Therefore:

- *no clear causal relationship exists between the event and the monitored concentration*
- *the concentration due to sea salt may be within what could reasonably be expected to occur*
- *there may have been an exceedance without the sea salt*
- *the exceedance cannot be classified as an exceptional event.*

Caused by human activity that is unlikely to recur or a natural event

The majority of exceptional events are likely to be relating to a natural disaster or extreme weather event. However, some human (anthropogenic) activities may cause exceptional events. Often an exceptional event will relate to an emergency situation such as those declared by Ministry of Agriculture and Forestry (MAF), Ministry of Defence, or Civil Defence authorities during a 'State of Emergency'. In such cases, the emergency provisions of the RMA are likely to be invoked and the Regulations will not apply.

Some examples of natural disasters and extremes are:

- extreme high wind events including tornados
- dust storms from Australia
- prolonged or severe drought conditions
- wild bush fires
- volcanic, geothermal and seismic (earthquake) activity
- sea salt and pollen¹¹

The key proviso with anthropogenic events and extremes is that they are 'unlikely to recur' at that location again (ie, they are unlikely to happen again under similar circumstances in a similar area).

Some examples of anthropogenic induced exceptional events are:

- terrorist attacks
- accidental property fires
- emergency property demolition
- industrial accidents.

Activities that would not be considered to be an anthropogenic extreme would include:

- controlled burn-offs and open burning
- sulphur dioxide emissions from vessels docked at port
- traffic congestion including that caused by roadworks

¹¹ Levels of sea salt and/or pollen will need to be well above those usually considered to be normal 'baseline' for the airshed in order for an exceedance to be deemed an exceptional event.

- large scale earthworks.

In many instances an anthropogenically induced exceptional event (eg, an industrial accident) will be covered under other sections of the RMA and enforcement action may be taken under these circumstances.

Monitors may also be subjected to localised impacts that could constitute an exceptional event. Some examples include:

- a motor vehicle idling under/near a monitor intake (eg, NO₂ 1-hour average) provided the monitor was not located near an area where vehicles could legally park
- extreme traffic congestion due to an unforeseeable emergency such as a plane crash closing the Auckland Harbour Bridge.

However a monitor cannot have an exceptional event occur due to:

- inadequate monitoring quality assurance or calibration. A monitor should be regularly maintained in accordance with the manufacturer's instructions and have robust QA/QC undertaken on it to ensure that exceedances are not a fault of the monitor (eg, zero drift). Further information on monitoring quality assurance is given in the Good Practice Guide for Air Quality Monitoring and Data Management (MfE, 2009a).
- placement of a monitor close to a large source for example, a monitor being placed on a cycleway next to a motorway (as people are likely to be exposed here).

No exceedance but for the event

An exceptional event can only happen if without the event the exceedance would not have occurred. It is not an exceptional event if there was already going to be an exceedance (due to 'normal' sources) and the event was only going to make the amount the standard was exceeded by larger.

In summary, all exceedances will be considered to be 'real' unless they can be proven to be an exceptional event.

Example 3.16

Historically the Awesome Town Airshed records PM₁₀ concentrations between 65 and 80 µg.m⁻³ on cold, clear, calm winter days and nights (ie, exceedances of the ambient PM₁₀ standard of 50 µg.m⁻³). However, when weather conditions in winter are not cold and calm, PM₁₀ concentrations typically do not exceed 45 µg.m⁻³. In summer, the highest PM₁₀ level recorded is 35 µg.m⁻³.

A volcano has been erupting nearby for several months and monitoring indicates it is contributing approximately 20 µg.m⁻³ to PM₁₀ concentrations when wind conditions are unfavourable. Therefore:

- *exceedances in summer during the volcanic eruption may be classified as exceptional events providing certain meteorological conditions are satisfied*
- *exceedances on cold, calm winter days cannot be classified as exceptional events (as there would normally be an exceedance at this time)*
- *exceedances during winter that are not on cold, calm days may be classified as exceptional events (as exceedances do not usually occur during these conditions).*

3.8.2 Application to the Minister

Application for the consideration of an exceedance of any ambient standard as an ‘exceptional event’ must be made to the Minister for the Environment no more than 3 months from the date of the event. Application cannot be made for any exceedances that occurred before 1 June 2011. This is because the Regulations are not retrospective (Regulation 20 of the 2011 amendments).

If the application is made to the Minister more than 3 months after the event the Minister cannot consider the application and the event cannot be classed as an exceptional event. This is to provide certainty to industry in resource consent decision making and to enable timely enactment of the ban on solid-fuel burning open fires.

Irrespective of whether a council considers that the exceedance is likely to be an exceptional event, Regulation 16A(6) requires that the council must still notify the exceedance in accordance with Regulation 16 (section 3.7).

It is important that decisions on exceptional events be justified, clear and transparent. Accordingly, the Ministry will create and maintain a public register of exceptional events. The register will make the regional council’s application, and the Minister’s reasons for his/her decision publically available. The register will be on Ministry for the Environment’s website at www.mfe.govt.nz.

The website will also include information on the procedures to be followed and an example application form.

Matters the Minister will take into account

The decision to classify an exceedance as an ‘exceptional event’ can have wide reaching implications for an airsheds ability to meet the ambient standards and the resulting actions that need to be taken (especially for PM₁₀). Therefore a council applying to reclassify an exceedance as an exceptional event will need to provide a detailed, scientifically robust rationale and sufficient evidence to enable the Minister to make a decision.

The written application to the Minister for the Environment for an ‘exceptional event’ will need to include, as a minimum, the following:

- the location, airshed, date and extent of the exceedance
- a discussion of the five technical criteria given in section 3.8.1
- documented evidence to support the application
- an estimate of what the likely concentration would have been without the ‘exceptional event’
- an analysis of ‘baseline’ monitoring data
- the results of any source speciation or other analysis that may have been undertaken to support the decisions
- any other supporting information available to determine ‘proof’ of the event (eg, photos, newspaper articles, other agency statements, and eyewitness accounts).

A form for this purpose may be downloaded from the MfE website.

The Minister will also take into consideration any other matter he/she considers relevant, including but not limited to:

- the frequency of occurrence of similar exceptional events in the past
- instances where more than one airshed has experienced elevated concentrations due to a single exceptional event (eg, where dust from Australia is causing widespread effects).

The Minister may request further information be provided to support the application to classify an exceedance as an exceptional event. However as given in section 3.8.3 below a final decision must still be issued within 3 months of the application being made. Therefore it is important that the application be of sufficiently high quality to ensure that a decision can be made in a timely manner.

Examples of high-quality applications will be provided on the MfE website for guidance.

3.8.3 Decision by the Minister

The Minister for the Environment must make a decision on an application for an exceedance to be considered an ‘exceptional event’ within 3 months of receiving the application. There is no provision in the RMA or the Regulations for any review of this decision.

If the Minister decides that the event **is an ‘exceptional event’** then *‘the exceedance must be ignored in determining whether the ambient air quality standard for the relevant contaminant has been breached in the airshed’* (Regulation 16A(5)). This means that for the purposes of the Regulations, in particular Regulations 15, 16B, 16D, 17, 20 and 21, the elevated concentration does not need to be considered with respect to:

- monitoring
- split target compliance dates (refer to Chapter 4)
- calculation of annual averages
- resource consent decisions (discussed in more detail below).

If the Minister decides that the event is **not an ‘exceptional event’** then the result **cannot be ignored** and will need to be included as an exceedance for the purpose of the Regulations.

3.9 Ambient standards and resource consents

The ambient standards for carbon monoxide (CO), nitrogen dioxide (NO₂), ozone (O₃) and sulphur dioxide (SO₂) in Regulation 13 and Schedule 1 (summarised in table 3), are aimed at providing a guaranteed level of health protection for New Zealanders. Some activities, usually large industries, have substantial discharges of these pollutants either individually, or cumulatively. These activities typically require resource consents from regional councils through regional plans.

The intent of the Regulations is to ensure that industry does not cause airsheds to breach the ambient standards.

3.9.1 Carbon monoxide (CO), nitrogen dioxide (NO₂) and ozone (O₃)

From 1 September 2005, Regulation 20 has required that:

- 20 Resource consents for discharge of carbon monoxide, oxides of nitrogen, and volatile organic compounds**
- (1) A consent authority must decline an application for a resource consent to discharge carbon monoxide into air if the discharge to be permitted by the resource consent –
 - (a) is likely, at any time, to cause the concentration of that gas in the airshed to breach its ambient air quality standard; and
 - (b) is likely to be a principal source of that gas in the airshed.
 - (2) A consent authority must decline an application for a resource consent to discharge oxides of nitrogen or volatile organic compounds into air if the discharge to be permitted by the resource consent –
 - (a) is likely, at any time, to cause the concentration of nitrogen dioxide or ozone in the airshed to breach its ambient air quality standard; and
 - (b) is likely to be a principal source of oxides of nitrogen or volatile organic compounds in the airshed.
 - (3) In this regulation, **volatile organic compound** –
 - (a) means a hydrocarbon based compound with a vapour pressure greater than 2 millimetres of mercury (0.27 kilopascal) at a temperature of 25°C; but
 - (b) does not include methane.

Ozone (O₃) is formed by the photochemical reaction of primary pollutants (eg, nitrogen oxides (NO_x) and volatile organic compounds (VOCs)) and is often associated with photochemical smog. Primary pollutants are produced mainly from combustion sources including motor-vehicle emissions, and industrial and domestic use of solvents and coatings. In order to manage emissions of primary pollutants and VOCs to control O₃ formation it is necessary to have a good understanding of the chemistry within the airshed.

Nitrogen dioxide (NO₂) can be emitted directly but in many situations is formed as a secondary pollutant when nitric oxide (NO) transforms in the presence of oxidants (for example O₃) to NO₂.

Regulation 20 applies only to discharges that are a ‘**principal source**’ of the pollutant in the airshed **and** the discharge is ‘**likely**’ to cause the ambient standard to be breached.

For example, in areas of very low background NO₂, consent could not be granted to a large discharge of nitrogen oxides (‘a principal source’) that caused a breach of the NO₂ standard. However, in areas of relatively high background NO₂ (but below the ambient standard) the Regulations do not prohibit granting consent to a small discharge of nitrogen oxides – even if it pushed ambient levels of NO₂ in the airshed over the ambient standard when the activity is not a ‘principal source’.

Whether an activity is ‘principal source’ varies depending on the airshed the source is discharging into. When determining whether a source is a ‘principal’ source councils should consider the following:

- the mass emission rate for the source site compared with the total mass emission rate within the airshed
- the maximum predicted ground level concentration from the source. The Good Practice Guide for Assessing Discharges to Air from Land Transport (MfE, 2008b) considers an activity that emits a maximum predicted ground level concentration of 5 to 10% of the

ambient standard to be important. This could be reasonably considered to be a principal source.

The term 'likely' is usually considered to mean 'probably, possibly or could be expected to'. This does not mean that the discharge must cause a breach, just that it could possibly do so.

Example 3.17

Acme Power operates a Power Station in the Fabulous Town Airshed. The plant is a large source of nitrogen dioxide (NO₂) and is predicted to produce ground level concentrations outside Acme's site boundary (off-site) of 20 µg.m⁻³ (1-hour average) for 10 hours per year. The ambient NO₂ standard is 200 µg.m⁻³ (1-hour average) – with a maximum of 9 hours of exceedances allowed per year. The historic background levels within the Fabulous Town Airshed are around 100 µg.m⁻³, giving a predicted combined maximum ground level NO₂ concentration of 120 µg.m⁻³. Therefore:

- *the power station is one of the largest individual sources of NO_x in the Fabulous Town Airshed emitting nearly half a tonne a day*
- *maximum predicted concentrations are substantial (20 µg.m⁻³ is 10% of the ambient NO₂ standard of 200 µg.m⁻³)*
- *the power station can reasonably be considered to be a principal source*
- *however, consent can be granted because the power station will not, and is not likely to, cause the Fabulous Town Airshed to exceed the ambient standard.*

Fantastic Regional Council undertakes further monitoring in the Fabulous Town Airshed and determines that the maximum background concentration of NO₂ is actually 195 µg.m⁻³. This gives a predicted combined maximum ground level NO₂ concentration of 215 µg.m⁻³ for up to 10 hours per year. Thus:

- *the power station is likely to be a principal source **and***
- *consent must be declined, because the power station is likely to cause the Fabulous Town Airshed to exceed the ambient standard.*

In response to the likely declining of their original consent, the Acme Power Station proposed different control equipment and advised that the maximum ground level NO₂ concentrations produced off-site by the power station would now be only 7 µg.m⁻³. This would give a maximum combined ground level NO₂ concentration of 202 µg.m⁻³. Therefore:

- *the power station is not a principal source (7 µg.m⁻³ is 3.5% of the ambient NO₂ standard of 200 µg.m⁻³)*
- *Fantastic Regional Council may however, choose to decline consent on the grounds that the source is likely to cause the Fabulous Town Airshed to exceed the ambient standard.*

Further guidance on assessing discharges to air from activities that require resource consents is provided in the Good Practice Guide for Assessing Discharges to Air from Industry (MfE, 2008a). The good practice guide can be downloaded from the Ministry for the Environment website at www.mfe.govt.nz.

Amendments

In July 2005 Regulation 20 was amended to reflect that ozone and nitrogen dioxide are both secondary pollutants that are formed from other pollutants (oxides of nitrogen and volatile organic compounds). A definition of volatile organic compounds was also included.

3.9.2 Sulphur dioxide (SO₂)

From 1 September 2005, Regulation 21 has required that:

21 Resource consents for discharges of sulphur dioxide

A consent authority must decline an application for a resource consent to discharge sulphur dioxide into air if the discharge to be expressly allowed by the resource consent is likely, at any time, to cause the concentration of sulphur dioxide in the airshed to breach its ambient air quality standard.

Regulation 21 requires resource consent for the discharge of sulphur dioxide (SO₂) to be declined if it is the cause of the ambient standard being **likely** to be breached. The source of SO₂ **must** be the cause.

This means that in areas with very low background SO₂ levels, councils cannot grant consent to a large source of SO₂ that, on its own, would cause the 1-hour concentration limit to be breached (either 350 µg.m⁻³ for more than 8 hours per year or 570 µg.m⁻³ ever).

Conversely, in areas with high background levels of SO₂, but below the existing ambient standard consent could not be granted to a small discharge of SO₂ if it caused the ambient levels within the airshed to breach the concentration limit.

Councils and consent applicants should be aware that the WHO has significantly reduced their recommendations for acceptable levels of SO₂ to reflect new data which show severe adverse effects at lower concentrations than previously anticipated. The ambient standard for SO₂ has a threshold 1-hour mean concentration for SO₂ of 350 µg.m⁻³ but the WHO guideline is only 20 µg.m⁻³ (24-hour average).

Councils may wish to consider the new WHO guideline in resource consent applications as ‘an other matter’ as allowed for in section 104(1)(c) of the RMA.

Further guidance on assessing discharges to air from activities that require resource consents is provided in the Good Practice Guide for Assessing Discharges to Air from Industry (MfE, 2008a). The good practice guide can be downloaded from the Ministry for the Environment website at www.mfe.govt.nz.

Amendments

In June 2011 Regulation 21 was amended to align with the words of the Act and to avoid any confusion with permitted activities.

Example 3.18

Acme Fertiliser operates a super phosphate plant in the CoolCity Airshed. The plant is a large source and is predicted to produce ground level SO₂ concentrations outside Acme’s plant boundary (off-site) of 300 µg.m⁻³ for 32 hours per year. The ambient SO₂ standard is 350 µg.m⁻³ (1-hour average) – with a maximum of 1 exceedance allowed per year (and a never to be exceeded maximum of 570 µg.m⁻³). The background levels within the CoolCity Airshed are 64 µg.m⁻³ giving a predicted combined ground level SO₂ concentration of 364 µg.m⁻³. Therefore:

- *the ambient standard for SO₂ of 350 µg.m⁻³ will be exceeded for at least 32 hours per year (maximum permitted is 8 hours per year)*
- *consent must be declined.*

Example 3.19

Acme Asphalt operates an asphalt plant in the HotCity Airshed. The plant is a small source and is predicted to produce ground level concentrations off-site of $20 \mu\text{g.m}^{-3}$ for 11 hours per year. The background levels within the HotCity Airshed are $344 \mu\text{g.m}^{-3}$ due to the presence of Acme Fertiliser next door (which was subsequently granted consent following a massive reduction in emissions) giving a predicted combined ground level SO_2 concentration of $364 \mu\text{g.m}^{-3}$. Therefore:

- *the ambient standard for SO_2 of $350 \mu\text{g.m}^{-3}$ will be exceeded for at least 11 hours per year*
- *consent must be declined.*

3.10 Impacts on regulatory documents

The Regulations are mandatory under the RMA. Notwithstanding the constraints upon resource consent decisions, the ambient standards impact on all decisions that relate to air quality made under the RMA.

For example, a regional council may currently permit a range of activities (eg coal-fired boilers under 5 megawatts (MW) in size) in their regional plan. These activities may cumulatively be making a significant contribution to exceedances of the ambient SO_2 standard. If so, the regional council should review their regional plan.

Application of the Regulations with respect to regional plans, designations and resource consents (both existing and new) are discussed in more detail below.

3.10.1 Regional plans

The Regulations are mandatory under the RMA. They automatically supersede any relevant regional plan rules (unless the local government controls are stricter).

As a result of the 2009 amendments to the RMA, section 44A(5) of the RMA requires that regional councils **must** remove regional plan rules that are more lenient than the national environmental standards for air quality. A regional plan cannot allow resource consent for an activity that discharges ambient pollutants that is less stringent than, or conflicts with, the Regulations. Removal of the rule/s must be carried out without using the consultation, notification, hearings and decision processes for plan changes in Schedule 1 of the RMA and must be done as soon as practicable.

Regulation 28 allows for more stringent rules, resource consents or bylaws than the Regulations (including Regulations 13, 20 and 21). For example, this means:

- regional plans can have tighter ambient standards for ambient pollutants (either lower concentration levels or different averaging times)
- regional plans could apply stricter requirements or tests to resource consents (eg, other than ‘principal source’ or ‘likely’) in relation to the ambient standard pollutants
- regional plans could require offsets in resource consents for dischargers of ambient pollutants other than PM_{10} .

This policy advice is true only for the national environmental standards for air quality. Other national environmental standards will have a different relationship with regional plans.

3.10.2 Designations

A designation is a provision in a district plan which provides notice to the community of an intention by a requiring authority (eg, a road controlling authority) to use land in the future for a particular project (eg, road or airport). Once a site is designated for a particular purpose, the requiring authority is able to proceed with the specific work on the site as if it were permitted by the district plan.

The Regulations do not apply to designations that existed at 1 September 2005 (ie, when the ambient standards came into force).

For designations after 1 September 2005, territorial authorities and/or requiring authorities must consider the Regulations when weighing up whether new designations, or alterations to existing designations, meet the purposes of the RMA (eg, safeguarding the life-supporting capacity of air). This is particularly important for new roads as roads can have significant impacts on ambient pollutant levels both locally and regionally.

Territorial authorities will need to take into account the potential impacts of a new designation on air quality in the airshed, and the subsequent impact upon the ability to issue future resource consents within that airshed.

Additional guidance for territorial authorities and regional councils is provided on assessing discharges from transport with respect to the ambient standards in the Good Practice Guide for Assessing Discharges to Air from Land Transport (MfE, 2008b). The good practice guide can be downloaded from the Ministry for the Environment website at www.mfe.govt.nz.

3.10.3 Bylaws

Territorial authorities do not have a specific air quality management function under the RMA but do have the primary responsibility for land use (eg, the location of activities that may discharge contaminants to air). However, territorial authorities are able to make bylaws under the Local Government Act 2002 (LGA). Section 145 of the LGA states:

- 145 General bylaw-making power for territorial authorities**
A territorial authority may make bylaws for its district for 1 or more of the following purposes:
- (a) protecting the public from nuisance;*
 - (b) protecting, promoting, and maintaining public health and safety;*
 - (c) minimising the potential for offensive behaviour in public places.*

This could include bylaws regarding air quality in terms of (b) above. Regulation 28 allows for bylaws to be more stringent than the Regulations.

A good working relationship between the regional councils and territorial authorities can significantly assist in addressing air quality issues, and meeting the national air quality standards effectively and efficiently.

3.10.4 Existing consents

The effects of the Regulations on existing consents is also discussed in section 2.3.3.

Review of consents

Section 43B(6) of the RMA provides that the Regulations do **not** affect consents that have commenced before 1 September 2005 until such time as consent conditions are reviewed under section 128(1)(ba).

Renewal of existing consents

Under the RMA, consents up for renewal are treated as ‘new’ consents.

For example, an existing industry applying for consent to continue to discharge SO₂ would not be permitted if it resulted in a breach of the SO₂ ambient standard.

The 2011 amendments to the Regulations have additional requirements for substantial PM₁₀ sources that must also be considered. This is discussed in further detail in section 4.10.

3.10.5 New consents

As outlined above, the introduction of the Regulations has placed differing constraints upon the resource consent process. For consent applications, the first issue that should be addressed is whether or not the discharge will result in a substantial increase in concentrations (ie, whether the activity will be a principle source or would be likely to cause the ambient standard to be breached). If so, the next issue is to determine the scope of discharge – does it require a complex assessment or can a simple calculation (eg, comparison of in-stack concentrations) meet the ambient standards.

Detailed assessments should be carried out using predictive tools such as computer dispersion modelling in accordance with the Good Practice Guide for Atmospheric Dispersion Modelling (MfE, 2004b). This document contains comprehensive protocols on how to carry out dispersion modelling. Guidance on the interpretation of results is provided in the Good Practice Guide for Assessing Discharges to Air from Industry (MfE, 2008a). The good practice guides can be downloaded from the Ministry for the Environment website at www.mfe.govt.nz.

3.11 Implementing the ambient standards

The Regulations were promulgated in 2004 and the ambient standards have been in force since 2005. For all ambient standards other than PM₁₀ the Regulations have required compliance from 1 September 2005. Only a few airsheds within New Zealand have the potential to breach, or have breached the ambient standards for carbon monoxide (CO), sulphur dioxide (SO₂), nitrogen dioxide (NO₂) or ozone (O₃).

Where an airshed is known to be close to, or breach, the ambient standards, the regional council should have developed an ‘action plan’ to determine a path to compliance.

In simple terms, councils with air quality that exceeds the ambient standards should have taken action by now. In particular, those airsheds breaching the standards face constraints on resource consents. There are, therefore, significant implications for communities – and councils – if they have not implemented an appropriate response.

3.12 Enforcement

Any person who discharges emissions of ambient pollutants from an activity, particularly those that require resource consent, could be subject to enforcement action from the regional council in accordance with the enforcement provisions of the RMA. These provisions are discussed in more detail in section 2.4.

In addition to this, section 44A(8) of the RMA now requires that *‘every local authority and consent authority must enforce the observance of national environmental standards to the extent to which their powers enable them to do so’*.

There is therefore, an obligation on regional councils, territorial local authorities and requiring authorities (when considering designation applications) to enforce the Regulations.

Given the time the Regulations have been in force, it is not unreasonable to expect that the Minister for the Environment may take similar action to ensure compliance with these ambient standards as he/she may do for PM₁₀. This is discussed further in section 4.12 and in the Compliance Strategy (MfE, 2011e).

3.13 Reporting requirements

The Regulations do not require the mandatory reporting of progress towards achieving the ambient standards to the Ministry of the Environment.

The Minister for the Environment may however, under section 27 of the RMA, request information on the implementation of the Regulations from regional councils at any time. Councils have 20 working days to respond.

4 Ambient Air Quality Standard for PM₁₀

4.1 Introduction

This chapter has been added to the 2011 Users' Guide to give due attention to the amended requirements in the Regulations for PM₁₀. In the previous Users' Guides the ambient PM₁₀ standard was discussed in Chapter 3 together with the ambient standards for other pollutants.

The original Regulations imposed restrictions on the issuing of resource consents to industry in breaching airsheds. This was inequitable because domestic fires and not industry are the primary source of PM₁₀ in winter.

Furthermore, in 2004, when the air quality standards were put in place, it was expected that all airsheds would comply with the PM₁₀ standard by 2013. However, by late 2009, it was estimated that there would be 15 airsheds which would not comply in time, including Auckland, which represents nearly 30 per cent of New Zealand's population. There was concern that the 2013 deadline was unachievable.

The Regulations for PM₁₀ were amended in 2011 to address these issues. The main changes are:

- extending the date for compliance for regional councils to meet the ambient PM₁₀ standard of 50 µg.m⁻³ by creating split targets. Airsheds with more than 10 exceedances a year must meet the standards with three exceedances by 1 September 2016 and one exceedance by 1 September 2020. Airsheds with fewer than 10 exceedances a year must meet the standard with one exceedance by 1 September 2016. (section 4.4) All other airsheds must continue to meet the standard with one exceedance (this requirement has been in place since 1 September 2005).
- requirement for 'meaningful' monitoring data for PM₁₀ in accordance with best practice (section 4.6.1)
- requirement for mandatory 'offsets' (section 4.10.2) from new industries with large PM₁₀ discharges in 'polluted' airsheds (section 4.10.1) from September 2012, replacing the current restrictions on industrial consents.
- ban on new solid-fuel burning open fires in polluted airsheds after 1 September 2012 (section 5.3)

It is important to note that while the compliance timeframe for PM₁₀ has been amended, the value of the PM₁₀ standard remains the same. This means that bottom-line standards for public health protection remain unaffected.

Airsheds that meet their allocated split targets within the time allowed will be deemed to comply with the ambient PM₁₀ standard. However, if possible, councils should aim to reduce the number of exceedances within airsheds earlier (and hence meet their compliance dates earlier as well) as communities will be looking to them to reduce the likely health impacts arising from poor air quality.

It is well known that a number of urban areas do not meet the ambient standard for PM₁₀. The Ministry has published a non-regulatory companion document – the Compliance Strategy (MfE, 2011e), to assist councils to meet the PM₁₀ standards as quickly and easily as possible.

4.2 Adverse effects of PM₁₀ (and PM_{2.5})

Particulate matter is a collective term used to describe very small solid particles and/or liquid aerosols in the air, such as dust, smoke or fog. PM₁₀ particles are too small to be seen with the naked eye, being less than 10 micrometres in diameter (one-fifth of the diameter of a human hair). PM₁₀ pollution includes ‘coarse’ particles (between 2.5 and 10 micrometres) and ‘fine’ particles (less than 2.5 micrometres, also known as PM_{2.5}).¹²

PM₁₀ comes from sources such as burning coal, oil, wood and light fuel oil in domestic fires, transportation and industrial processes. Natural sources of particles include sea salt, dust, pollens and volcanic activity. In most places in New Zealand, levels of PM₁₀ in the air are at their highest in winter months due to the prevalence of domestic fires.

A summary of the health effects of PM₁₀ is given below. For a more detailed discussion refer to the Compliance Strategy (MfE, 2011e) and the PM₁₀ Health Fact Sheet (MfE, 2011d).

There is a substantial body of evidence that breathing particulate matter is harmful to human health. Generally, larger (coarse) particulate matter (between 2.5 and 10 µm) deposits in the upper airways whereas smaller (fine) particulate matter (< 2.5 µm, PM_{2.5}) lodge in the very small airways deep in the lung. Inhaled very small (ultrafine, < 0.1 µm, PM_{<0.1}) particulate matter may enter the blood circulation. Fine particulate matter is more hazardous than coarse particulate matter in terms of mortality and cardiovascular and respiratory outcomes.¹³

The health effects of particulate matter are predominantly respiratory and cardiovascular ranging from functional changes (eg, reduced lung function) to symptoms, impaired activities (eg, school or work absenteeism), doctors’ or emergency room visits through to hospital admissions, reduced life expectancy and death. More recent evidence includes pregnancy-related outcomes such as low birth weight and increased infant mortality.

Adverse health impacts, including premature death, are not confined to one part of the population. However, the proportion of the population affected by less severe outcomes (e.g. symptoms, reduced lung function) is much larger than that affected by more severe outcomes such as hospital admissions and death. Several groups have increased susceptibility to PM₁₀ including the elderly, individuals with pre-existing heart or lung disease, children, especially the very young and unborn babies (because of the effects on lung function development) and asthmatics and people with respiratory conditions or with diabetes.

The studies have shown that in addition to the acute effects of rises in particulate matter (ie, effects in the hours and days following an increase in particulate matter), which have been recognised since the middle of last century, there is now a large body of evidence on the chronic effects of particulate matter. Importantly, the studies do not support the hypothesis that particulate matter pollution causes premature death by “harvesting” the very frail who would have died in a few days anyway. Rather than finding excess deaths during and immediately after days of high particulate matter pollution, followed by a short-term compensatory reduction in deaths, they found that particulate matter mortality associations were stronger at longer time intervals.

¹² Some publications describe PM₁₀ as ‘fine’ particulate matter. While PM₁₀ does have a fine component, it also contains a coarse component and therefore it is not referred to as ‘fine’ particulate matter in this report.

¹³ Research now focuses on ultrafine particles (i.e. particulate matter less than 1 micron in diameter) to investigate translocation via the olfactory nerve following deposition on the olfactory mucosa of the nasopharynx. This mechanism bypasses the blood-brain barrier to provide a direct route to the central nervous system (WHO, 2006).

The 2007 HAPINZ (Health and Air Pollution in New Zealand) national study estimated that about 1100 New Zealanders die prematurely from air pollution in urban areas each year, resulting in total economic costs of \$1.14 billion per annum (Fisher et al, 2007). A more recent update indicates that this figure may be even higher, with around 1640 premature deaths and an overall health burden of \$1.62 billion (Kuschel & Mahon, 2010). At the time of writing (2011) an update to the full HAPINZ report is being produced. This report is due in late 2011 and may be of interest to readers.

In most New Zealand cities and towns, daily PM₁₀ levels are usually about 25-35 µg/m³ which is well below the ambient standard for PM₁₀ of 50 µg/m³. However, some cities and towns have relatively high levels of PM₁₀, especially in winter with recorded levels of up to 200 µg/m³ as a 24-hour average. In rural areas, daily levels of PM₁₀ are usually less than 15 µg/m³.

There is no 'safe' threshold for PM₁₀. Adverse health effects are observed at all measured levels.

PM₁₀ pollution can affect whole urban areas, especially during winter smog conditions, and smaller local areas such as around dusty activities or industrial discharges.

4.3 What is the ambient PM₁₀ standard?

Regulation 13 and Schedule 1 of the Regulations specify the ambient air quality standards (the ambient standards). These, including the ambient standard for PM₁₀, are discussed in detail in section 3.3.

For PM₁₀ the Regulations set an ambient air quality concentration limit of 50 µg.m⁻³ as a 24-hour average with a permissible exceedance of no more than one day of the year (ie, one 24-hour period in 12-months).

To summarise the ambient PM₁₀ standard is that the:

PM₁₀ concentration of 50 µg.m⁻³ (24-hour average) will not be exceeded for more than one 24-hour period in a 12-month period.

The PM₁₀ ambient standard came into force on 1 September 2005.

Section 3.3.2 discusses how the ambient PM₁₀ standard in the Regulations co-exist with the Ambient Air Quality Guidelines (MfE, 2002a) for PM₁₀ and PM_{2.5}. Section 3.3.3 then explains how regional requirements, other documents and a potential review of the national environmental standards for air quality are affected by the ambient PM₁₀ standard.

It must ultimately be recognised that there is no safe threshold for PM₁₀ and councils should continue to work towards minimising long-term health effects beyond the minimum requirement of the current Regulations.

Amendments

In June 2011 Regulation 13 and Schedule 1 were amended to clarify permissible exceedances.

4.4 Split targets for meeting the ambient PM₁₀ standard

The 2011 amendments to the Regulations have changed the timeframes for compliance with the ambient PM₁₀ standard.

The amended Regulations have added Regulation 16B which introduces extended timeframes (the ‘split targets’) for PM₁₀ depending on how many exceedances an airshed has at 1 September 2011. Whilst new target dates for PM₁₀ have been introduced, importantly, the value of the PM₁₀ standard remains the same. This means that bottom-line standards for public health protection remain unaffected by the amendments.

The split targets were introduced into the revised Regulations to moderate the target date for compliance and require an ‘equivalence of effort’ from all parties charged with implementation. The split targets therefore draw a careful balance between the level of health protection the standard affords against the need to reduce compliance costs and the very real issue of feasibility.

Regulation 16B states:

16B Allowances for meeting PM₁₀ standard

- (1) *The PM₁₀ standard strictly applies to an airshed (so that 1 exceedance is allowed in a 12-month period), unless subclause (3) applies to the airshed and allows more exceedances.*
- (2) *Subclause (3) applies to an airshed on and from the first day on or after 1 September 2011 on which the airshed has meaningful PM₁₀ data for at least a 12-month period in the immediately prior 5-year period (the **start date**).*
- (3) *In an airshed with the average exceedances of PM₁₀ per year specified in the first column of the table in this subclause, the PM₁₀ standard is not breached, or is to be treated as if it were not breached, during the period specified in the second column despite the occurrence of the number of exceedances of PM₁₀ specified in the third column.*

| <i>Average exceedances per year (before start date)</i> | <i>Period in which exceedances allowed (on and from start date)</i> | <i>Number of exceedances allowed</i> |
|---|---|--|
| <i>1 or fewer</i> | <i>Always</i> | <i>1 or fewer in a 12-month period</i> |
| <i>More than 1, but fewer than 10</i> | <i>1 September 2011 to 31 August 2016</i> | <i>Unlimited</i> |
| <i>10 or more</i> | <i>1 September 2016 onwards</i> | <i>1 or fewer in a 12-month period</i> |
| | <i>1 September 2011 to 31 August 2016</i> | <i>Unlimited</i> |
| | <i>1 September 2016 to 31 August 2020</i> | <i>3 or fewer in a 12-month period</i> |
| | <i>1 September 2020 onwards</i> | <i>1 or fewer in a 12-month period</i> |

- (4) *The average exceedances of PM₁₀ per year for an airshed under subclause (3) must be calculated under regulation 16D for the 5-year period ending immediately before the airshed’s start date.*
- (5) *Despite subclause (3), any breach of the PM₁₀ standard is still a breach for the purposes of the following regulations:*
 - (a) *regulation 15 (regional council must monitor air quality if standard breached):*
 - (b) *regulation 16 (regional council must give public notice if standard breached):*
 - (c) *regulation 17(4)(b) (airshed stops being polluted airshed if PM₁₀ standard not breached for 5 years):*
 - (d) *regulation 24A (discharge from certain open fires prohibited).*

- (6) *If an airshed is established by notice in the Gazette, the data (if any) that best applies to the new airshed from the 1 or more airsheds from which the new airshed derived must be treated as if it were the new airshed's data to determine,---*
- (a) *under subclause (2), whether subclause (3) immediately applies or later applies to the airshed; and*
- (b) *under subclauses (3) and (4), how the table in subclause (3) applies to the airshed (if subclause (3) applies).*
- (7) *To avoid doubt,---*
- (a) *subclause (3) does not affect the calculation under regulation 16D of an airshed's average exceedances of PM₁₀ per year; and*
- (b) *a reference in the third column of the table in subclause (3) to 1 or fewer exceedances being allowed in a 12-month period simply reflects the strict application of the PM₁₀ standard.*
- (8) *This regulation expires on 1 September 2020.*

Example

On 1 September 2011, an airshed has meaningful PM₁₀ data for four 12-month periods in the immediately prior 5-year period (ending on 31 August 2011). There were 42 exceedances of PM₁₀ in the airshed in those four 12-month periods. The airshed's average exceedances of PM₁₀ per year is (for the purpose of subclause (3))---

$$10.5 = \frac{42}{4}$$

The airshed is therefore (for certain purposes)---

- *allowed unlimited exceedances of PM₁₀ from 1 September 2011 to 31 August 2016;*
- *allowed 3 exceedances of PM₁₀ in a 12-month period from 1 September 2016 to 31 August 2020.*

The PM₁₀ standard strictly applies again on 1 September 2020 (allowing 1 exceedance of PM₁₀ in a 12-month period).

Amendments

In June 2011 Regulation 16B was introduced into the national environmental standards for air quality. Prior to this the ambient PM₁₀ standard strictly applied from 1 September 2004 with severe consequences for industry after 2013.

4.4.1 What are the split targets for PM₁₀?

The split targets created by Regulation 16B(3) are given below in table 5. In order for an airshed to qualify for split targets an airshed must have as a minimum:

at least one 12-month period of meaningful PM₁₀ monitoring data in the previous five years.

A 12-month period of meaningful PM₁₀ monitoring data does not have to be for a calendar year or from 1 September to 31 August; simply a continuous 12 month period of data which fulfils the requirements for meaningful data. Meaningful data is discussed in greater detail in section 4.6.1.

Airsheds that meet their allocated split targets (either 1 September 2011, 1 September 2016 or 1 September 2020) within the time allowed are deemed to comply with the ambient PM₁₀ standard. However, if possible, airsheds should aim to reduce their number of exceedances earlier (and hence meet their compliance dates earlier as well) as this will reduce the likely health impacts of PM₁₀ within the airshed.

Table 5: Split targets for PM₁₀

| Average exceedances per year* | New Compliance Timeframe | Allowable exceedances per year |
|-------------------------------|-----------------------------------|--------------------------------|
| ≤ 1 | Always | 1 |
| 1 < exceedances < 10 | 1 September 2011 – 31 August 2016 | Unlimited |
| | 1 September 2016 onwards | 1 |
| ≥ 10 | 1 September 2011 – 31 August 2016 | Unlimited |
| | 1 September 2016 – 31 August 2020 | 3 |
| | 1 September 2020 onwards | 1 |

* As, and from, 1 September 2011 using meaningful data (discussed further below)

4.4.2 When do the split targets start?

Regulation 16B(2) states that the split targets start from **1 September 2011**. If an airshed does not have a continuous 12-month period of meaningful data in the preceding 5 years for an airshed prior to 1 September 2011 (ie, between 1 September 2006 and 31 August 2011) then that airshed cannot use split targets until such time as it does.

If an airshed does not have meaningful data then the split targets **cannot be used** and the airshed must have immediate compliance with only **one** exceedance from 1 September 2011.

The intent of Regulation 16B(2) is to ensure that the split targets are only allocated where there is sufficient data to ‘prove’ that compliance could not be met earlier. This is because the split targets extend the attainment dates and hence prolong adverse health effects in airsheds with extended timeframes.

If an airshed achieves a rolling 12-month period of meaningful PM₁₀ data **after** 1 September 2011 (eg, from 20 July 2011 to 19 July 2012, from 2 February 2014 to 1 February 2015, or from 13 April 2017 to 12 April 2018) then the split targets can be utilised from that date. The airshed will be then assigned a number of permissible exceedances depending on the date the meaningful data is obtained by and the average number of exceedances that occurred during the rolling 12-month period.

In order for councils to be sure that an airshed is in the right category of split targets, it would be preferable to have a full 5 years of meaningful data. However, this is not a necessity.

Example 4.1

As at 1 September 2014, the Fantastic Unitary Authority has meaningful PM₁₀ data for the Amazing Airshed only for the 12-month period of 1 July 2013 to 30 June 2014. During this 12-month period, there were 6 exceedances of the ambient PM₁₀ standard. Therefore:

- *following the method outlined in section 4.7, the Amazing Airshed’s average exceedances of PM₁₀ per year is six (6 exceedances ÷ 1 year of data)*
- *between 1 September 2011 and 1 September 2014, the Regulations required the Amazing Airshed to meet 1 exceedance of the PM₁₀ standard*
- *from 1 September 2014 until 31 August 2016, having now satisfied the requirements for split targets, the Amazing Airshed is allowed unlimited exceedances of the ambient PM₁₀ standard*
- *from 1 September 2016, the Amazing Airshed must then have no more than one exceedance of PM₁₀ in a 12-month period.*

4.4.3 How are the split target allowable exceedances calculated?

Regulation 16D specifies how the average allowable exceedances of PM₁₀ for setting split targets under Regulation 16B are calculated. This process is discussed in section 4.7. Regulation 16B also gives an example of how to determine which category of split targets applies to an airshed (see section 4.4).

4.4.4 When do the split targets finish?

Regulation 16B(8) states that Regulation 16B (ie, the split targets) **finishes on 1 September 2020**. At this time, every airshed **must meet no more than one exceedance per year**.

4.4.5 When do the split targets not apply?

Regulation 16B(5) states that despite the split targets, which allow the number of permissible exceedances to be more than one, **any breach** of the PM₁₀ standard (ie, more than one exceedance of the threshold concentration of 50 µg/m³, as a 24-hour average, in any 12-month rolling period) **is still a breach** for the purposes of the following:

- Regulation 15 - regional council must monitor air quality if standard breached
 - a regional council must still monitor PM₁₀ in an airshed if PM₁₀ is likely to exceed the PM₁₀ standard, more than once in any 12-month rolling period
- Regulation 16 - regional council must give public notice if standard breached
 - a regional council must still publicly notify the second and all further exceedances of the PM₁₀ standard within the airshed in each rolling 12-month period
- Regulation 17(4)(b) - airshed stops being polluted airshed if PM₁₀ standard not breached for 5 years
 - a regional council must still have 5 years with no more than one exceedance of the PM₁₀ standard in any rolling 12-month period during that 5 years to stop being a polluted airshed (and stop requiring mandatory offsets)
- Regulation 24A - discharge from certain open fires prohibited
 - a regional council must still notify a ban on new solid-fuel burning open fires within six months of the first breach (i.e. second exceedance) of the PM₁₀ standard that occurs after 1 September 2011.

As the split targets extend the attainment dates, and hence could be seen to be prolonging adverse health effects in airsheds with extended timeframes, the Regulations are designed to ensure that the split targets are only allocated where there is sufficient data to 'prove' that compliance could not be met earlier. There are large financial implications for meeting the targets (and for industry that need to offset) – this needs to be managed in a fair and accountable manner.

4.5 Where do the ambient PM₁₀ standards apply?

Section 3.4 discusses in detail where the ambient PM₁₀ standards apply. To summarise, they apply:

- to all of New Zealand whether an area is a gazetted airshed or not
- in open air
- where people are likely to be exposed.

The ambient PM₁₀ standard does not apply on-site to a site for which resource consents apply for the discharge of PM₁₀.

Airsheds, and how they are created, are discussed in section 3.4.1. In practice, the bulk of gazetted airsheds within New Zealand have been created to manage discharges and effects of PM₁₀. For an up to date list of airsheds currently gazetted for PM₁₀ please check the Ministry for the Environment website at www.mfe.govt.nz. Councils may reclassify their airsheds from time to time as more information becomes known about individual airsheds.

Regulation 16B(6) discusses what happens if a new gazetted airshed is derived at a later date from existing airsheds (ie, an airshed is created that is a subset of one or more bigger airsheds). The Regulation requires that any new airshed takes on the data (if any) and the status of the parent airshed/s. The parental status will determine whether the new airshed can have split targets, and if so what they are. Readers should note that Regulations 16B, 16C and 16D only relate to PM₁₀ and do not apply to any of the other ambient pollutant standards.

4.6 Monitoring of PM₁₀

Section 3.5 discusses in detail how monitoring of ambient pollutants for the purposes of the Regulations should be undertaken. To summarise, PM₁₀ monitoring must:

- be undertaken for PM₁₀ in an airshed (whether gazetted or not) if it is likely the ambient PM₁₀ standard will be breached
- be undertaken in an airshed until such time as air quality is unlikely to breach the ambient PM₁₀ standard
- occur in the airshed where people are likely to be exposed
- be undertaken where the ambient standards are most likely to be **breached by the greatest margin** or with the **most frequency**, whichever is more likely (section 3.5.3)
- be undertaken in accordance with the PM₁₀ monitoring methods specified in Schedule 2 of the Regulations.

4.6.1 'Meaningful' PM₁₀ data

The 2011 amendments to the Regulations have inserted a new Regulation 16C. This Regulation introduces the concept of 'meaningful' PM₁₀ data and states:

16C Meaningful PM₁₀ data for airshed

- (1) *This regulation specifies what is required for an airshed to have meaningful PM₁₀ data under regulation 16B(2), 16D(2), or 17(4)(a)(i).*
- (2) *An airshed has meaningful PM₁₀ data for a 12-month period if,---*
 - (a) *when the concentration of PM₁₀ in the airshed was measured during that period, it was measured in a way that allowed 24-hour mean concentrations to be calculated under Schedule 1; and*
 - (b) *the measurements captured data for at least 95% of the 12-month period, after deducting from the duration of the 12-month period any periods of time that were not covered by measurements because of maintenance or calibration; and*
 - (c) *at least 75% of the data captured was valid data.*

Meaningful PM₁₀ data (meaningful data) is required for:

- Regulation 16B(2) – split targets for compliance with the ambient PM₁₀ standard
- Regulation 16D(2) – calculation of an airshed’s average exceedances of PM₁₀ per year
- Regulation 17(4)(a)(i) – determining whether an airshed is polluted and therefore whether mandatory offsets must be applied to new resource consents.

The use of meaningful data is intended to ensure that sufficient and appropriate data is available to determine compliance with the Regulations. In this way it will provide certainty that nationally equivalent approach is being used to determine if an exceedance of the ambient PM₁₀ standard has occurred. Accordingly, the intent of Regulation 16C is to enshrine current best practice for monitoring as detailed in the Good Practice Guide for Air Quality Monitoring and Data Management 2009 (MfE, 2009a) (the Monitoring GPG) in the Regulations.

In practice, the majority of airsheds, with PM₁₀ concentrations of concern, already have meaningful monitoring data for a least a year, and usually more.

Meaningful data is not required by the Regulations for any of the other ambient pollutants (discussed in Chapter 3). However, the Monitoring GPG (MfE, 2009a) recommends that all monitoring sites achieve at least 75% valid data for averaging and 95% data capture (ie, meaningful data).

What is meaningful data?

Regulation 16C defines meaningful data for a 12-month period as data captured for at least 95% of any 12-month period (excluding any periods for calibration and maintenance). Further, at least 75% of the data must be valid data.

Data capture is a quality assurance indicator. That is, trying to minimise unplanned outages of a monitor and prevent large periods of data being missed. Periods of data will still be lost for calibration and maintenance.

Valid data is data that has been through a process to remove any data values that do not reflect actual conditions being monitored. For example, sometimes monitors register negative values. These are not ‘real’ and hence are removed when assessing ‘valid’ data.

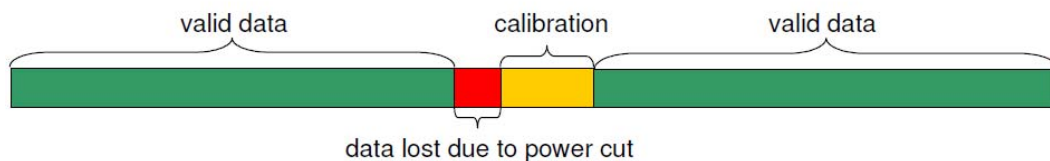
In the context of Regulation 16C, valid data attempts to ensure that its monitoring data is ‘real’ and representative of the averaging period. A requirement for 75% ensures that the data is representative of what might occur within a year – ie, both winter and summer.

Section 8.7 of the Monitoring GPG (MfE 2009a) discusses missing data (ie, meaningful data) and states:

"No monitoring record is ever complete. There will inevitably be periods of missing data – some deliberate and necessary, such as calibration periods – but most unforeseen, such as equipment failures, power outages, bias and drifts. Even in the most diligently operated monitoring networks it is difficult to reach anything close to 100 per cent valid data for long-term monitoring.

Note that calculation of data capture normally excludes down time for routine calibrations and maintenance while the per cent valid data calculation includes this down time. Slight bias, drifts or calibration shifts can often be dealt with, but complete outages need special consideration.

The diagram below shows an example of a data capture rate and per cent valid data calculation



24-hour average = 24 1-hour averages

If



power cut = 1 hour (1 1-hour average)

calibration = 2 hours (2 1-hour averages)

valid data points = 21 hours (21 1-hour averages)

then

per cent valid data for averaging = $21/24 = 88\%$

data capture rate = $21/24-2 = 95\%$

data loss = $1/24 = 4\%$

Interpolation or extrapolation to fill in missing data should not be used in the process of producing a basic quality-assured data set, and the missing data should be left as a gap...

Sites used for compliance monitoring [of an ambient standard] should achieve at least:

- 75% valid data for averaging
- 95% data capture

$$\text{Percent valid data for averaging} = \frac{\text{number of valid data points obtained}}{\text{total number of data points in the averaging period}}$$

$$\text{Data capture rate} = \frac{\text{number of valid data points obtained}}{\text{total number of data points for the period} - \text{calibration and maintenance data points}}$$

It must be noted that in order to calculate an average for any monitoring period there must be at least 75% of the data points that make up that period considered to be valid. 1-hour averages are calculated from 10-minute averages, 24-hour averages are calculated from 1-hour averages, and annual averages are calculated from 24-hour averages. Therefore to calculate:

- a 1-hour average, a minimum of 5 individual 10-minute averages out of the possible 6 is required, (ie, $6 \times 75\% = 4.5$ which is rounded to 5)
- a 24-hour average, a minimum of 18 individual 1-hour averages out of the possible 24 is required (ie, $24 \times 75\% = 18$)
- an annual average, a minimum of 274 individual 24-hour averages in a 12-month period (ie, $365 \times 75\% = 273.75$ (which is rounded to 274)).

What about monitor calibration and maintenance?

In accordance with the *Monitoring GPG* (MfE, 2009a) monitor downtime for calibration and maintenance is excluded from the data capture requirements.

Multiple monitors within an airshed with meaningful data

Large airsheds (eg, Auckland), or airsheds with complex terrain or source characteristics (eg, Nelson), or airsheds with multiple urban areas (eg, Otago) may require several monitors. This can mean that several monitors *within* an airshed may have meaningful data.

For the purpose of compliance with the Regulations, an airshed is deemed to have meaningful data for the entire airshed provided at least one monitor that is representative of the airshed has meaningful data for the 12-month period.

An airshed with multiple monitors that *cumulatively* have only 12 months of meaningful data between the monitors would not be considered to meet the intent of the meaningful data requirement of the Regulations.

Example 4.2

The Freezing Regional Council has a PM₁₀ monitor operating for a 4 month period in each of 3 towns – Big Town, Medium Town and Little Town. These towns are all within the Frosty Airshed. The monitor records data at one town and is then relocated to the next town. The monitor cumulatively records 12 months of data. Therefore:

- *there is a 12-month period of PM₁₀ data for the airshed but not a continuous 12-month record at a single location*
- *this is not meaningful data for the purposes of Regulation 16C.*

Example 4.3

The Balmy Regional Council has PM₁₀ monitors operating in 3 suburbs – Coastal Suburb, Hilly Suburb and Valley Suburb. These suburbs are a long way from each other but are all within the Temperate City Airshed. Over a period of a year each monitor unfortunately breaks down. The monitors only operate for 4 months, 9 months and 7 months respectively. When all the data is ‘cobbled’ together the monitors have cumulatively recorded a continuous 12 month period of data. Therefore:

- *there is a 12-month period of PM₁₀ data for the airshed but not a continuous 12-month record at a single location*
- *this is not meaningful data for the purposes of Regulation 16C.*

What happens if an airshed does not have meaningful data?

If an airshed does not have meaningful data then:

- split targets for compliance with the ambient PM₁₀ standard do not apply (Regulation 16B(2))
- an airshed’s average exceedances of PM₁₀ per year cannot be calculated (Regulation 16D(2))
- an airshed cannot be classified as polluted and therefore offsets are not mandatory for new resource consents (Regulation 17(4)(a)(i)) (but may still be required by council as part of a normal consent processing).

Meaningful data defines the ‘burden of proof’ for demonstrating compliance with the Regulations. Its’ primary role in the Regulations is to ‘turn on’ the application of split targets and ‘turn off’ the requirement for mandatory offsets.

As the split targets extend the attainment dates, and hence could be seen to be prolonging adverse health effects in airsheds with extended timeframes, the Regulations are designed to ensure that the split targets are only allocated where there is sufficient data to ‘prove’ that compliance could not be met earlier. There are large financial implications for meeting the targets (and for industry that need to offset), which needs to be managed in a fair and accountable manner.

Irrespective of whether an airshed has meaningful PM₁₀ data or not, any measured exceedances of the ambient 24-hour PM₁₀ concentration standard of 50 µg.m⁻³ must be notified in accordance with Regulation 16 once a breach occurs.

4.6.2 Monitoring methods

Schedule 2 of the Regulations provides the required methods for ambient air quality monitoring of PM₁₀. These methods are summarised in table 6 and must be used for monitoring PM₁₀ for the purposes of the Regulations.

The methods that comply with the requirements of Schedule 2 of the Regulations, including USEPA reference and equivalent methods are given in Appendix 4¹⁴. This list, and the list in the Good Practice Guide for Air Quality Monitoring and Data Management 2009 (MfE, 2009a), are updated periodically to reflect technology changes. Readers are referred to the Ministry for the Environment website for up to date information.

Table 6: Monitoring methods for ambient PM₁₀ standard

| Method |
|---|
| United States Code of Federal Regulations, Title 40---Protection of Environment, Volume 2, Part 50, Appendix J---Reference method for the determination of particulate matter as PM ₁₀ in the atmosphere; or |
| Australian/New Zealand Standard AS/NZS 3580.9.6:2003, Methods for sampling and analysis of ambient air---Determination of suspended particulate matter---PM ₁₀ high volume sampler with size-selective inlet---Gravimetric method; or |
| Australian Standard AS 3580.9.8:2008, Methods for sampling and analysis of ambient air---Determination of suspended particulate matter---PM ₁₀ continuous direct mass method using a tapered element oscillating microbalance analyser; or |
| Australian/New Zealand Standard AS/NZS 3580.9.11:2008, Methods for sampling and analysis of ambient air---Determination of suspended particulate matter---PM ₁₀ beta attenuation monitors. |

It must be noted that monitoring for PM₁₀, for the purposes of the Regulations, requires **continuous** monitoring in order to calculate a **daily** 24-hour mean. This is necessary to properly assess compliance with the PM₁₀ standard (50 µg.m⁻³ not to be exceeded for more than one 24-hour period in a 12-month period).

With respect to TEOMs¹⁵, the intent is to continue with current best practice as outlined in the Monitoring GPG. This requires the development of a site-specific adjustment factor or the use

¹⁴ Note that the USEPA methods are periodically updated, councils are referred to the USEPA website www.epa.gov.

¹⁵ TEOM stands for tapered element oscillating microbalance analyser

of Filter Dynamics Measurement System (FDMS) to ensure the volatile fraction is not lost. Further an operating temperature of 40 °C (degrees Celsius) is recommended.

Amendments

In June 2011, the Australian/New Zealand test methods for PM₁₀ were updated to refer to the 2008 versions.

4.7 Exceedances

Section 3.6 describes what an exceedance is and how these are used. For PM₁₀, an exceedance is any monitoring result that is **above 50 µg.m⁻³** (24-hour average),

The 2011 amendments to the Regulations have inserted a new Regulation 16D to define how average PM₁₀ exceedances per year are calculated. The Regulation states:

16D Calculation of airshed's average exceedances of PM₁₀ per year

- (1) This regulation specifies how to calculate an airshed's average exceedances of PM₁₀ per year in a 5-year period for regulation 16B(4) or 17(4)(a)(ii).
- (2) The average exceedances of PM₁₀ per year in an airshed is calculated as follows:

$$a = \frac{e}{y}$$

where---

a is the average per year

e is the number of exceedances of PM₁₀ in the airshed in the 1 or more 12-month periods for which the airshed had meaningful PM₁₀ data in the relevant 5-year period

y is the number of those 12-month periods.

- (3) However, if an exceedance of PM₁₀ (relating to exceptional circumstances) must be ignored under regulation 16A(5), the exceedance must be excluded from the calculation.

The average number of exceedances of PM₁₀ per year when calculated by this Regulation is used to determine whether:

- split targets will apply in an airshed, and if they do whether air quality must comply with the ambient standard by 2016 or 2020 (Regulation 16B(4))
- an airshed is polluted in accordance with Regulation 17(4)(a)(ii) and thus initiate mandatory offsets for any new industry that has substantial discharges of PM₁₀ into the airshed.

When using Regulation 16D exceedances allowed by the Minister as exceptional events under Regulation 16A (discussed in sections 3.8 and 4.9) must be ignored.

Example 4.1 in section 4.4.2 shows how the calculation in Regulation 16D is used.

Irrespective of how many exceedances an airshed is allowed, and how they are calculated, a regional council must still:

- monitor air quality within an airshed if the airshed is likely to breach the PM₁₀ standard
- give public notice if the ambient PM₁₀ standard is breached (ie, as soon as the 2nd exceedance occurs) and for each exceedance thereafter
- have 5 clear years of compliance (ie, one or less exceedances) to no longer be defined as polluted (and thus require mandatory offsets for new consents for large sources of PM₁₀)

- notify, within 6 months of the PM₁₀ standard being breached after 1 September 2011, that new solid-fuel burning open fires will be banned a year from date of breach.

4.8 Reporting of breaches

Section 3.7 details the reporting of breaches of the ambient standards by public notice. To summarise, exceedances of the ambient PM₁₀ standard must be publicly notified:

- once the strict ambient PM₁₀ standard (ie, one exceedance of the PM₁₀ concentration threshold of 50 µg.m⁻³ (24-hour average) in a year) in an airshed has been breached (irrespective of whether or not such breaches are allowed under Regulation 16B)
- in accordance with the definition of public notice within the RMA
- at least once a month until there is no further breach (ie, 12 months from the last breach).

The new solid-fuel burning open fire ban (Regulation 24A) also has requirements for public notification once it is initiated. This is discussed in section 5.3.4.

Examples of public notices are given in Appendix 3 and Appendix 6.

4.9 Exceptional circumstances

Section 3.8 discusses the exceptional circumstances where an exceedance can be ignored (ie, an ‘exceptional event’). To summarise, exceptional events:

- may be considered by the Minister for the Environment on criteria including:
 - the event affected air quality **and**
 - the event was not reasonably controllable or preventable **and**
 - there is a clear causal relationship between the event and the monitored concentration **and**
 - the event was caused by human activity that is unlikely to reoccur **and**
 - there would be no exceedance but for the event.
- must be the subject of an application to the Minister within 3 months of the event occurring
- must be decided by the Minister within 3 months of receiving the application
- must be ignored, in relation to PM₁₀ for Regulations 16B, 16D, 17 and 24A, if the Minister for the Environment decides they are an exceptional event
- must still be publicly notified if a breach (See sections 3.7 and 4.8).

4.10 The PM₁₀ standard and resource consents

The ambient PM₁₀ standard in Regulation 13 and Schedule 1 is aimed at providing a guaranteed level of health protection for New Zealanders. Some activities, usually large industries, can have substantial discharge of PM₁₀ either individually or cumulatively. These activities typically require resource consents from regional councils through regional plans.

The 2011 amendments have removed previous requirements for Straight Line or Curved Line Paths (SLiPs or CLiPs). These have been replaced with a requirement for mandatory offsets for

large dischargers of PM₁₀ for new industry in polluted airsheds. Polluted airsheds are discussed in section 4.10.1.

It is **not** intended that the offset requirements penalise industry. Existing industry can continue to operate without needing to implement offsets, whilst any new industry must have a 'zero' PM₁₀ emission level by offsetting any PM₁₀ that they may discharge.

Offsets to mitigate PM₁₀ emissions from consented activities have been substantially modified. Offsets, and how they apply, are detailed in 4.10.2.

Section 17 of the Regulations states:

- 17 Certain applications must be declined unless other PM₁₀ discharges reduced**
- (1) *A consent authority must decline an application for a resource consent (the **proposed consent**) to discharge PM₁₀ if the discharge to be expressly allowed by the consent would be likely, at any time, to increase the concentration of PM₁₀ (calculated as a 24-hour mean under Schedule 1) by more than 2.5 micrograms per cubic metre in any part of a polluted airshed other than the site on which the consent would be exercised.*
- (2) *However, subclause (1) does not apply if---*
- (a) *the proposed consent is for the same activity on the same site as another resource consent (the **existing consent**) held by the applicant when the application was made; and*
- (b) *the amount and rate of PM₁₀ discharge to be expressly allowed by the proposed consent are the same as or less than under the existing consent; and*
- (c) *discharges would occur under the proposed consent only when discharges no longer occur under the existing consent.*
- (3) *Subclause (1) also does not apply if---*
- (a) *the consent authority is satisfied that the applicant can reduce the PM₁₀ discharged from another source or sources into each polluted airshed to which subclause (1) applies by the same or greater amount than the amount likely to be discharged into the relevant airshed by the discharge to be expressly allowed by the proposed consent; and*
- (b) *the consent authority, if it intends to grant the proposed consent, includes conditions in the consent that require the reduction or reductions to take effect within 12 months after the consent is granted and to then be effective for the remaining duration of the consent.*
- (4) *For the purposes of this regulation,---*
- (a) *an airshed becomes a polluted airshed on and from 1 September 2012 or any later day if, for the immediately prior 5-year period,---*
- (i) *the airshed has meaningful PM₁₀ data for at least a 12-month period; and*
- (ii) *the airshed's average exceedances of PM₁₀ (as calculated under regulation 16D) was more than 1 per year; and*
- (b) *an airshed stops being a polluted airshed on and from any day if the PM₁₀ standard was not breached in the airshed in the immediately prior 5-year period.*
- (5) *If an airshed is established by notice in the Gazette, the data (if any) that best applies to the new airshed from the 1 or more airsheds from which the new airshed is derived must be treated as if it were the new airshed's data to determine, under subclause (4),---*
- (a) *whether the new airshed immediately becomes a polluted airshed; or*
- (b) *whether the new airshed later becomes or stops being a polluted airshed.*
- (6) *To avoid doubt,---*
- (a) *a polluted airshed to which subclause (1) applies may or may not be an airshed in the region of the consent authority considering an application; and*
- (b) *if an airshed stops being a polluted airshed under subclause (4)(b), it may later become a polluted airshed again under subclause (4)(a).*

Example

An airshed's average exceedances of PM₁₀ per year is 1.2 for the 5-year period from 1 September 2007 to 31 August 2012. The airshed therefore becomes a polluted airshed on 1 September 2012.

15 March 2020 is the first day after the end of a 5-year period in which the PM₁₀ standard was not breached in the airshed. The airshed therefore stops being a polluted airshed on 15 March 2020.

Amendments

The June 2011 amendments have repealed provisions for straight line or curved line paths and replaced them with a new requirement for mandatory offsets for new large industrial dischargers of PM₁₀ in a polluted airshed from 1 September 2012.

These amendments have also removed previous requirements for offsets for resource consents that discharge PM₁₀ (discussed further in section 4.12.3).

4.10.1 'Polluted' Airsheds

Regulation 17 requires a new activity that requires a resource consent for substantial discharges of PM₁₀ to offset at least all its PM₁₀ emissions if the activity discharges into a polluted airshed.

What is a polluted airshed?

Any airshed that has more than one exceedance in a 12-month period is not meeting the strict PM₁₀ standard given in Regulation 13 and therefore has an air pollution problem. The use of split targets (as allowed under Regulation 16B) only extends the compliance date for meeting the strict standard – it is not intended to imply that there is not an air pollution problem and therefore that no action is required. Therefore, the concept of polluted airsheds has been developed to ensure that industrial discharges, although not normally the largest source in an airshed, do not make an existing air pollution problem worse.

A polluted airshed only relates to PM₁₀ and is described in Regulation 17(4) as **an airshed that has average exceedances of more than one per 12-month period, for the immediately prior 5-year period**. That is, if an airshed has on average more than one exceedance (as defined using meaningful data – refer section 4.6.1) of the ambient PM₁₀ concentration standard of 50 µg.m⁻³ (24-hour average) then it is a polluted airshed.

Regulation 17(5) discusses what happens if a new gazetted airshed is derived at a later date from existing airsheds (ie, an airshed is created that is a subset of one or more bigger airsheds). This Regulation requires that any new airshed takes on the data (if any) and the status of the parent airshed/s.

The parental status will determine whether the new airshed is a polluted airshed or not. The parental status also determines whether the newly created airshed becomes, or stops being, a polluted airshed at some later date.

Regulation 17(5) only applies to the standard for PM₁₀, it does not apply to any of the other ambient pollutant standards.

If an airshed does not have meaningful data it cannot be classified as polluted and mandatory offsets cannot be required by virtue of the Regulations.

When do polluted airsheds apply?

An airshed may be classified as polluted for the purposes of Regulation 17 on, or from 1 September 2012. Once an airshed is polluted, mandatory offsets apply. These are discussed in section 4.10.2.

An airshed ceases to be polluted when, and only when, the PM₁₀ standard has not been breached in the airshed for 5 years. That is, **5 years with no breaches** (ie, only 1 exceedance of the 24-hour average within any rolling 12-month period during that 5 years) must have occurred before an airshed is no longer classed as polluted. Once the airshed is no longer polluted offsets for new industry are no longer mandatory (but still may be deemed necessary by the council to achieve continued compliance with the PM₁₀ standard).

Any airshed can be reclassified as polluted at any date from 1 September 2012 (ie, even after a period of 5 years or more with no breaches) if the average exceedances go back above one 24-hour period in 12-months. This restarts the requirement for mandatory offsets for resource consents.

Does a polluted airshed have to be the same airshed as where the consent activity is occurring?

A polluted airshed does not have to be the same airshed as where the activity discharging PM₁₀ is located. Regulation 17(6) also advises that a polluted airshed may or may not be an airshed in the region of the consent authority considering the application.

The intention of this is to offset the emissions of PM₁₀ where the effect of the PM₁₀ is occurring (and the airshed is already polluted) rather than where the discharge is being emitted.

4.10.2 Offsetting PM₁₀ for New Consents

Regulation 17 was amended in 2011. Consequently, there are new requirements for ‘offsets’ for large dischargers of PM₁₀. The aim of the Regulations is to ensure that large sources of PM₁₀, which require resource consents, do not add to the burden of airsheds that are already polluted.

It is not intended that mandatory offsets heavily penalise industry. Rather, the intent is that new industry does not make existing pollution worse. Existing industry can continue to operate without needing to implement offsets but new industry must have a ‘zero net effect’ (or better) by offsetting any PM₁₀ that they discharge elsewhere in the airshed.

This section discusses the offset requirements for new consents. Consent renewals and changes to consent conditions are discussed in section 4.10.3.

What is an offset?

Offsets are mitigation measures to ‘offset’ potential impacts. They achieve this by requiring that emissions from the new activity are offset by emission reductions elsewhere in the airshed. In simple terms an activity is offsetting when it:

removes at least as much PM₁₀ from other sources in the airshed as it puts into the same airshed when operating.

The intention of the Regulations is to ensure that airsheds that already breach the ambient PM₁₀ standard (polluted airsheds) can still provide for new industry. New industry is typically cleaner than established industry; because it is in a better position to avail itself of modern, cleaner

technologies. Without offsets, new industry would not be able to become established at all as existing industry has effectively ‘used up’ the industrial allocation within the airshed.

Who is required to offset?

Offsets are mandatory for new resource consents for substantial discharges of PM₁₀.

New resource consents

As discussed above the intent is to capture new industry and not existing industry. Under section 88 of the RMA, however, applications for resource consent are treated as ‘new’ consent applications - regardless of whether the activity is proposed or existing.

In order to differentiate between existing activities (for which offsets are not mandatory) and new activities (for which offsets are mandatory) Regulation 17 introduces the term **existing** consent. Offset requirements for existing consents (i.e. consent renewals) are discussed in detail in section 4.10.3.

Substantial discharges of PM₁₀

A substantial discharge is defined in Regulation 17(1) as one that:

...would be likely, at any time, to increase the concentration of PM₁₀ (calculated as a 24-hour mean under Schedule 1) by more than 2.5 micrograms per cubic metre in any part of a polluted airshed other than the site on which the consent would be exercised.

Guidance on undertaking dispersion modelling to determine ground level concentrations of PM₁₀ is given in the Good Practice Guide on Atmospheric Dispersion Modelling (MfE, 2004b) (the Modelling GPG). It is important that dispersion modelling is undertaken in accordance with the best practice given in the Modelling GPG (MfE, 2004b). This is so that there is a level playing field for consent applicants regionally and nationally.

The 2.5 µg.m⁻³ threshold for requiring offsets is a **concentration** limit. This limit does not relate directly to **mass** emissions from an activity which is usually how large PM₁₀ sources adverse effects on an airshed are considered.¹⁶ It is considered to be good practice to use mass emissions when considering offsets.

Ground level concentrations can vary depending on how high the PM₁₀ is being discharged (eg, stack height), how fast the discharge is going (eg, stack velocity and flow rate) and how hot the plume of PM₁₀ laden air is (buoyancy). Mass emission rates are not affected by any of these. It is not best practice when assessing discharges of PM₁₀ to air to attempt to reduce the ground level PM₁₀ concentration to meet the 2.5 µg.m⁻³ by manipulating these variables. ‘Dilution is not the solution!’

Where do offsets apply?

Offsets are only mandatory in airsheds that have been classified as polluted airsheds (ie, airsheds that have breached the PM₁₀ standard). This does not preclude the use of offsets elsewhere (eg, in airsheds that are not polluted so that they do not become polluted) – only that they are not mandatory. Offsets are an important mitigation tool (eg, for resource consents and/or airshed action plans) that could be useful in a variety of applications.

¹⁶ It is good practice that any localised effects are assessed against ground level concentrations. It is only when assessing the effects within an airshed as a whole that mass emissions are usually considered.

Importantly, Regulation 17 is effects-based. It contains provisions to ensure that offsets occur in the airshed in which the PM₁₀ discharges are causing an effect. The discharge itself:

- may not be located in the airshed in which the effect occurs; and/or
- may not be located in the same region in which the effect occurs.

For example, if a new activity in one airshed will cause PM₁₀ effects in another polluted airshed, even another airshed in another region, then mandatory offsets apply. It will, therefore, be very important for the relevant regional councils to work together, to ensure that the Regulations are implemented effectively.

Example 4.4

Acme Packaging has applied for consent to operate a new plant in the Cheerful Airshed. The Cheerful Airshed is not a polluted airshed. The Assessment of Environmental Effects identifies that the discharge of PM₁₀ from Acme Packaging will impact on the neighbouring Bright Airshed with maximum levels between 7 and 10 µg.m⁻³ as a 24-hour average. The Bright Airshed is a polluted airshed. Therefore:

- *offsets are not required in the Cheerful Airshed*
- *offsets are required in the Bright Airshed.*

When do offsets apply?

Offsets are mandatory in all polluted airsheds **from** 1 September 2012. As noted above, this does not preclude their use earlier than this date; only that this is when they become mandatory. Polluted airsheds are discussed in section 4.10.1.

In addition to this, offsets may not be the only mitigation tool necessary. Other PM₁₀ mitigation techniques such as pollution control equipment may be required to ensure health effects are minimised both locally and within airsheds. It must be recognised that there is no safe threshold for PM₁₀ and councils should continue to work towards minimising long-term health effects beyond the minimum requirement of the current Regulations.

How do offsets work in practice?

The PM₁₀ discharges that need to be offset can arise from one, or a number of, sources. Typically, the chief concerns are that the offset should be cost effective, demonstrable and relatively quick and easy to implement.

The key sources in most polluted airsheds, and the most likely options for offsets of PM₁₀, are discharges from solid-fuel burning domestic fires. Domestic fires consume around 1.5 to 5 tonnes of fuel per year. Depending on the appliance type, they emit anywhere from 20 – 150 kg/year per unit which, when considered cumulatively, can be extraordinarily large.¹⁷ Domestic fires are also plentiful and relatively straightforward to replace.

Other potential offset options are vehicles (especially buses which are disproportionately high polluters) or other industrial discharges (eg, replacing a small coal-fired boiler with gas).

The value of offsets will be determined by the market but it is likely that ‘low hanging fruit’ (ie, the cheaper to replace emitters of PM₁₀) will be selected first. For example, the oldest buses, the worst domestic fires or the dirtiest boilers will be the initial options.

¹⁷ 22 kg/yr for new wood burners, 142 kg/yr for an open fire

The Regulations do not provide detailed criteria for offsets. Rather, the intent was that councils are in the best position to determine how to effectively and efficiently manage offsets in their own airsheds. However, to ensure as equitable implementation of offsets as possible there are some **key considerations that should be incorporated in any decisions and offset programmes**. These are (in no particular order):

1. All PM₁₀ is created equal (discussed later).
2. Offsets should be calculated using annual mass emission rates not concentration (discussed previously).
3. Offsets should occur close to the effect of the discharge of PM₁₀ (this should also apply for offsets required in adjacent airsheds).
4. There should, if possible, be some level of certainty that the offset applies in perpetuity, ie, cannot be ‘turned on’ again later (eg, if removing a domestic fire, that the owner of the property cannot put a new fire in later).
5. Equally, there should be some level of certainty that the offset is real (eg, removing an open fire that was previously in use) and that double counting does not occur (e.g. if the open fire was being removed anyway either voluntarily or under another scheme).

To foster clear, accountable consent decision making, regional councils may wish to produce guidance for activities on how offsets will be implemented within their region. Regional councils should also give consideration to providing policies and assessment criteria for offsets within regional plans.

Any consent conditions created to maintain offsets throughout the term of the consent need to be effective and efficient. Appendix 5 contains example consent conditions that may provide a guide to councils on what matters may need to be considered when issuing consent for an activity where offsets are required.

Is all PM₁₀ created equal?

Particles from different sources (eg, domestic fire emissions as opposed to sea salt) will have quite different chemical compositions, different physical characteristics and therefore potentially quite different toxicities. However, conclusive evidence from epidemiological studies is not yet available to establish these differences.

The World Health Organisation recommends that **all PM₁₀ is treated equal, irrespective of source**, as follows:

*“There are now substantial data available on the sources and composition of PM and on personal exposures to particles of various population groups. The information shows the complex characteristics of PM as the mixture varies spatially and temporally. **The mass-based standards that have been proposed inherently assume that all airborne PM has the same potential to cause adverse health effects, regardless of chemical composition or physical characteristics.** While both observational and experimental findings imply that particle characteristics are determinants of toxicity, definitive links between specific characteristics and the risk of various adverse health effects have yet to be identified.”*
(WHO, 2006)

For the purposes of the Regulations all PM₁₀ should be considered as equal. That is, one kilogram of PM₁₀ discharged from a motor vehicle, industry or domestic fire is considered to be the same.

Do I have to offset other pollutants (not just PM₁₀)?

The Regulations only require offsets to be undertaken for PM₁₀. However, a regional council may require offsetting of other contaminants under the consent process.

How to calculate an offset

The Regulations require that at an activity offset **at least** as much PM₁₀ as it is discharging. This is the minimum required. The Regulations do not preclude a regional council requiring an activity to offset **more** than their equivalent discharge.

Although the trigger in the Regulations to offset is a concentration limit, the method to calculate the amount of offset required should be a mass emission rate.

The amount of PM₁₀ an activity needs to offset needs to be calculated as a mass emission in a 12-month period. That is, an industry needs to determine how many kilograms of PM₁₀ it produces, which will then equate to the minimum amount the industry will need to remove from an airshed during a year of operation (**annual PM₁₀ mass emissions**).

When calculating annual emissions from an activity, it is good practice to use maximum hours of operation and emission rates.

Once the annual PM₁₀ mass emissions have been calculated then this is the minimum amount of PM₁₀ that needs to be removed by the offsets annually for the life of the consent.

In summary:

Annual PM₁₀ mass emission of activity = Annual PM₁₀ mass emissions of offset

Or, for example:

Annual PM₁₀ mass emissions of activity = x domestic fires

To ensure a fair, equitable and cost effective approach to offsets regional councils, either locally or nationally, need to determine what mass emission rates are for the key potential offset activities (eg, vehicles and different types of domestic fires).

Once an activity has calculated the mass emissions it needs to offset then it needs to calculate how many offsets (eg, how many domestic fires) would be required.

Some regional councils may already have regional data on offsets. Examples include, Auckland Council's Domestic Fire Emissions Prediction Model, DFPEM (ARC, 2010) and Bus Emission Prediction Model, BEPM (ARC, 2005). There is also national guidance for vehicle emissions from the Vehicle Emission Prediction Model, VEPM (ARC, 2009).¹⁸

How long do offsets apply?

Regulation 17(3)(b) requires offsets to be undertaken within 12 months of the granting of the consent and to be effective for the remaining term of the consent.

¹⁸ At time of writing (2011) Version 4 is in development.

Offsets are not required for new consent applications once an airshed is no longer polluted. However consents that have already been granted with offset requirements must continue undertaking offsets until such time as their consent expires. Otherwise, the airshed may become polluted again.

Who implements the offsets?

Carrying out the offsets (eg, replacing old domestic fires with other forms of heating) may be undertaken by any party. This could be the consent holder, the regional council or a third party.

What is important when implementing any offset programme is that a detailed register is kept of the offset process detailing what has been done to date, the effect this has on the annual requirement for PM₁₀ removal given in the consent conditions and what has yet to be done. This register will be critical in determining compliance for the consent holder with their consent conditions and in calculating how much PM₁₀ has been removed from an airshed.

Councils will need to work with activities that require consents to discuss ways in which offsets can be achieved. For example, a Council may wish to calculate the number of domestic fires that would need to be removed from the airshed to offset the emissions from the new industry. The Council may require the applicant to work on the scheme, or it may wish to calculate how much the applicant might pay to them annually to provide the necessary funds for the Council itself to offer a grant scheme to achieve the necessary offsets.

Careful attention to detail will be required when drafting resource consent conditions with respect to offsets. To help councils, example subject matter for consent conditions is given in Appendix 5.

4.10.3 Existing consents

The Regulations override rules in a regional plan or a resource consent unless the plan or resource consent has stricter controls (section 43B(1) of the RMA). The following sub sections of section 43B are relevant in terms of resource consents:

- (5) *A land use consent or a subdivision consent **granted before the date** on which a national environmental standard is notified in the Gazette **prevails over the standard.***
- (6) *A coastal, water, or discharge permit **granted before the date** on which a national environmental standard is notified in the Gazette **prevails over the standard until** a review of the permit's conditions under section 128(1)(ba) results in some or all of the standard prevailing over the permit.*
- (7) *This subsection applies to a resource consent not covered by subsection (5) or (6). The consent **prevails over a national environmental standard** if the application giving rise to the consent was the subject of a decision on whether to notify it before the date on which the standard is notified in the Gazette. However, the consent **does not prevail** if the standard expressly provides otherwise.*

Renewal of existing consents and changes to consent conditions

Under the RMA, consents up for renewal are treated as 'new' consents. Existing industry can continue to operate without needing to implement offsets.

The requirement to offset large sources of PM₁₀ in a polluted airshed does not apply for 'existing' consents if:

- the proposed consent is for the same activity on the same site as the existing consent and the existing consent will be replaced by the new consent (ie, for consent renewals)

- the amount **and** rate of PM₁₀ to be allowed by the renewed consent is the same or less than that allowed by the existing consent
- a change to a resource consent does not increase the amount or rate of PM₁₀ allowed to be discharged by the existing consent.

However, if the amount or rate of PM₁₀ discharged by the existing consent is to be increased then offsets are mandatory. This is the case even if ground level concentrations are predicted to reduce (eg, by the installation of a taller stack as part of a plant upgrade to increase process capacity) under the renewed consent. If there is an increase in PM₁₀ emissions, the industry must offset at least **all** its emissions irrespective of the previous resource consent. A regional plan may require that industry contributes funding, or in some other way, achieves a greater reduction in PM₁₀ emissions in the airshed.

Example 4.5

Acme Industries has an existing resource consent to discharge PM₁₀ from a 50 MW coal fired boiler. The boiler is in the polluted Fiery Airshed (as defined by Regulation 17). The consent is due to expire and Acme has applied to have the consent renewed. Acme has advised the Scorching Regional Council that the discharge of PM₁₀ from the boiler will not increase. Therefore:

- *offsets are not mandatory under the Regulations (but may still be deemed necessary by the Scorching Regional Council to improve air quality in the Fiery Airshed).*

However, Acme Industries then decides it wishes to upgrade the coal fired boiler to a new, larger, cleaner 100 MW boiler. It is predicted that the new boiler will discharge 1.5 times more PM₁₀ than the existing 50 MW boiler, but that the maximum ground level PM₁₀ concentration from the new boiler will only be 10 µg.m⁻³ (ie, 2/3 of that from the old boiler but still substantial). Therefore:

- *offsets are now required in the Bright Airshed*
- *offsets are mandatory under the Regulations*
- *Acme Industries must offset at least all the PM₁₀ emitted by the new boiler.*

Review of consents

Section 43B(6) of the RMA provides that the Regulations do **not** affect a coastal, water or discharge permit that commenced before 1 September 2005 until such time as consent conditions are reviewed under section 128(1)(ba).

Large dischargers of PM₁₀ may have their resource consents reviewed to reduce emissions in an airshed that cannot comply with the ambient PM₁₀ standard.

4.11 Impacts on regulatory documents

The Regulations are mandatory under the RMA. Notwithstanding the constraints upon resource consent decisions discussed in section 4.10, the ambient PM₁₀ standards impact on all decisions that relate to air quality made under the RMA.

For example, a regional council may currently permit a range of activities (eg, coal-fired boilers under 5 MW in size) in their regional plan. These activities may cumulatively be making a significant contribution to exceedances of the ambient PM₁₀ standard. If so, the regional council should review their regional plan.

Application of the Regulations with respect to regional plans, designations and bylaws are discussed in more detail below. Resource consents (both existing and new) are discussed in section 4.10.

4.11.1 Regional plans

The Regulations are mandatory under the RMA. They automatically supersede any relevant regional plan rules (unless the local government controls are stricter).

As a result of the 2009 amendments to the RMA, section 44A(5) of the RMA requires that regional councils **must** remove regional plan rules that are more lenient than, or conflict with, the national environmental standards for air quality. A regional plan cannot allow resource consent for an activity that discharges PM₁₀ that is less stringent than, or conflicts with, the Regulations. Removal of the rule/s may be carried out without using the detailed processes for plan changes normally required by Schedule 1 of the RMA and must be done as soon as practicable.

Regulation 28 allows for more stringent rules, resource consents or bylaws than the Regulations (this includes Regulations 13, 16B and 17). For example, this means:

- regional plans can have tighter ambient PM₁₀ standards for ambient pollutants (either lower concentration levels or fewer permissible exceedances)
- regional plans can have earlier compliance dates than the split target dates specified in the Regulations
- regional plans could specify assessment criteria for implementing PM₁₀ offsets
- regional plans could require offsets for **all** existing industries upon renewal of their resource consent.

This policy advice is true only for the national environmental standards for air quality. Other national environmental standards will have a different relationship with regional plans.

4.11.2 Designations

A designation is a provision in a district plan which provides notice to the community of an intention by a requiring authority (eg, a road controlling authority) to use land in the future for a particular project (eg, road or airport). Once a site is designated for a particular purpose, the requiring authority is able to proceed with the specific work on the site as if it were permitted by the district plan.

The Regulations do not apply to designations that existed at 1 September 2005 (ie, when the ambient standards came into force).

For designations after 1 September 2005, territorial authorities and/or requiring authorities must consider the Regulations when weighing up whether new designations, or alterations to existing designations, meet the purposes of the RMA (eg, safeguarding the life-supporting capacity of air). This is particularly important for new roads as roads can have significant impacts on ambient pollutant levels both locally and regionally.

Territorial authorities will need to take into account the potential impacts of a new designation on air quality in the airshed and the subsequent impact upon the ability to issue future resource consents within that airshed.

Additional guidance for territorial authorities and regional councils is provided on assessing discharges from transport with respect to the ambient standards in the Good Practice Guide for Assessing Discharges to Air from Land Transport (MfE, 2008b). The good practice guide can be downloaded from the following Ministry for the Environment website at www.mfe.govt.nz.

4.11.3 Bylaws

Regional councils and unitary authorities are the agencies primarily responsible for air quality management under the RMA. However, territorial authorities are also tasked with the requirements to observe the Regulations and to enforce observance to the extent that their powers enable them to do so.

Importantly, territorial authorities have the ability to make bylaws under section 145(b) of the LGA. This could include bylaws in relation to discharges of PM₁₀. Regulation 28 allows for bylaws to be more stringent than the Regulations. An example of a domestic fire bylaw is discussed in section 5.4.1.

A good working relationship between the regional councils and territorial authorities can significantly assist in addressing air quality issues and meeting the national air quality standards effectively and efficiently.

4.12 Implementing the ambient PM₁₀ standard

The Regulations were promulgated in 2004 and have been in force since 2005. The compliance timetable has been amended to enable split targets which now apply in either 2011, 2016 or 2020 depending on the state of air quality. However, the value of the PM₁₀ standard has remained the same. Therefore, councils with airsheds which exceed the PM₁₀ standard should have begun taking action by now.

However, change takes time. It is acknowledged that many airsheds still have a long way to go to achieve compliance with the ambient PM₁₀ standard.

4.12.1 The PM₁₀ Compliance Strategy

Ministry for the Environment has produced the Clean Healthy Air for All New Zealanders: The National Air Quality Compliance Strategy to Meet the PM₁₀ Standard (MfE, 2011e) (Compliance Strategy) to assist councils with implementing the PM₁₀ Regulations as easily, and quickly, as possible. The Compliance Strategy is the primary implementation instrument for compliance with the ambient PM₁₀ standard nationally.

The Compliance Strategy promotes a ‘toolkit’ of graduated responses for PM₁₀, ranging from education, advice, reporting and review through to assisted compliance and enforcement action. It is intended that the Compliance Strategy will ensure greater collaboration between the Ministry, regional councils, industry and others in meeting the PM₁₀ standard and ultimately delivering clean healthy air to all New Zealanders.

Table 7 (from the Compliance Strategy) summarises the critical steps within the Compliance Strategy to implement and comply with the ambient PM₁₀ standard and who is involved.

Table 7: Timeline for critical dates in complying with the PM₁₀ standard

| Date | Item | Action By Whom |
|------------------|--|--|
| 1 June 2011 | Exceedances caused by exceptional circumstances can be considered by the Minister | Councils can apply for consideration of an exceptional circumstance within three months of the exceedance |
| | | The Minister to provide written notice of his/her decision within three months of the application and instigate a public register for all applications |
| 2 August 2011 | Guidance on the revised air quality standards to be provided via: <ul style="list-style-type: none"> The Compliance Strategy 2011 Users' Guide | Ministry for the Environment releases in August 2011 |
| 1 September 2011 | Split targets for permissible exceedances come into effect from this date | Councils to ensure they have meaningful PM ₁₀ data and up to 5-year average exceedances to justify permissible exceedances above immediate compliance |
| | | Under s27 of the RMA, the Minister may make a request for mandatory provision of this monitoring data to confirm compliance |
| | Review of regional plans underway | Councils to start reviewing their regional plans to ensure they are consistent with the revised Regulations These reviews should be completed no later than 31 August 2012 to help councils prepare for the mandatory items that come into effect from 1 September 2012 |
| 2 September 2011 | Earliest date that the ban on discharges from new open fires installed in breaching airsheds can be notified | Councils to give public notice of the upcoming ban upon first breach, irrespective of the number of permissible exceedances This notice must be given at least 6 months in advance of the date of the ban and the ban must commence 12 months after the first breach |
| | | |
| 1 September 2012 | Polluted airshed status comes into effect from this date ² | Councils to ensure they have meaningful PM ₁₀ data and up to 5-year average exceedances to determine whether an airshed is polluted (based on more than 1.0 on average) Once invoked, "polluted" status lasts until five consecutive years of no breaches achieved |
| | | Under s27 of the RMA, the Minister may make a request for mandatory provision of this monitoring data |
| | Requirement for offsets for new industry in polluted airsheds comes into effect from this date | Councils to ensure that relevant industry offset their PM ₁₀ emissions for the duration of their consents Once invoked, the offset requirement lasts until five consecutive years of no breaches achieved |
| 2 September 2012 | Earliest date that ban on discharges from new open fires installed in breaching airsheds can come into effect | Councils to enforce ban 12 months after first breach occurred Once invoked, the ban lasts in perpetuity |
| | | |
| 1 September 2013 | Progress on compliance to be reviewed | Councils to report back to Ministry on monitoring data and progress towards their targets |
| | | The Ministry to review council monitoring data and airshed implementation progress reports |
| | | Under s27 of the RMA, the Minister may make a request for mandatory provision of this monitoring data to confirm compliance For polluted airsheds, the Minister may also make a request for mandatory provision of an airshed action plan and/or a progress report to monitor whether councils are on track to meet their permissible exceedances targets |

| Date | Item | Action By Whom |
|-------------------------|--|---|
| 1 May 2014 | Report on compliance status to be released | The Ministry to publish a report showing the compliance status of all airsheds |
| 1 September 2014 | Progress on compliance to be reviewed | Councils to report back to Ministry on monitoring data and progress towards their targets |
| | | The Ministry to review council monitoring data and airshed implementation progress reports |
| | | Under s27 of the RMA, the Minister may make a request for mandatory provision of this monitoring data For polluted airsheds, the Minister may also make a request for mandatory provision of an airshed action plan and/or a progress report to monitor whether councils are on track to meet their targets |
| 1 May 2015 | Report on compliance status to be released | The Ministry to publish a report showing the compliance status of all airsheds |
| 1 September 2015 | Progress on compliance to be reviewed | Councils to report back to Ministry on monitoring data and progress towards targets |
| | | The Ministry to review council monitoring data and airshed implementation progress reports |
| | | Under s27 of the RMA, the Minister may make a request for mandatory provision of this monitoring data For polluted airsheds, the Minister may also make a request for mandatory provision of an airshed action plan and/or a progress report to monitor whether councils are on track to meet their targets |
| 1 May 2016 | Report on compliance status to be released | The Ministry to publish a report showing the compliance status of all airsheds |
| 1 September 2016 | Progress on compliance to be reviewed | Councils to report back to Ministry on monitoring data and progress towards their targets |
| | | The Ministry to review council monitoring data and airshed implementation progress reports |
| | | Under s27 of the RMA, the Minister may make a request for mandatory provision of this monitoring data For polluted airsheds, the Minister may also make a request for mandatory provision of an airshed action plan and/or a progress report to monitor whether councils are on track to meet their targets |
| | All airsheds to meet three or fewer permissible exceedances per 12-month period from this date | Eligible councils to achieve no more than three permissible exceedances per rolling 12-month period from this date All other councils to achieve no more than one permissible exceedance Under s24A of the RMA, the Minister may commence an investigation of the performance of any non-complying councils |
| 1 May 2017 | Report on compliance status to be released | The Ministry to publish a report showing the compliance status of all airsheds |

| Date | Item | Action By Whom |
|------------------|--|--|
| 1 September 2017 | Progress on compliance to be reviewed | Councils to report back to Ministry on monitoring data and progress towards their targets |
| | | The Ministry to review council monitoring data and airshed implementation progress reports |
| | | Under s27 of the RMA, the Minister may make a request for mandatory provision of this monitoring data For polluted airsheds, the Minister may also make a request for mandatory provision of an airshed action plan and/or a progress report to monitor whether councils are on track to meet their targets |
| 1 May 2018 | Report on compliance status to be released | The Ministry to publish a report showing the compliance status of all airsheds |
| 1 September 2018 | Progress on compliance to be reviewed | Councils to report back to Ministry on monitoring data and progress towards their targets |
| | | The Ministry to review council monitoring data and airshed implementation progress reports |
| | | Under s27 of the RMA, the Minister may make a request for mandatory provision of this monitoring data For polluted airsheds, the Minister may also make a request for mandatory provision of an airshed action plan and/or a progress report to monitor whether councils are on track to meet their targets |
| 1 May 2019 | Report on compliance status to be released | The Ministry to publish a report showing the compliance status of all airsheds |
| 1 September 2019 | Progress on compliance to be reviewed | Councils to report back to Ministry on monitoring data and progress towards their targets |
| | | The Ministry to review council monitoring data and airshed implementation progress reports |
| | | Under s27 of the RMA, the Minister may make a request for mandatory provision of this monitoring data to confirm compliance For polluted airsheds, the Minister may also make a request for mandatory provision of an airshed action plan and/or a progress report to monitor whether councils are on track to meet their targets |
| 1 May 2020 | Report on compliance status to be released | The Ministry to publish a report showing the compliance status of all airsheds |
| 1 September 2020 | All airsheds to meet one or fewer permissible exceedances | All councils to achieve no more than one permissible exceedances per rolling 12-month period from this date |
| | | Under s24A of the RMA, the Minister may commence an investigation of the performance of any non-complying councils |
| 1 September 2025 | Requirement for offsets for new significant industry in polluted airsheds ceases | All councils to have achieved five years of no breaches and therefore should no longer have any "polluted" airsheds" in New Zealand |

Notes:

1. Councils are encouraged to achieve compliance earlier than the timing indicated
2. None of the other reporting requirements/recommendations shown supersede the mandatory requirement for councils to publicly report all breaches of the ambient standards (Regulation 16), which applies irrespective of the number or timing of permissible exceedances.

4.12.2 Airshed Action Plans for PM₁₀

A number of the gazetted airsheds exceed, or are likely to exceed, the PM₁₀ standard. The Compliance Strategy (MfE 2011e) recommends that regional councils develop an ‘airshed action plan’ to outline how it is intended to achieve compliance with the PM₁₀ standard by the required deadline.

Airshed action plans may also be prepared for other pollutants or for areas that do not breach the ambient standards to maintain or enhance air quality. An airshed action plan is not a legal requirement of the Regulations (ie, airshed action plans are not mandatory) rather, they are a strategy to achieve compliance.

An effective air quality management framework is shown in Table 8. Any airshed action plan needs to address these key elements to successfully (and efficiently) target problem emissions.

It is recommended that airshed action plans be prepared in a transparent manner so that affected parties, which include the general public and industry, are informed and able to participate. This does not mean however, that full consultation as defined under the RMA is necessary – such decisions are at the discretion of the council.

Table 8: Elements of an air quality management framework*

| Element | Details |
|-------------------------------|--|
| Ambient air quality standards | Based on health and environmental indicators. Provided by national environmental standards. Augmented by national ambient air quality guidelines and ambient targets specified in regional plans. |
| Monitoring networks | Must include both air quality and meteorology. Additional monitoring to that required for the purposes of the national environmental standards may be necessary. |
| Emission inventories | Emissions quantified by source and location. |
| Predictive models | Validated numerical prediction tools to calculate spatial, short and long term impacts. Models are used to estimate projections for emissions inventories and the dispersion characteristics of an airshed to ultimately provide the comprehensive understanding of the airshed that is so necessary for determining action. |
| Regulatory instruments | Regulations, regional plans, by-laws, incentives, education etc. |
| Communication | System to give information to public on air quality. Includes reporting requirements under national environmental standards. |
| Strategy | Policies and measures to ensure ambient standards are achieved and maintained, eg, regional plans, airshed action plan. |

* Adapted from Elsom (2004).

The preparation of an airshed action plans is discussed in detail in the Compliance Strategy (MfE, 2011e). In summary, however an airshed action plan may be broken into five steps as outlined below.

1. What is the state of ambient air quality at the present in the airshed – what do you know and, equally important, what don’t you know?
2. Estimate the state of future ambient air quality within the airshed
3. Identify and prioritise policies or strategies to improve air quality within that particular airshed
4. Take action
5. Review the effectiveness of the airshed action plan and determine whether the airshed will attain the ambient PM₁₀ standard within the desired timeframe.

4.12.3 What about SLiPs and CLiPs?

The previous version of the Regulations required either a Straight Line Path (SLiP) or a Curved Line Path (CLiP) to compliance with the PM₁₀ standard.

The SLiP or CLiP was a projection of how a regional council would attain compliance with the ambient PM₁₀ standard within an airshed by 2013. They were determined by two things:

- the state of the air quality at the relevant date (ie, when the PM₁₀ Regulation came into force on 1 September 2005 or the gazettal date of the airshed)
- the rate at which things were required to improve to achieve compliance by 1 September 2013.

The SLiP or CLiP was then used to determine whether resource consent could be granted for discharges of PM₁₀ within an airshed.

The 2011 amendments repealed the requirement for SLiPs or CLiPs. Therefore, they are **no longer mandatory and do not have any impact on the granting of resource consents (unless in a regional plan)**. In practice however, SLiPs or CLiPs may still be a useful part of an airshed action plan; by showing how an airshed has been trending in the past and projecting how a regional council will attain compliance with the PM₁₀ standard. If a Council continues to use a SLiP or CLiP, it may need to be amended to take into account the new split target compliance dates.

4.13 Enforcement

Any person who discharges emissions of PM₁₀ from an activity, particularly if it requires resource consent, could be subject to enforcement action from the regional council in accordance with the enforcement provisions of the RMA. These provisions are discussed in more detail in section 2.4.

In addition to this, section 44A(8) of the RMA now requires that *‘every local authority and consent authority must enforce the observance of national environmental standards to the extent to which their powers enable them to do so’*.

There is therefore, an obligation on regional councils, territorial local authorities and requiring authorities, when considering designation applications, to enforce the PM₁₀ Regulations.

Given the time the Regulations have been in force, it is not unreasonable to expect that the Minister for the Environment may take action under section 24A of the RMA to investigate the performance of any council that has an airshed that is not complying with the ambient PM₁₀ standard by the relevant attainment date.

4.14 Reporting requirements

The Minister for the Environment may, under section 27 of the RMA, request information on the implementation of the Regulations from regional councils at any time. Councils have 20 working days to respond.

For information on reporting to the Minister for the Environment in relation to PM₁₀, please refer to the Compliance Strategy (MfE, 2011). Table 7 in section 4.12 (from the Compliance Strategy) highlights that the Minister may require:

- reporting of PM₁₀ monitoring data to determine the status of airsheds
- an airshed action plan to show how PM₁₀ standard will be achieved
- reporting on progress on achieving the PM₁₀ standards.

5 Domestic Fires

5.1 Introduction

The main source of PM₁₀ emissions in most urban areas in New Zealand is solid fuel burning in domestic fires.

At the time of writing, approximately 22 urban airsheds in New Zealand suffer poor air quality due to elevated levels of PM₁₀ particularly in the winter due to emissions from domestic heating. These areas range from large cities such as Auckland (which also has significant emissions from the transport sector) and Christchurch, to medium sized places such as Rotorua and Nelson as well as very small centres such as Reefton and Alexandra. The domestic fire Regulations are therefore expected to result in reduced PM₁₀ levels and improved health in areas with elevated PM₁₀ levels.

While the domestic fire Regulations only limit emissions of particulates, they have the additional benefit of controlling the emissions of other harmful pollutants such as carbon monoxide, volatile organic compounds, polycyclic aromatic hydrocarbons, toxics and dioxins.

The Regulations have two sets of provisions for domestic fires:

- the standards for new woodburners (Regulations 22 to 24)
- a ban on new solid-fuel burning open fires in airsheds that breach the ambient PM₁₀ standard (Regulation 24A).

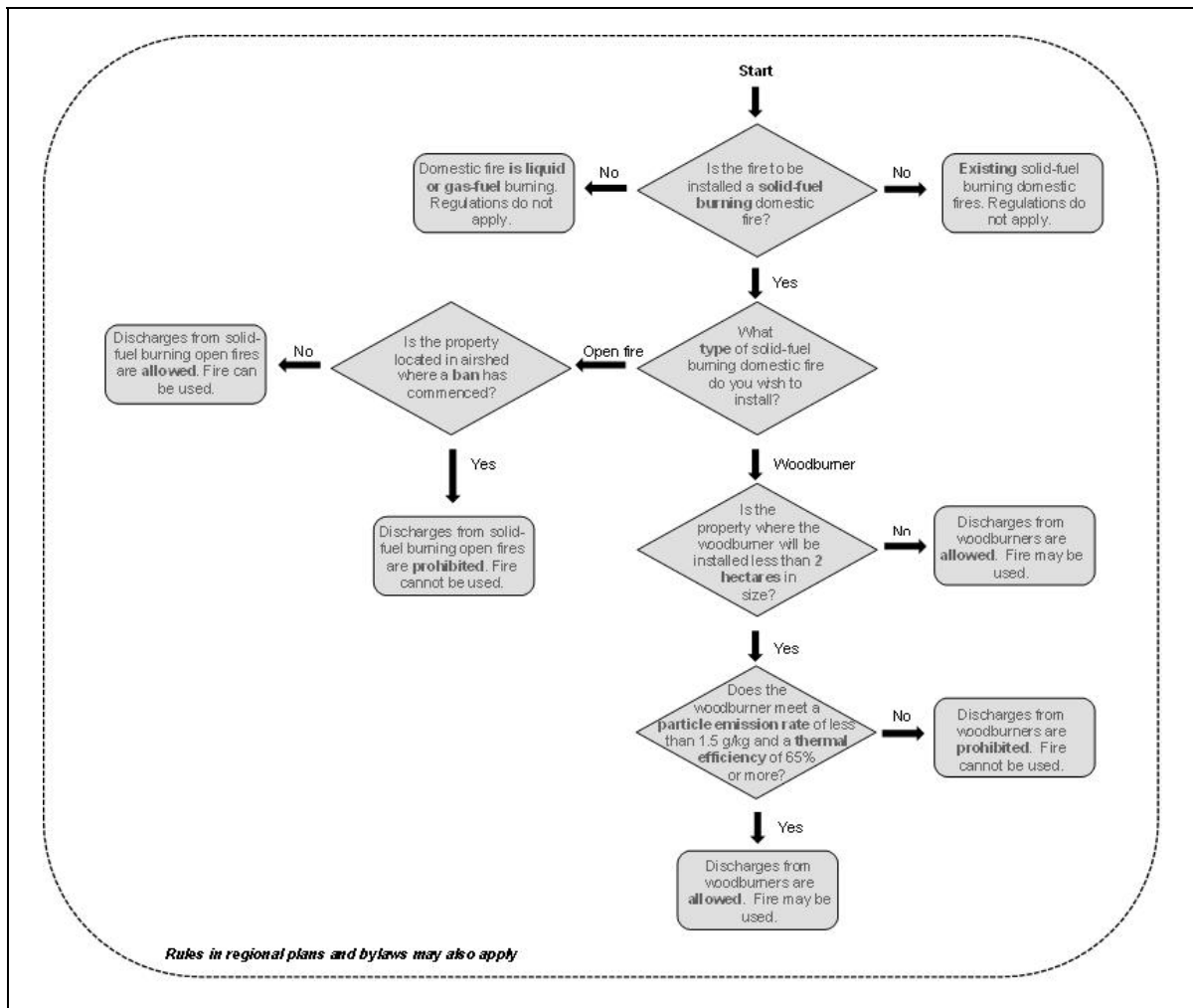
Some regional councils and unitary authorities also have rules in their regional plans for open fires or solid fuel burners. These rules are in addition to, and in some cases more stringent than, the requirements in the Regulations. Councils with regional rules for domestic fires include Auckland Council, Hawke's Bay Regional Council, Nelson City Council, Tasman District Council, Environment Canterbury and Otago Regional Council.

In August 2010 Rotorua District Council enacted New Zealand's first air quality bylaw to reduce emissions of PM₁₀ from home heating in Rotorua. In addition to regional rules for domestic heating, bans on outdoor open burning are becoming increasingly common across New Zealand as awareness of PM₁₀ and dioxins from this type of burning grows.

This section outlines the woodburner standards (section 5.2) and the new solid-fuel burning open fire bans (section 5.3) including what they do, and do not, apply to.

Figure 3 below provides a summary flow diagram showing how the Regulations apply for both new solid-fuel burning open fires and woodburners. The flow diagram only relates to the Regulations and does not consider the additional requirements of any regional rules or bylaws.

Figure 2: Flow diagram for Regulations regarding domestic fires



5.2 Woodburners

5.2.1 What are the woodburner standards?

Regulations 23 and 24 require the following:

23 Design standard

- (1) *The design standard for a woodburner is a discharge of less than 1.5 gram of particles for each kilogram of dry wood burnt.*
- (2) *The discharge must be measured in accordance with –*
 - (a) *the method specified in Australian/New Zealand Standard AS/NZS 4013:1999, Domestic solid fuel burning appliances – Method for determination of flue gas emissions; or*
 - (b) *for a woodburner excluded from that method, another method that is functionally equivalent.*

24 Thermal efficiency standard

- (1) *The thermal efficiency standard for a woodburner –*
 - (a) *is the ratio of useable heat energy output to energy input (thermal efficiency); and*

- (b) *must be not less than 65%.*
- (2) *The thermal efficiency must be calculated in accordance with –*
 - (a) *the method specified in Australian/New Zealand Standard AS/NZ 4012:1999, Domestic solid fuel burning appliances – Method for determination of power output and efficiency; or*
 - (b) *for a woodburner excluded from that method, another method that is functionally equivalent.*

The woodburner standards specify a maximum particle emission limit of 1.5 g/kg of wood burnt as measured in accordance with AS/NZS 4013:1999 *Domestic solid fuel burning appliances – Method for determination of flue gas emissions*. This method specifies a test procedure for determining the rate of particulate emission from batch feed solid-fuel burning appliances.

The woodburner standards further specify a minimum thermal efficiency of 65% as measured in accordance with AS/NZS 4012:1999 *Domestic solid fuel burning appliances – Method for determination of power output and efficiency*. This method specifies a test procedure for the determination of the average efficiency and average thermal power output from batch feed domestic solid-fuel burning appliances.

Amendments

Regulations 23 and 24 were amended in 2011 to enable the use of functionally equivalent test methods to AS/NZS 4012 and 4013. The intent behind this amendment was to provide a way to determine compliance for woodburners that would otherwise be excluded from the test methods (eg, wood-fired central heating appliances).

5.2.2 What do the woodburner standards apply to?

Regulation 23 and 24 **apply** to domestic woodburners installed after 1 September 2005 on properties smaller than 2 hectares. They **do not apply** to woodburners installed prior to this date.

The Regulations are aimed at reducing discharges of PM₁₀ from inefficient and dirty woodburners which represent a major potential source. The Regulations apply to the installation of woodburners. They do not apply to multi-fuel burners (burners that use coal and wood), coal burners, pellet fires, and wood/coal stoves designed for the primary purpose of cooking.

Many regional plans already have controls on the use of woodburners and these should be referred to. Several regional plans (including Auckland's, Canterbury's and Nelson's) prevent the burning of any solid fuel other than clean wood or paper products in woodburners. The burning of refuse, plastics, and other household waste can cause significant discharges of hazardous air pollutants, including dioxins. Regional plans may also have requirements on the quality of the wood that can be used including suitable wood moisture contents and the use of treated timber and marine (salt infused) driftwood.

Burning any materials other than wood or paper in a woodburner can damage the appliance. This is not recommended by woodburner manufacturers and may void the warranty. Manufacturers specify the use of dry wood in the accompanying user manual and retailer best practice includes teaching the customers how to use the fire most efficiently. The woodburner authorisation manual (MfE, 2011b) contains a great deal of information about woodburners, the authorisation process and local rules. This manual is available on the Ministry website www.mfe.govt.nz.

5.2.3 What is a woodburner?

Under the Regulations a woodburner is defined as:

Woodburner –

- (a) means a domestic heating appliance that burns wood; but
- (b) does not include –
 - i. an open fire; or
 - ii. a multifuel heater, a pellet heater, or a coal burning heater; or
 - iii. a stove that is –
 - (A) designed and used for cooking; and
 - (B) heated by burning wood.

Typical domestic woodburners have fully enclosed metal fireboxes with a door primary and secondary air controls to allow for the efficient burning of wood within the combustion chamber.

A woodburner is designed to burn wood (and paper): it does not burn coal. A multi-fuel burner is designed to burn both wood and/or coal and has over fuel and under fuel combustion air supply with separate controls, a grate in the base of the firebox and an ash pan.

The woodburner Regulations specifically exclude:

- open fires (discussed in section 5.2)
- multi-fuel burners (or heaters)
- pellet fires (or burners/heaters)
- coal burners (or heaters)
- cooking stoves.

5.2.4 Where do the Regulations apply?

Regulation 22 states that the woodburner standards apply to woodburners installed in certain properties:

- 22 Discharge from woodburners installed in certain properties after 1 September 2005 prohibited**
- (1) The discharge of particles to air from a woodburner installed after 1 September 2005 in a building or property with an allotment size of less than 2 hectares is prohibited.
 - (2) Subclause (1) does not apply if the discharge from the woodburner complies with –
 - (a) the design standard in regulation 23; and
 - (b) the thermal efficiency standard in regulation 24.

The woodburner standards apply to all new woodburners installed after 1 September 2005 on a property with a lot size of 2 ha or less (20,000 m²). This is most urban areas within New Zealand. Information on the size of a lot is available from the property title, local council rates notice or Land Information Memoranda (LIM) report.

The Regulation only **applies to domestic** woodburners. These are woodburners installed in buildings like dwelling houses, apartments, holiday homes, farm accommodation and other home residences. The Regulation **does not apply to woodburners in commercial buildings** such as restaurants, motels, hotels, marae and other cultural facilities, schools, community halls and offices.

The woodburner Regulations apply regardless of the state of air quality. In this regard they are unlike the open fire ban as they make no reference to breaches of PM₁₀ standards or airsheds.

The woodburner Regulations do not apply to existing woodburners installed prior to 1 September 2005 – unless they are reinstalled into a property eg, burner taken out and put back in after renovation or a woodburner taken from one room in a house and put in another). The Regulations do, however, apply to second-hand woodburners because these are ‘new’ installations after 1 September 2005.

People can still operate or install multi-fuel burners, coal burners, pellet fires, and wood/coal stoves designed for the primary purpose of cooking, unless their regional plan prevents this. Open fires are dealt with separately in section 5.3.

5.2.5 Who do they affect?

The woodburner Regulations affect anyone installing a woodburner in a building or property with a lot size of less than 2 hectares. They do not affect people installing open fires (refer section 5.3), cooking ranges, coal burners, pellet burners or multi fuel burners.

They further affect home heating manufacturers, retailers and territorial authorities, who sell, install and/or grant building consents for the installation of woodburners.

5.2.6 Implementation

The Regulations apply nationally. From 1 September 2005, all woodburners installed into a house or dwelling in New Zealand, on a lot size less than 2 hectares, have been required to meet the design (emission and thermal efficiency) standards outlined above. This includes reconditioned and/or second-hand woodburners.

It should be noted that the woodburner standards refer to the *installation* of woodburners. Woodburners that do not meet the standards can still be sold but they may then only be installed in homes on a property with a lot size of over 2 hectares.

The woodburner standards only apply to properties less than 2 hectares and they are not retrospective. If a property size is reduced (eg, via subdivision) to less than two hectares, the woodburner standard will not apply retrospectively – any existing woodburner that does not meet the standards can remain.

5.2.7 Functionally equivalent test methods

The 2011 amendments corrected a technical anomaly for wood-fired central heating appliances. Previously, the Regulations required that wood-fired central heating appliances (as woodburners) meet the design and efficiency standards described in section 5.2.1, but the designated test methods for doing so (AS/NZS 4013 and AS/NZS 4012) specifically exclude wood-fired central heating appliances. This meant that wood-fired central heating appliances needed to meet the standards using a test method from which they were excluded. The insertion of ‘functionally equivalent test methods’ has been added to address this issue.

Functionally equivalent test methods may also be used for other types of woodburners that do not comply with the designated test methods.

Environment Canterbury and/or Nelson City Council will determine what is ‘functionally equivalent’ given their roles as authorising authorities. In doing so, it is likely that consideration will be given to the following matters:

- does the test method utilise a comparable range of operating conditions
- does the test method utilise a similar fuel
- does the test method measure the correct parameters (eg, particulate matter and thermal efficiency)
- what are the differences between the functionally equivalent test method and the designated test method and how could these impact on burner performance in the laboratory and the home
- is the test method sufficiently rigorous and robust that meaningful comparisons could be drawn between the different burners
- is the test method a prescribed method in another jurisdiction (eg, United Kingdom, European Union, United States of America or Canada)?

5.2.8 Compliant/Authorised woodburners

There is a wide range of products on the market which meet the woodburner standards. The Ministry for the Environment hosts a list of burners that have been tested and authorised by Environment Canterbury and/or Nelson City Council.

The New Zealand Domestic Solid Fuel Burner Authorisation Manual (MfE, 2011b) sets out the process by which woodburners are certified by Environment Canterbury and/or Nelson City Council. This process is aimed at facilitating the sale of compliant domestic solid fuel burners in New Zealand.

The Ministry for the Environment also undertakes periodic audits of woodburners. Woodburners that do not comply with their authorisation and/or the Regulations can be removed from the Ministry’s list of compliant woodburners.

Readers are referred to the Ministry’s website www.mfe.govt.nz for further information on compliant and authorised woodburners.

5.2.9 What is the impact on regional plans?

The Regulations are mandatory under the RMA. They automatically supersede any relevant regional plan rules (unless the local government controls are stricter).

As a result of the 2009 amendments to the RMA, section 44A(5) of the RMA requires that regional councils **must** remove regional plan rules that are more lenient than, or conflict with, the national environmental standards for air quality. Removal may be carried out without using the consultation, notification, hearings and decision processes for plan changes in Schedule 1 of the RMA and must be done as soon as practicable.

Regulation 28 allows for more stringent rules, resource consents or bylaws than Regulation 24A. For example, this means:

- regional plans can prohibit woodburners on any size property or place more stringent design (emissions) and thermal efficiency standards on woodburners where necessary

- regional plans or bylaws may place other requirements on woodburners such as point of sale replacement or phased transfer to other fuel sources.

A regional plan cannot allow resource consent for a woodburner on a property of less than 2 hectares that does not meet the woodburner standards.

Many regional councils and unitary authorities already have rules in place relating to woodburners including Environment Canterbury, Otago Regional Council and Nelson City Council, Hawkes Bay Regional Council, Tasman District Council, Rotorua District Council and Auckland Council.

Example 5.1

The operative Cold Regional Council Air Plan requires woodburners to obtain a discretionary consent if installed anywhere in the region. Therefore:

- *Before 1 September 2005*
 - *all new woodburners installed in the Cold Region require a discretionary consent.*
- *From 1 September 2005*
 - *all new woodburners installed on properties less than 2 hectares in size that **do not meet** the woodburner standards (thermal efficiency of 65% or more and a particle emission rate of less than 1.5 g/kg) are prohibited*
 - *all new woodburners installed on properties less than 2 hectares in size that **do meet** the woodburner standards (thermal efficiency of 65% or more and a particle emission rate of less than 1.5 g/kg) require a discretionary consent*
 - *all new woodburners installed on properties greater than 2 hectares in size require a discretionary consent*
 - *the Cold Regional Council Air Plan must be amended to reflect the above.*

5.3 Solid-fuel burning open fires

5.3.1 What is the open fire ban?

Regulation 24A has been introduced to prohibit discharges of PM₁₀ from new solid-fuel burning open fires in airsheds that breach the ambient PM₁₀ standard. Regulation 24A came into effect on 1 June 2011 and states:

24A Discharge from certain open fires prohibited

- (1) *A regional council must give public notice the first time that the PM₁₀ standard is breached in an airshed in its region on or after 1 September 2011.*
- (2) *The public notice must –*
 - (a) *state that subclauses (3) and (4) of this regulation will prohibit the discharge of particles from domestic solid-fuel burning open fires installed in the relevant area on or after a certain date (the date of the ban); and*
 - (b) *specify as the date of the ban the day that is 12 months after the day of the breach; and*
 - (c) *specify the airshed whose area the notice applies to; and*
 - (d) *be given at least 6 months before the date of the ban; and*
 - (e) *be given in accordance with the Act.*
- (3) *Subclause (4) applies to a domestic solid-fuel burning open fire that is installed in the area of an airshed specified in a notice under subclause (2) on or after the date of the ban specified in the notice.*
- (4) *The discharge of particles into any airshed from the open fire is prohibited.*

- (5) *For the purposes of this regulation, -*
 - (a) *the area of an airshed is determined at the date of the related breach of the PM₁₀ standard; and*
 - (b) *once subclauses (3) and (4) apply to an area they always apply to the area, despite the establishment of any new airshed by notice in the Gazette.*
- (6) *In this regulation, **domestic solid-fuel burning open fire** –*
 - (a) *means an appliance or a structure inside a domestic building that can burn solid fuel but cannot effectively control the rate of air supply to the combustion zone; and*
 - (b) *to avoid doubt, includes a fireplace to which paragraph (a) applies that has a cover or doors that cannot effectively control the rate of air supply to the combustion zone.*

Example

The PM₁₀ standard is breached in a regional council's airshed on 18 April 2013. It was not breached from 1 September 2011 until then. That is to say, since 1/9/11 there has been one or less exceedances in each rolling 12 month period, until on 18 April 2013 a second exceedance occurs within 12 months of the last.

The council must give at least 6 months' public notice that regulation 24A(3) and (4) will prohibit the discharge of particles from domestic solid-fuel burning open fires installed in the area of the airshed on or after 18 April 2014. The prohibition takes effect accordingly.

Note: Regulation 16 – public notification of a breach, also applies to this event.

The intent of Regulation 24A is to 'close the back door' on new pollution sources in areas that are already over the ambient PM₁₀ standard. This is because solid-fuel burning open fires are disproportionate polluters and a very inefficient form of heating.

5.3.2 What does the open fire ban apply to?

The Regulations **apply** to discharges from new open fires installed from the date the ban commences. They **do not apply** to existing open fires.

The Regulations do not apply until such time as the ambient PM₁₀ standard is breached on the first occasion after 1 September 2011, and notice is given to the public of the impending ban. If the PM₁₀ standard is not breached within an airshed then, so far as the Regulations are concerned, the installation of domestic solid-fuel burning open fires remains allowed.

Regulation 24A applies only to solid-fuel burning fires, ie, those that use either wood or coal, or a combination of the two. The Regulations apply to the installation of open fires that use these fuels only. The Regulation does not affect people who have, or are looking to have, open fires fuelled for example by diesel or gas.

Many regional plans already have controls on the use of different fuels within open fires and these should be referred to. Several regional plans (including Auckland's, Christchurch's and Nelson's) prevent the burning of any solid fuel other than wood, coal or paper products: the burning of refuse, plastics and other household waste can cause significant discharges of hazardous air pollutants, including dioxins. Regional plans may also have requirements on the quality of the wood or coal that can be used, including suitable wood moisture contents, coal sulphur levels and the use of treated timber and marine (salt infused) driftwood.

5.3.3 What is a solid-fuel burning open fire?

A domestic solid-fuel burning open fire is defined in Regulation 24A as:

- (6) *In this regulation, **domestic solid-fuel burning open fire** –*

- (a) means an appliance or a structure inside a domestic building that can burn solid fuel but cannot effectively control the rate of air supply to the combustion zone; and
- (b) to avoid doubt, includes a fireplace to which paragraph (a) applies that has a cover or doors that cannot effectively control the rate of air supply to the combustion zone

Open fires are common in older houses where they are built into the house. More generally speaking, an open fire is any fire where the combustion chamber is not **totally** enclosed. This includes combustion chambers that are partially closed (eg, have a door) and those that have limited control of the primary or secondary air supply. Some examples of open fires are:

- fireplaces, including brick or masonry
- visors
- open hearths
- 'Jetmaster' fireplaces.

5.3.4 When does the open fire ban apply?

A period of time needs to elapse before giving effect to the ban so that people can be made aware of it coming into force. Accordingly, Regulation 24A provides a year for people to be aware of and prepare for the ban. Regulation 24A applies one year after the first breach of the PM₁₀ standard in an airshed that occurs after 1 September 2011. The public notice requirements are discussed below.

Regulation 24A **applies** in any airshed where the ambient PM₁₀ concentration threshold standard (50µg.m⁻³ averaged over 24 hours) has been exceeded more than once in a rolling 12-month period. As soon as a second PM₁₀ concentration that is higher than 50µg.m⁻³ is measured within the 12-month period (ie, the PM₁₀ standard is breached), then the use of domestic solid-fuel burning open fires will cease in that airshed 12 months from the date of the breach.

In effect therefore, the first date by which the ban could apply is 2 September 2012. That is, for a breach of the standard to occur a second exceedance must have occurred - the first could occur within the 12-month period prior to 1 September 2011 and the second could occur during the 24 hour period on 1 September 2011. In practice, the majority of PM₁₀ exceedances occur in winter and so the ban on solid-fuel burning open fires is unlikely to be initiated in most airsheds until winter 2012.

Councils should also note the following technical considerations.

- There is no requirement for meaningful PM₁₀ data to initiate the ban. That is, the open fire ban will still be initiated following the first breach of the ambient PM₁₀ standard after 1 September 2011, even if you have less than 12 months data or you do not meet the requirements of Regulation 16C.
- There is no requirement for the breach of PM₁₀ to be due to emissions from domestic fires in winter (ie, two elevated PM₁₀ results in summer would still initiate the ban).
- The new split target compliance dates have no bearing on the requirement for a ban, ie, Regulation 16B(5)(d) states that even in airsheds where the number of PM₁₀ exceedances allowed has been extended '*any breach of the PM₁₀ standard is still a breach for the purposes of... regulation 24A (discharge from certain open fires prohibited)*'.
- The only time an exceedance of the PM₁₀ standard causes a breach that may **not** initiate the ban is if the Minister determines that the exceedance was an 'exceptional event' in

accordance with Regulation 16A (ie, the exceedance could be ignored and therefore a breach has not occurred).

- Once notice is given of the breach of the PM₁₀ standard, the ban comes into effect 12 months after the date of the breach. In this intervening period domestic solid-fuel burning open fires may still be installed (unless a regional plan or local bylaw provides otherwise). Any open fires installed within the 12 month period prior to the ban becoming operative are not affected.
- Regulation 24A makes no reference to property size. The 2 hectare requirement for woodburners (section 5.2) is not relevant to the open fire ban.
- Regulation 24A does not apply to existing solid-fuel burning open fires – unless they are reinstalled into a property in which case they are considered to be a ‘new’ open fire (eg, rebuilding an open fire in a renovated house)

The ban is mandatory and, once in effect, is for perpetuity. Councils cannot postpone the start of the ban, prevent the ban occurring or remove the ban once it is in effect.

After giving notice, once the 12-month period is complete the ban takes immediate effect within the airshed without further action from the council. If for any reason smaller airsheds are created from an airshed where the ban applies then the ban still applies to these smaller, new airsheds.

It is recommended that councils advise the Ministry if an airshed has an open fire ban in their region. This will enable the Ministry to provide details on the website at www.mfe.govt.nz and collate national information on the success of the Regulations and resulting reduction in health effects on New Zealanders.

The ban only **applies to** discharges from solid-fuelled open fires installed in **domestic buildings**. These are fires installed in buildings like dwelling houses, apartments, holiday homes, farm accommodation and other home residences. The ban **does not apply to open fires in commercial buildings** such as restaurants, motels, hotels, marae and other cultural facilities, schools, community halls and offices.

People can still operate or install authorised woodburners (as discussed in section 5.2), multi fuel burners, pellet fires, coal burners and wood/coal stoves designed for the primary purpose of cooking, unless their regional plan or a local bylaw prevents this.

Public notice of open fire ban

Regulation 24A requires councils to give public notice on the first occasion a breach of the PM₁₀ standard occurs in an airshed after 1 September 2011 – thus initiating the solid-fuel burning open fire ban. The notice must state:

- the airshed to which the ban applies
- the date the ban applies (ie, 12 months after the first breach of the PM₁₀ standard on or after 1 September 2011)
- that subclauses (3) and (4) of Regulation 24A will prohibit the discharge of particles from domestic solid-fuel burning open fires installed on or after the date of the ban (ie, that solid-fuel burning open fires cannot be installed and operated in domestic premises from the date of the ban).

Notice must be given at **least 6 months prior** to the ban coming into effect and must be in accordance with the definition of public notice in section 2 of the RMA, that is to say a public

notice must be placed **in a newspaper circulating in the entire region likely to be affected by the contents of the notice.**

As best practice, consideration should be given to including the following additional information to aid public understanding of the Regulations:

- a statement that the public notice is required by, and relates to, the Resource Management (National Environmental Standards for Air Quality) Regulations 2004
- a statement that the PM₁₀ standard has been breached (ie, the ban has been initiated) and the date and time of the exceedance/s that have initiated the ban
- location of the exceedance/s (monitoring site location and airshed)
- value of the exceedance/s
- value of the ambient PM₁₀ standard and the averaging period (ie, 50 µg.m⁻³ as a 24-hour average for PM₁₀)
- how many breaches of the ambient standard have occurred in a 12-month period
- a contact at the council for public inquiries.

An example public notice is given in Appendix 6, Figure A6.1. This contains all the statutory information required. Whilst it is recommended that additional information over and above that required is included in the notice, councils should take care to ensure that the statutory requirements are not lost during editing.

It should be noted that the first breach of the PM₁₀ standard after 1 September 2011 will also be a situation where public notice under Regulation 16 applies, see section 4.8. The example notice given in Figure A6.1 reflects this. However, some councils may find it more expedient to give two separate notices bearing in mind the different timing requirements of the two Regulations.

5.3.5 Who does the open fire ban affect?

The open fire ban affects anyone installing a solid-fuel burning open fire in a domestic building in an airshed that breaches the ambient PM₁₀ standard. Importantly, however, they are only affected one year after the first breach of the ambient PM₁₀ standard after 1 September 2011.

The open fire ban further affects home heating manufacturers, retailers, builders, bricklayers, architects and territorial authorities who sell, design, install and/or grant building consents for the installation of solid-fuelled open fires. It is recommended that Councils bring any open fire ban to the particular attention of these groups.

The open fire ban does not affect people installing woodburners (refer to section 5.2), cooking ranges, coal burners, pellet fires or enclosed multi fuel burners.

5.3.7 Implementation

It should be noted that the open fire Regulation refers to the *installation* of solid-fuel burning open fires. Open fires can still be sold or built but they may then only be installed in homes outside the regulated airshed. The opportunity to remind builders and installers of the open fire ban arises during the application for a building permit for the fire from a local council. Regional councils should therefore maintain a good working relationship with their local councils to aid in the exchange of information and enforcement of the ban.

The open fire ban only applies to airsheds where a ban has come into force and it is not retrospective. It will be lawful to continue to use existing open fires within a dwelling (unless local rules say otherwise).

A region may have several different airsheds and not all the airsheds may have breached the PM₁₀ standard. The open fire ban only applies to the airsheds where the PM₁₀ standard has been breached. If a regional council wishes to have an open fire ban in airsheds where the standard has not been breached (as established by Regulation 24A) then a regional rule or a bylaw will need to be promulgated. The Regulations cannot be used for this purpose.

Where a region has several airsheds, it is likely that the airsheds would all have different implementation dates for the open fire ban due to the different times that the PM₁₀ standard is breached. It will be very important for regional councils to provide detailed education material to the public within affected airsheds and provide training for staff on when and where open fire bans are in force.

Some methods Councils could use to inform the public of the bans include:

- publishing maps of affected areas
- providing lists of affected postcodes or street names
- letter drops to builders, architects, and appliance retailers
- working with local councils to advise applicants for resource or building consents for domestic dwellings of the ban.

5.3.8 Impact on Regional Plans

The Regulations are mandatory under the RMA. They automatically supersede any relevant regional plan rules (unless the local government controls are stricter).

As a result of the 2009 amendments to the RMA, section 44A(5) of the RMA requires that regional councils **must** remove regional plan rules that are more lenient than, or conflict with, the national environmental standards for air quality. Removal may be carried out without using the detailed processes for plan changes normally required by Schedule 1 of the RMA and must be done as soon as practicable.

Regulation 28 allows for more stringent rules, resource consents or bylaws than Regulation 24A. For example, this means:

- regional plans can prohibit open fires without requiring a breach of the PM₁₀ standard to have occurred in an airshed first
- regional plans could require resource consent to be issued for open fires (for any activity status) where an airshed is unlikely to ever exceed the PM₁₀ standard.

A regional plan cannot allow resource consent for a new solid-fuel burning open fire to be granted in an airshed 12 months after the PM₁₀ standard is breached (after 1 September 2011). If open fires become banned in an airshed where previously a regional plan permitted these (or required resource consent) then the regional plan must be amended to reflect this as soon as practicable.

Some regional plans already have bans on the installation of solid-fuel burning open fires in place (eg, Canterbury, Auckland and Nelson).

Example 5.2

The operative Hot Regional Council Air Plan requires domestic open fires to obtain a discretionary consent if installed anywhere in the region. The HotTown Airshed breaches the ambient PM₁₀ standard on 30 June 2012 and the Hot Regional Council notifies that the ban on domestic solid-fuelled open fires will commence on 1 July 2013. Therefore:

- *Until 30 June 2013*
 - *all new domestic open fires (including solid-fuelled open fires) installed within the Hot Regional Council region require a discretionary consent (and may be declined pending the ban)*
 - *all new commercial (ie, non-domestic) open fires installed within the region are allowed without a resource consent.*

- *From 1 July 2013*
 - *the installation of all new domestic solid-fuelled open fires in the HotTown Airshed is prohibited*
 - *the installation of all new domestic gas or liquid-fuelled open fires in the region (including the HotTown Airshed) requires a discretionary resource consent*
 - *the installation of new commercial (ie, non-domestic) open fires within the region is allowed without a resource consent*
 - *the Cold Regional Council Air Plan must be amended to reflect the above.*

Open fires may potentially be regulated by regional plans, the Regulations and local bylaws; and each set of requirements may be different. Therefore, to avoid confusion, it is important that regional councils provide explanatory material to people who may be affected.

5.4 Role of territorial authorities

Compliance with the open fire bans and woodburner standards is the responsibility of the regional councils. However, in practice, the role of the territorial authorities is paramount.

All new domestic fire installations require a building consent from their territorial authority to ensure they meet Building Code requirements (eg, safety and structural integrity). The national environmental standards for air quality are regulations made under the RMA. There is no link between the Regulations and the Building Act 2004.

However, under section 44A of the RMA, territorial authorities do have a responsibility to ensure that they ‘*observe the national environmental standards*’ and ‘*enforce the observance of national environmental standards to the extent to which their powers enable them to do so*’. Therefore, it would be prudent, for territorial authorities to inform the home owner that granting of a building consent is not authority to install and operate a non-compliant domestic fire. In practice, territorial authorities act in the public interest by referring people to the authorised woodburner list and advising people on whether their woodburner is compliant with the Regulations.

The Ministry for the Environment has previously written to all territorial authorities noting the above and suggesting they issue an advice note with a building consent for woodburners alerting the owner to the Regulations, as these Regulations prevent discharge from any non-compliant woodburner. The same issue will arise with open fires banned under new Regulation 24A.

Unitary authorities have responsibilities for both the RMA and the Building Act 2004. Acting in the public interest would dictate that explanatory material, covering the Regulations and local rules, should be provided to those people seeking to install domestic fires.

The Ministry for the Environment recommends that regional councils liaise closely with the territorial authorities on woodburner installations. Whilst regional councils are responsible for enforcement of the Regulations, it is territorial authorities who collect key data about domestic fires including installation date, type of domestic fire and location through the building consent process. This type of information is critical for air quality management and to determine compliance with the Regulations and any regional rules.

A list of authorised woodburners is available on the Ministry for the Environment’s website (section 5.2.8).

5.4.1 Bylaws

Territorial authorities do not have a specific air quality management function under the RMA but they do have the primary responsibility for land use (eg, the location of activities that may discharge contaminants to air). However, territorial authorities are able to make bylaws under section 145(b) of the LGA. This could include bylaws regarding air quality. Regulation 28 allows for bylaws to be more stringent than the Regulations.

As an example, Rotorua District Council, in collaboration with the Bay of Plenty Regional Council, has developed the Air Quality Control Bylaw to help clean up Rotorua’s air. The bylaw requires that:

- Only approved woodburners and pellet fires can be installed in the Rotorua Airshed.
- From 1 May 2012 (when the Point of Sale Rule comes into effect), an owner of a house cannot sell it with a working open fire or non-compliant burner.
- From the 1 May 2015 (when the Open Fire Rule comes into effect) there will be a ban on using indoor open fires.

A good working relationship between the regional councils and territorial authorities can significantly assist in addressing air quality issues, and meeting the national air quality standards effectively and efficiently.

5.5 Enforcement

Any person who discharges particles from:

- a woodburner which does not comply with the woodburner standards
- a solid-fuel burning open fire in an airshed that breaches the ambient PM₁₀ standard

could be subject to enforcement action from the regional council in accordance with the enforcement provisions of the RMA. These provisions are discussed in more detail in section 2.4.

In addition to this, section 44A(8) of the RMA now requires that *‘every local authority and consent authority must enforce the observance of national environmental standards to the extent to which their powers enable them to do so’*.

Therefore, there is an obligation on regional councils to enforce any open fire bans and the Regulations.

5.6 Education

Retailers are still able to sell woodburners with particulate emissions greater than 1.5 g/kg, and with a thermal efficiency of less than 65%, but only for the installation in properties that are larger than two hectares. Under the Consumer Guarantees Act, retailers should make the implications of the woodburner standard clear to their customers at the time of sale.

Builders and architects can still design and build solid-fuel burning open fires but these should only be within properties that are outside airsheds where these are banned from operating. If a customer wishes to have an open fire within a breaching airshed then it will need to be either a liquid-fuel, or gas-fuel burning open fire.

It is extremely important that regional councils widely publicise the rules relating to domestic fires (both in relation to woodburners and any open fire bans).

5.6.1 Funding Programmes

Central Government

Central government has been running a number of programmes since 1996 to improve the energy use and efficiency of New Zealand Homes. These are all run by the Energy Efficiency and Conservation Authority (EECA).

The Clean Heat programme has been running since 2007. It provided \$1.1 million per annum to fund retrofits of clean heat appliances in low-income houses with open fires or old woodburners. For the period to June 2013, this fund will be used, alongside the grants available in the Warm Up New Zealand Heat Smart programme, to incentivise the decommissioning of old domestic fires in airsheds with elevated PM₁₀ levels.

The Warm Up New Zealand: Heat Smart programme has been running since 2009. By 2013 this programme will have provided insulation grants for more than 188,500 New Zealand homes. The programmes also installs about 7000 authorised appliances (eg, heat pumps, flued gas fires or wood or pellet burners) each year.

Local initiatives

Many regional councils provide subsidies or loans to assist with the removal of open fires or older non-compliant woodburners and the installation of a clean heating source. Environment Canterbury and Nelson City Council are examples of regional councils that have had Clean Heat schemes. For more information on these please contact the relevant council.

Eight councils offer a Voluntary Targetted Rate Scheme, which is a way for people to pay off the costs of retrofitting insulation and/or clean heat over time through their rates bill. These councils are: Auckland Council, Greater Wellington Regional Council, Marlborough District Council, Tasman District Council, Hawkes' Bay Regional Council, Nelson City Council, Environment Canterbury and the Chatham Islands Council.

Nelson City Council and Tasman District Council have also introduced a business-friendly Good Wood scheme which involves firewood merchants guaranteeing their wood to be less than 25 per cent moisture in return for free promotion as a 'good wood' supplier by the council. Dry seasoned wood produces less PM₁₀ per kilogram of wood burnt.

5.7 Reporting requirements

The Minister for the Environment may, under section 27 of the RMA, request information on the implementation of the Regulations from regional councils at any time. Councils have 20 working days to respond.

6 Greenhouse Gas Emissions at Landfills

6.1 Background

The Kyoto Protocol under the United Nations Framework Convention on Climate Change (UNFCCC) is an international agreement to address global warming and delay climate change. New Zealand has ratified the Kyoto Protocol and in August 2009 the Government announced a responsibility target range for greenhouse gas emissions of between 10 and 20% below 1990 levels by 2020. In March 2011 the Government notified a further reduction target in the *Gazette* of a 50% reduction in New Zealand greenhouse gas emissions from 1990 levels by 2050.

One of the most important greenhouse gases in terms of the level of emissions and its global warming potential is methane. It is estimated that landfill gas emissions make up 4% of New Zealand's total methane (a greenhouse gas) emissions (MfE 2004a).

The Regulations contain landfill gas standards (Regulations 25 to 27). The objective of the landfill gas standards is the effective management of discharges to air of greenhouse gases (mainly methane) generated from large landfills. The control and destruction of methane is therefore the focus of the Regulations. It is also important to understand the Resource Management (Energy and Climate Change) Amendment Act 2004 in relation to the landfill gas standards.

The Regulations require the collection and destruction of methane gas at all landfill sites with a total design capacity greater than 1 million tonnes of refuse (ie, large landfills). They also set design standards for the flaring of the gas, allow for destruction of collected gas via beneficial uses of methane – such as electricity generation, and facilitate management of organic waste outside of the landfill (eg, via composting initiatives).

6.2 Resource Management (Energy and Climate Change) Amendment Act 2004

The Resource Management (Energy and Climate Change) Amendment Act 2004 came into force on 2 March 2004.

One of the motivations for the Amendment Act 2004 was to remove the potential for duplication of greenhouse gas emissions regulations at the local and national levels and to achieve national leadership of controls on greenhouse gas discharges. The Amendment Act has achieved national direction by removing the power of regional councils to consider the impacts of greenhouse gas discharges to air on climate change when making rules in regional plans or determining air discharge consents, except where necessary to implement a national environmental standard.

The purpose of the landfill gas controls under the Regulations is to control greenhouse gas discharges (mainly methane) to air.

The following sections of the RMA apply and need to be read in conjunction with the landfill gas standards: sections 70A, 70B, 104E and 104F (which were inserted by the Climate Change Amendment Act 2004). These state that:

70A Application to climate change of rules relating to discharge of greenhouse gases
Despite section 68(3), when making a rule to control the discharge of greenhouse gases under its functions under section 30(1)(d)(iv) or (f), a regional council must not have regard to the effects of such a discharge on climate change, except to the extent that the use and development of renewable energy enables a reduction in the discharge into air of greenhouse gases, either ---

- (a) *in absolute terms; or*
- (b) *relative to the use and development of non-renewable energy.*

70B Implementation of national environmental standards
If a national environmental standard is made to control the effects on climate change of the discharge into air of greenhouse gases, a regional council may make rules that are necessary to implement the standard, provided the rules are no more or less restrictive than the standard.

104E Applications relating to discharge of greenhouse gases
When considering an application for a discharge permit or coastal permit to do something that would otherwise contravene section 15 or section 15B relating to the discharge into air of greenhouse gases, a consent authority must not have regard to the effects of such a discharge on climate change, except to the extent that the use and development of renewable energy enables a reduction in the discharge into air or greenhouse gases, either –

- (a) *in absolute terms; or*
- (b) *relative to the use and development of non-renewable energy.*

104F Implementation of National Environmental Standards
If a national environmental standard is made to control the effects on climate change of the discharge into air of greenhouse gases, a consent authority, when considering an application for a discharge permit or coastal permit to do something that would otherwise contravene section 15 or section 15B, –

- (a) *may grant the application, with or without conditions, or decline it, as necessary to implement the standard; but*
- (b) *in making its determination, must be no more or less restrictive than is necessary to implement the standard.*

To summarise, these sections of the RMA state:

- rules and resource consents can only consider the effects on climate change to the extent that the use of renewable energy will reduce discharges into air or greenhouse gases in total, or in comparison to non-renewable energy (ie, the effects of climate change per se cannot be considered)
- rules can be made that are necessary to implement the national environmental standard (not the policy)
- rules have to be no more or no less restrictive than the national environmental standard
- resource consents can be issued for greenhouse gas emissions but the regional council may be no more or no less restrictive than is necessary to implement a national environmental standard.

These sections of the RMA mean that regional rules (and resource consents) when considered within the context of the Regulations are applied differently for the control of greenhouse gas

emissions from landfill gas in comparison to other parts of the Regulation. That is, regional rules (and resource consents) cannot be more restrictive (as allowed for by Regulation 28) when applied to greenhouse gas emissions from landfill gas.

Regional rules and resource consents conditions for the purpose of controlling odour from landfill gas, and/or methane emissions for health and safety reasons are not subject to these sections of the RMA. This is because these rules and/or conditions are not for the purpose of managing greenhouse gas emissions in terms of their effects on climate change. Such rules and/or conditions would not be covered by the Regulations or the Climate Change Amendment Act 2004.

To avoid doubt, regional councils should indicate what their rules relating to landfill gas emissions are for (eg, greenhouse gas emission, odour or health and safety).

6.3 What do the landfill gas standards say?

Regulation 25 outlines which sites the landfill gas standards apply to.

25 *Application of regulations 26 and 27*

- (1) *Regulations 26 and 27 apply to a landfill if –*
 - a. *the landfill –*
 - i. *has a total capacity of not less than 1 million tonnes; and*
 - ii. *contains not less than 200,000 tonnes of waste; and*
 - iii. *is or is likely to be accepting waste; and*
 - b. *the waste in or to be included in the landfill is likely to consist of 5% or more (by weight) of matter that is putrescible or biodegradable.*
- (2) *However, regulations 26 and 27 do not apply to a landfill until 8 October 2007 if the landfill –*
 - a. *has a total capacity of not less than 1 million tonnes of waste; and*
 - b. *on 8 October 2004 –*
 - i. *contains not less than 200,000 tonnes of waste; and*
 - ii. *is accepting waste; and*
 - c. *does not operate a gas collection system.*
- (3) *Regulations 26 and 27 do not apply to a cleanfill.*

6.3.1 Applies to landfills that are designed to accept over 1 million tonnes of refuse throughout their design life

Regulation 25(1)(a)(i) states that the Regulations apply to sites with a design capacity of greater than 1 million tonnes of refuse. Landfills smaller than 1 million tonnes can generate methane at volumes that are able to be collected, however, this is usually below economically viable volume levels.

As noted above, a regional council can require landfills smaller than 1 million tonnes to install a gas collection system through regional plans or resource consent for the purposes of managing odour and/or health and safety. Such landfills are not covered by the Regulations or the Climate Change Amendment Act 2004.

6.3.2 Applies once 200,000 tonnes of refuse is in place

Regulation 25(1)(a)(ii) requires that the gas collection system must be operating when 200,000 tonnes of refuse has been placed within the landfill.

Gas collection systems are normally not installed until adequate volumes of methane have been generated. Methane generation is dependent on the period of time the refuse has been in place and the total quantity and type of refuse. The time anaerobic conditions start varies, but is usually between 80 and 260 days after refuse placement. Methane volumes usually only reach viable options for gas control after approximately 200,000 tonnes of refuse is in place.

The Regulations do not preclude the installation of a gas collection system prior to 200,000 tonnes of refuse being in place. Similarly, and as noted above, landfills can still be required by a regional plan rule or resource consent, to install a gas collection system prior to the installation of 200,000 tonnes of refuse. In this instance, the gas collection system would for the purposes of managing odour and/or health and safety and is therefore not covered by the Regulations or the Climate Change Amendment Act 2004.

6.3.3 Applies only to operating sites

Regulation 25(1)(a)(iii) states that the Regulation only applies to sites that are operating. It does not apply to closed landfills.

Existing gas management control systems at closed landfills may continue to operate as per existing consent conditions.

Closed landfills can still produce significant quantities of methane over an extended period. It is also usual for gas to accumulate in an old landfill site and for there to be periodic uncontrolled emissions of gas.

6.3.4 Applies to large landfills with more than 5% putrescible matter

Regulation 25(3) states that the Regulation does not apply to a cleanfill site, as these sites produce only minor amounts of methane. The Regulation defines cleanfill as follows:

Cleanfill

- (a) *means a landfill that accepts only material that, when buried or placed, will not have an adverse effect on the environment; but*
- (b) *does not include a landfill that contains 5% or more (by weight) putrescible matter.*

The Regulations do apply to industrial monofills such as bark or sawdust dumps that are over 1 million tonnes in size and have more than 5% (by weight) of matter that is putrescible or biodegradable.

6.3.5 Transitional period for operating sites without gas collection

Regulation 25 applied with immediate effect on 8 October 2004 for sites that had existing gas collection systems and for any new landfills that were being built (providing the criteria in Regulation 25(1) was met).

However, Regulation 25(2) also allowed existing operational sites at the time the Regulations were promulgated (8 October 2004) that did not operate a landfill gas collection and destruction system to have a transitional period of three years (until 8 October 2007) to install and commence operation of a collection system. This was to provide time for the landfill owner to fund, design, install and operate a landfill gas collection and destruction system. At the time of writing (2011) the transitional period finished several years ago; therefore, all existing and new large landfills must comply with Regulation 25.

6.3.6 Control of gas

26 *Control of gas*

- (1) *No person may allow the discharge of gas to air from a landfill.*
- (2) *Subclause (1) does not apply if the landfill has a system for the collection of gas from the landfill –*
 - a. *that is designed and operated to ensure that any discharge of gas from the surface of the landfill does not exceed 5000 parts of methane per million parts of air; and*
 - b. *in which the gas is –*
 - i. *flared in accordance with regulation 27; or*
 - ii. *used as a fuel or for generating electricity.*

Gas collection efficiencies are variable and so measurements are relatively inaccurate and unreliable. It is therefore not possible for the Regulations to specify a percentage efficiency for a gas collection system. Measuring methane emissions at the landfill surface and at monitoring points around the landfill is currently common practice in resource consent conditions at major landfills, including many recently closed sites. The surface emission limit is commonly 0.5% methane (by volume in air) in New Zealand which is 5000 parts per million (ppm) and corresponds to approximately 10% of the lower explosive limit (LEL) for methane.

Monitoring of surface methane emissions is a requirement of resource consents at most landfills and is used at some closed landfills to assess risks. Factors to consider when designing a surface methane monitoring programme are outlined in section 6.6 of this report.

Regulation 26(2)(b)(ii) allows for collected landfill gas to be used as a fuel, or for the purposes of generating electricity. Potential beneficial re-use options are outlined in section 6.5 of the report.

6.3.7 Flaring standards

27 *Flaring of gas*

- (1) *If gas collected at a landfill is destroyed by flaring, –*
 - a. *the system for the principal flare or flares must –*
 - i. *comply with the requirements in subclause (2); or*
 - ii. *achieve at least the same effect as the system in subclause (2); and*
 - b. *the system for the backup flare must –*
 - i. *comply with the requirements in subclause (3); or*
 - ii. *achieve at least the same effect as the system in subclause (3).*
- (2) *The system for a principal flare must –*
 - a. *have a flame arrestor; and*
 - b. *have an automatic backflow prevention device, or an equivalent device, between the principal flare and the landfill; and*
 - c. *have an automatic isolation system that ensures that, if the flame is lost, no significant discharge of unburnt gas from the flare occurs; and*
 - d. *have a continuous automatic ignition system; and*

- e. *have a design that achieves a minimum flue gas retention time of 0.5 seconds; and*
 - f. *be designed and operated so that gas is burned at a temperature of at least 750 degrees C; and*
 - g. *have a permanent temperature indicator; and*
 - h. *have adequate sampling ports to enable emission testing to be undertaken; and*
 - i. *provide for safe access to sampling ports while any emission tests are being undertaken.*
- (3) *The system for a backup flare must have –*
- a. *a flame arrestor; and*
 - b. *an automatic backflow prevention device, or an equivalent device, between the backup flare and the landfill; and*
 - c. *an automatic isolation system that ensures that, if the flame is lost, no significant discharge of unburnt gas from the flare occurs; and*
 - d. *a continuous automatic ignition system.*
- (4) *A principal flare must be operated at all times unless it has malfunctioned or is shut down for maintenance.*
- (5) *A backup flare must be operated if, and only if, a principal flare is not operating.*

Regulation 27 outlines the performance standards a landfill consent holder is required to meet if they elect to destroy the collected gas by flaring. This Regulation requires that any principal flare must operate at a minimum temperature of 750°C (degrees Celsius) and be designed to achieve a minimum flue gas retention time of 0.5 seconds. The Regulation also requires that any principal landfill gas flare has:

- a flame arrestor and automatic back-flow protection device or an equivalent system between the flare and the landfill to prevent flash-back and landfill fires
- a continuous automatic ignition system
- an automatic isolation system to ensure that there is no significant discharge of unburnt landfill gas from the flare in the event of flame loss
- a permanent temperature indicator
- adequate sampling ports to enable emissions testing to be undertaken
- provision for safe access to sampling ports while any emission tests are being undertaken.

The Regulations also require that a landfill has a backup flare that is available to operate when the principal flare is not operational due to malfunction or maintenance requirements. The backup flare must have:

- a flame arrestor and automatic back-flow protection device or an equivalent system between the flare and the landfill to prevent flash-back and landfill fires
- a continuous automatic ignition system
- an automatic isolation system to ensure that there is no significant discharge of unburnt landfill gas from the flare in the event of flame loss.

Regulation 27(1)(a)(ii) allows for differing technologies to be adopted if these alternatives can achieve at least the same effect as the systems outlined in the Regulations. Information would need to be provided by the landfill operator to the regional council to demonstrate that an alternative system achieves at least the same effect as that specified in Regulation 27(2).

6.3.8 Perimeter monitoring

Landfill gas can migrate horizontally through the ground and discharge at a point remote from the landfill. This can cause health and safety (or odour issues) for neighbouring properties. Perimeter monitoring probes are typically used around the edge of the landfill to monitor for gas movement away from the site.

Perimeter probe gas limits have historically been set at 5% methane (by volume in air), which corresponds to the lower explosive limit (LEL) for methane. However, there is an increasing trend in New Zealand and overseas to set the perimeter probe limits based on neighbouring land use activities and a limit figure of 1.25% methane (which is approximately 25% of the LEL for methane).

The Regulations do not require or preclude the monitoring of landfill gas at the perimeter of a site because this is not necessary to control the effects of greenhouse gas emissions from the landfill. Landfills can still be required by a regional council, through regional plan rules or resource consent conditions, to undertake perimeter monitoring for the prevention of odour from landfill gas or health and safety effects on neighbouring properties.

6.4 Exclusions from the landfill gas standards

6.4.1 Less than 5% putrescible or biodegradable matter

There may be situations where a landfill exceeds the refuse quantity threshold of 1 million tonnes but through the effective diversion of putrescible or biodegradable matter will generate low methane volumes. In this case effective operation of a methane collection and destruction system may not be warranted or feasible.

To encourage the diversion of organic matter, the Regulations provide an exemption to installing and operating a landfill gas collection system, if the site owner can demonstrate that the landfill contains, and is continuing to accept, less than 5% (by weight) of matter that is putrescible or biodegradable.

The best way to assess putrescible or biodegradable matter content in a landfill is to collect data about the composition of waste deposited over the life of the site. The Solid Waste Analysis Protocol (Ministry for the Environment, 2002b) provides a methodology for sorting waste into 12 primary categories including 'putrescible' (or organic) waste.

A typical Solid Waste Analysis Protocol survey programme would include:

- two years of quarterly surveys (to establish seasonal variations)
- an ongoing programme of annual surveys, with each season surveyed once per four-year cycle
- individual surveys designed to determine putrescible waste quantity to $\pm 20\%$.

For further information about developing, designing and interpreting surveys see the *Solid Waste Analysis Protocol* document and the survey design and analysis resources on the Ministry for the Environment website at www.mfe.govt.nz. Regional councils and the landfill consent holder would need to agree an acceptable monitoring programme.

For further information on alternatives to landfill disposal for organic wastes, see www.mfe.govt.nz.

6.4.2 Is odour from landfill gas covered by the Regulations?

The Regulations controlling the collection and destruction of landfill gas have been promulgated to control greenhouse gas emissions at landfills. They do not cover emissions of odour, the effects of odour nuisance or health and safety risks due to methane explosions.

Regional councils may have regional rules and resource consents to control odour and/or methane emissions for health and safety reasons. These rules or conditions are not managing greenhouse gas emissions or their effects and are therefore not covered by the Regulations or the Climate Change Amendment Act 2004.

To avoid doubt, regional councils should indicate in their regional plans (and consent conditions) what their rules relating to landfill gas emissions are for (eg, for controlling greenhouse gas emissions, odour or health and safety).

6.5 Beneficial re-use of landfill gas

The Regulations require the collection and destruction of landfill gas, however Regulation 26(2)(b)(ii) specifies that it does not require collected landfill gas to be flared. Landfill owners may choose to harness the collected landfill gas for use as a fuel **or** for electricity generation.

Beneficial re-use options could therefore, include:

- electricity generation
- direct use of the gas, such as in boilers, kilns, heating or off-gas destruction
- low pressure gas supply (as fuel) to a dedicated user
- compressed natural gas.

The most common use of landfill gas (used in more than 80% or more of gas utilisation schemes) is in the production of electricity. Approximately 600 cubic metres per hour of landfill gas at 55% methane will support a 1 MW electric scheme. However, the life of a scheme is highly site-specific and detailed site-specific gas and commercial assessments are required to size a gas utilisation option. The economics of a 'gas-to-electric power' scheme will also be dependent on the proximity of the landfill to the nearest power grid connection point.

Direct use of landfill gas as a fuel for heating is considerably more efficient than converting the gas to electricity where approximately 60 to 70% of its energy value is lost.

Direct use as a fuel in brick kilns, boilers, production of steam or in co-generation plants (being facilities that produce electricity and usable heat) are the next most common group of gas utilisation options. Landfill gas has a unique composition and a dedicated landfill gas customer who is specifically set up to use the gas 24 hours a day, 365 days a year is preferable. Gas generation rates, quantities and quality vary from site to site. The gas usually requires pre-treatment before burning/use and a gas transmission system which can affect the economic viability of the system.

Compressing the gas for use in vehicles or for use by a dedicated gas user away from the site has been practised. A higher level of gas treatment is required for this option over other gas utilisation options.

6.6 Designing a surface methane monitoring programme

There are a number of different surface emission procedures worldwide. The surveys are commonly termed Instantaneous Surface Monitoring (ISM) surveys. The survey uses methane as an indicator for landfill gas and volatile organic emissions from the landfill surface.

ISM surveys are conducted on both final and intermediate capping but are **not** conducted on open refuse faces due to the danger to site personnel and the variable nature of the ground. ISM surveys are also not typically conducted on daily cover. Monitoring on intermediate capping is typically done only if the intermediate capping is to be in place for more than a few weeks.

The common factors to all ISM surveys are:

- a suitable instrument has to be used that is capable of measuring to parts per million (ppm) of methane
- the instrument is hand carried, is intrinsically safe and is suitably calibrated
- the walkpaths on the landfill are set before the survey
- the weather conditions have to be within certain parameters to ensure representative results can be obtained and that the instrument is not damaged
- where a surface emission is detected the ISM survey deviates from the walkpath to determine the extent of the area of effect
- all details of the survey are recorded on a plan and tabulated to include an explanation (where possible) of why an elevated level occurred.

Recommended procedures for undertaking an ISM survey are available from the Ministry for the Environment. Note that the details of an ISM are not part of the Regulations, but are available as guidance on how to design a system.

6.7 How do the landfill gas standards take effect?

6.7.1 Who does this affect?

The Regulations place requirements on consent holders of operating landfills that have a total design capacity of 1 million tonnes or greater.

Regional councils are responsible for ensuring compliance with the landfill gas standards. In addition, it is likely that conditions will be attached to resource consent for such an operation – see below. Therefore, the regional council could take enforcement action in accordance with the enforcement provisions of the RMA.

In addition to this, section 44A (7-8) of the RMA requires that:

- (7) *Every local authority and consent authority must observe national environmental standards.*
- (8) *Every local authority and consent authority must enforce the observance of national environmental standards to the extent to which their powers enable them to do so.*

There is an obligation on regional councils to enforce compliance with the landfill gas requirements in the Regulations.

6.7.2 What is the impact on existing resource consents?

The Regulations do not automatically apply to consents that have commenced before 8 October 2004 (section 43B(4) of the RMA). The introduction of the Regulations allows regional councils to review existing consents to make them become 'as stringent' as the Regulations – see sections 43B(6) and 128(1)(ba) of the RMA.

Landfills with greater than 5% putrescible or biodegradable matter (by weight) that are over 1 million tonnes in design capacity, but which do not operate a landfill gas collection and destruction system, had until 8 October 2007 to install and commence operation of a system.

6.7.3 What is the impact on new resource consent applications?

Regional councils will be required to impose consent conditions requiring the installation of a landfill gas collection and destruction system on any new resource consents granted for landfills with a projected total capacity of over 1 million tonnes, unless the applicant can demonstrate that the landfill contains less than 5% (by weight) of putrescible or biodegradable matter.

The Climate Change Amendment Act 2004 has resulted in the introduction of sections 104E and 104F of the RMA (given in section 6.2).

The result of these amendments is that when deciding on resource consent applications for new landfills, regional councils are not able to impose conditions to control greenhouse gas discharges that vary from those specified in the Regulations. This differs from how other parts of the Regulation are treated.

Regional councils may still impose conditions for the purposes of controlling odour and/or methane emissions for health and safety reasons.

6.7.4 What is the impact on regional plans?

The Climate Change Amendment Act 2004 introduced sections 70A and 70B to the RMA (given in section 6.2).

These sections of the RMA mean that regional rules when considered within the context of the Regulations are applied differently for the control of greenhouse gas emissions from landfill gas in comparison to other parts of the Regulation. That is, regional rules cannot be more restrictive (as allowed for by Regulation 28) when applied to greenhouse gas emissions from landfill gas. Regional councils must therefore amend any regional rules relating to greenhouse gas emissions from landfill gas as soon as practicable (section 44A of the RMA).

Regional councils may still however, have regional rules for the purposes of controlling odour and/or methane emissions for health and safety reasons. To avoid doubt, regional councils should indicate in their regional plans what their rules relating to landfill gas emissions are for (eg, greenhouse gas emission, odour or health and safety reasons).

6.8 Enforcement

Any person who discharges landfill gas that is not in compliance with the requirements of Regulations 25 to 27 could be subject to enforcement action from the regional council in accordance with the enforcement provisions of the RMA. These provisions are discussed in more detail in section 2.4.

In addition to this, section 44A(8) of the RMA now requires that *‘every local authority and consent authority must enforce the observance of national environmental standards to the extent to which their powers enable them to do so’*.

There is therefore, an obligation on regional councils to enforce the landfill gas standards and the Regulations.

6.9 Reporting requirements

The standards do not require the reporting of landfill gas monitoring information to the Ministry for the Environment.

The Minister for the Environment may, under section 27 of the RMA, request information on the implementation of the Regulations from regional councils at any time. Councils have 20 working days to respond.

Glossary

| | |
|-------------------------------------|--|
| 12-month period | a rolling consecutive 12 month period that does not necessarily relate to a calendar year |
| acute | short term exposure, eg, 1-hour |
| airshed | an area designated by a regional council for the purposes of managing air quality and gazetted by the Minister |
| ambient pollutant | a pollutant in the air outside particularly used in reference to CO, NO ₂ , O ₃ , SO ₂ and PM |
| ARC | the previous Auckland Regional Council now part of Auckland Council |
| breach | first exceedance of an ambient standard above the number of permissible exceedances in any 12-month period |
| breaching airshed | An airshed that has recorded a breach of any ambient standard in the Regulations. |
| chronic | long term exposure, eg, annual |
| Climate Change Amendment Act | Resource Management (Energy and Climate Change) Amendment Act 2004 |
| CO | carbon monoxide |
| coal burning heater | a domestic fire designed primarily for burning coal |
| compliance | a range of activities usually carried out by agencies with regulatory functions to ensure people and other organisations adhere to rules and regulations for the public good |
| cooking stove | a stove heated by any fuel used primarily for cooking |
| domestic fire | a combustion appliance used for heating space, or water, or for cooking which has a chimney and which is intended primarily for use in a residential dwelling house |
| dwelling house | any building, whether permanent or temporary, that is occupied, in whole or in part, as residence and includes any structure or outdoor living area that is accessory to, and used wholly or principally for the purposes of, the residence; but does not include the land upon which the residence is sited as defined in the RMA |
| EECA | Energy Efficiency and Conservation Authority |
| exceedance | an instance where a contaminant exceeds its threshold concentration (defined in Schedule 1 of the Regulations) in an airshed |
| GPG | good practice guide |

| | |
|--------------------------------------|---|
| hazardous air pollutant (HAP) | any substance known or suspected to cause a significant adverse effect on human health or the environment due to its toxicity, persistence in the environment, tendency to bio-accumulate, or any combination of these things |
| HAPINZ | Health and Air Pollution in New Zealand study |
| kg | kilogram |
| kaitiaki | the Māori concept of guardianship, for the sky, the sea, and the land. A kaitiaki is a guardian, and the process and practices of protecting and looking after the environment are referred to as kaitiakitanga. |
| LGA | Local Government Act 2002 |
| LINZ | Land Information New Zealand |
| MfE | Ministry for the Environment |
| mg | milligram, one thousandth of a gram |
| mg/m³ | milligram per cubic metre, a unit of concentration |
| µg | microgram, one millionth of a gram |
| µg/m³ | microgram per cubic metre, a unit of concentration |
| µm | micrometre, one millionth of a metre |
| Minister | Minister for the Environment |
| Ministry | Ministry for the Environment |
| morbidity effects | adverse health effects which result in increased illness, suffering and general unwellness |
| mortality effects | adverse health effects which result in death |
| MoT | Ministry of Transport |
| multi-fuel burner | similar to a woodburner but is designed to burn both wood and/or coal and has over fuel and under fuel combustion air supply with separate controls, a grate in the base of the firebox and an ash pan |
| MW | megawatt |
| <i>New Zealand Gazette</i> | The official newspaper of the Government of New Zealand, produced by the Department of Internal Affairs |
| NO | nitric oxide |
| NO₂ | nitrogen dioxide |
| NO_x | oxides of nitrogen (which include NO and NO ₂ but there are others) |
| O₃ | ozone |

| | |
|--------------------------------|---|
| open fire | a fire where the combustion chamber is not totally enclosed including combustion chambers that are partially closed (eg, have a door) and those that have limited control of the primary or secondary air supply. Open fires are common in older houses where they are built into the house. Some examples of open fires are fireplaces, including brick or masonry, visors, open hearths and 'Jetmaster' fireplaces. |
| PAH | polycyclic aromatic hydrocarbon |
| pellet burner | a woodburner with metal firebox and a door on the front, the wood is in the form of small pellets that is fed continuously into the fire |
| permissible exceedance | any monitoring result that is above the ambient standard concentration limit but is within the number of exceedances allowed in Schedule 1 |
| PM | particulate matter |
| PM_{<0.1} | particulate matter less than 0.1 µm in diameter, that may enter the bloodstream, sometimes referred to as 'ultrafine' particulate matter |
| PM_{2.5} | particulate matter less than 2.5 µm in diameter, that deposits in the very small airways deep in the lung, sometimes referred to as 'fine' particulate matter |
| PM_{2.5-10} | particulate matter between 2.5 µm and 10 µm in diameter that deposits in the upper airways, sometimes referred to as 'coarse' particulate matter |
| PM₁₀ | particulate matter less than 10 µm in diameter |
| polluted airshed | An airshed that with more than 1.0 average annual exceedances of the ambient PM ₁₀ standard for the immediately prior 5-year period, calculated from meaningful data for up to 5-years of monitoring data |
| ppm | parts per million |
| RMA | Resource Management Act 1991 |
| SO₂ | sulphur dioxide |
| solid fuel | coal or wood (including wood pellets) |
| The 2011 Users' Guide | The 2011 Users' Guide to the revised National Environmental Standard for Air Quality |
| The Regulations | The Resource Management (National Environmental Standards for Air Quality) Regulations 2004, which includes the amendments made in 2004, 2005, 2008 and 2011 |
| The Compliance Strategy | Clean Healthy Air for All New Zealanders: The National Air Quality Compliance Strategy to Meet the PM ₁₀ Standard |

| | |
|--------------------------------|---|
| threshold concentration | the concentration of the contaminant specified in the second column of the table in Schedule 1 of the Regulations calculated as a mean for the time period specified in the column |
| taonga | a treasured thing in Māori culture, whether tangible or intangible |
| toxic air pollutants | refer hazardous air pollutants |
| USEPA | United States Environmental Protection Agency |
| VOC | volatile organic compound |
| WHO | World Health Organisation |
| woodburner | a fully enclosed metal firebox only designed to burn wood (and paper) with a door primary and secondary air controls to allow for the efficient burning of wood within the combustion chamber |

References

- Auckland Regional Council. 2005. *Improving Air Quality in Auckland: Bus Emissions Prediction Model*. Auckland: Auckland Regional Council.
- Auckland Regional Council. February 2006. *Auckland Air Emissions Inventory 2004*. Auckland: Auckland Regional Council.
- Auckland Regional Council. 2009. *Vehicle Emission Prediction Model (VEPM), Version 3*. Auckland: Auckland Regional Council. Available on CD from Auckland Council.
- Auckland Regional Council. 2010. *Estimation of Domestic Fire Emissions in 2006*, Report TP 2010/056. Auckland. Auckland Regional Council.
- Elsom D. 2004. *Air Quality Management – Highlighting Good Practice*, Clean Air and Environmental Quality, Volume 38, No 1, Richmond, Victoria, Australia.
- Fisher G., Rolfe K., Kjellstrom T., Woodward A., Hales S., Sturman A., Kingham S., Petersen J., Shrestha R. and King D. 2002. *Health Effects due to Motor Vehicle Pollution in New Zealand*. Wellington: Ministry of Transport. Available from www.hapinz.org.nz
- Fisher G., Kjellstrom T., Kingham S., Hales S., Shrestha R. et al. 2007. *Health and Air Pollution in New Zealand: Main Report*, Report prepared for the Health Research Council of New Zealand, Ministry for the Environment and Ministry of Transport. Wellington: Health Research Council.
- Iremonger S. March 2010. *Environment Bay of Plenty Regional Council NERM Air Monitoring 2010*. Whakatane. Environment Bay of Plenty Regional Council. Available on www.boprc.govt.nz
- Kim N. 21 April 2011. *PM₁₀ in towns monitored by Waikato Regional Council to year ending 2010 – air quality, sources and trends*. Hamilton: Waikato Regional Council.
- Kuschel G. and Mahon K. 2010. *A Review and Update of HAPINZ for the Auckland Region*, Internal report no 2010/004 to Auckland Regional Council. Auckland: Auckland Regional Council.
- Minister for the Environment. 2011. *Amending the PM₁₀ Air Quality Standards: Final Recommendations*, Cabinet Paper prepared by Hon Dr Nick Smith. Wellington.
- Ministry for the Environment. 1998. *Compliance Monitoring and Emission Testing of Discharges to Air*, Wellington: Ministry for the Environment. Available on www.mfe.govt.nz
- Ministry for the Environment. 2001a. *Good Practice Guide for Assessing and Managing the Environmental Effects of Dust Emissions*, Report ME408. Wellington: Ministry for the Environment. Available on www.mfe.govt.nz.
- Ministry for the Environment. 2001b. *Guide to Landfill Consent Conditions*, Report ME389. Wellington: Ministry for the Environment. Available on www.mfe.govt.nz.
- Ministry for the Environment. 2001c. *An Action Plan for Reducing Discharges of Dioxin to Air*, ME411. Wellington: Ministry for the Environment. Available on www.mfe.govt.nz
- Ministry for the Environment. 2002a. *Ambient Air Quality Guidelines*, Report ME437 prepared by the Ministry for the Environment and the Ministry of Health. Wellington: Ministry for the Environment. Available from www.mfe.govt.nz
- Ministry for the Environment. 2002b. *Solid Waste Analysis Protocol*, Report ME430. Wellington: Ministry for the Environment.
- Ministry for the Environment. 2003. *Good Practice Guide for Assessing and Managing Odour in New Zealand*, Report ME473. Wellington: Ministry for the Environment. Available on www.mfe.govt.nz
- Ministry for the Environment. May 2004a. *Proposed National Environmental Standard to Control Greenhouse Gas Emissions from Landfills – Resource Management Act Section 32 – Analysis of the Costs and Benefits*. Wellington: Ministry for the Environment.

- Ministry for the Environment. 2004b. *Good Practice Guide for Atmospheric Dispersion Modelling*, Report ME522. Wellington: Ministry for the Environment. Available on www.mfe.govt.nz
- Ministry for the Environment. 2007a. *Environment New Zealand 2007*, Report ME847. Wellington: Ministry for the Environment. Available on www.mfe.govt.nz
- Ministry for the Environment. 2007b. *The 2006/07 National Landfill Census*, Report ME842. Wellington: Ministry for the Environment. Available on www.mfe.govt.nz.
- Ministry for the Environment. 2008a. *Good Practice Guide for Assessing Discharges to Air from Industry*, Report ME880. Wellington: Ministry for the Environment. Available on www.mfe.govt.nz
- Ministry for the Environment. 2008b. *Good Practice Guide for Assessing Discharges to Air from Land Transport*, Report ME881. Wellington: Ministry for the Environment. Available on www.mfe.govt.nz
- Ministry for the Environment. 2009a. *Good Practice Guide for Air Quality Monitoring and Data Management*, Report ME933. Wellington: Ministry for the Environment. Available on www.mfe.govt.nz
- Ministry for the Environment. 2009b. *2008 Report on Progress: National Environmental Standards*, Report ME945. Wellington: Ministry for the Environment.
- Ministry for the Environment. 2010a. *Regulatory Impact Statement – Amending the PM₁₀ Air Quality Standards: Final Recommendations*, Report ME1041. Wellington: Ministry for the Environment. Available on www.mfe.govt.nz
- Ministry for the Environment. 2010b. *Proposed Amendments to the National Environmental Standards for Air Quality: Discussion Document*, Report ME1018. Wellington: Ministry for the Environment. Available on www.mfe.govt.nz
- Ministry for the Environment. 2011a. *New Zealand Inventory of Dioxin Emissions to Air, Land and Water, and Reservoir Sources: 2011*, Prepared by Drs Bruce Graham and Alistair G Bingham for the Ministry for the Environment, Report ME1038. Wellington: Ministry for the Environment. Available on www.mfe.govt.nz
- Ministry for the Environment. 2011b. *New Zealand Domestic Solid Fuel Burner Authorisation Manual*, Report ME1043. Wellington: Ministry for the Environment. Available on www.mfe.govt.nz
- Ministry for the Environment. 2011c. *Revised National Environmental Standards for Air Quality – Evaluation under Section 32 of the Resource Management Act*, Report ME1041. Wellington: Ministry for the Environment. Available on www.mfe.govt.nz.
- Ministry for the Environment. 2011d. *Health Effects from PM₁₀ Air Pollution*, Factsheet prepared by Ministry for the Environment. Wellington: Ministry for the Environment. Available on www.mfe.govt.nz
- Ministry for the Environment. 2011e. *Clean Healthy Air for All New Zealanders: The National Air Quality Compliance Strategy to Meet the PM₁₀ Standard*, Report ME1064. Wellington: Ministry for the Environment. Available on www.mfe.govt.nz
- Ministry of Education. 2011. *Te Kete Ipurangi*, web based database hosted by the Ministry of Education. Wellington: Ministry of Education. Available at: <http://www.tki.org.nz/Schools> accessed 8 July 2011.
- Šrám RJ, Binková B, Rössner P, Rubeš J, Topinka J, Dejmek J, 1999: *Adverse reproductive outcomes from exposure to environmental mutagens* Mutat Res 428:203–215.
- Secretariat of the Basel Convention. 1992. *Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal*. Switzerland: United Nations Environment Programme. Web publication www.basel.int/text/17Jun2010-conv-e.pdf accessed 17 June 2010.
- United States Environmental Protection Agency. 2011a. *Health Effects of Ozone in the General Population*. Web publication www.epa.gov/apti/ozonehealth/population.html accessed 7 July 2011.
- United States Environmental Protection Agency. 2 May 2011. Overview of Draft Guidance Documents on the Implementation of the Exceptional Events Rule. – Note to State/Local/Tribal Agency Reviewers. Web publication www.epa.gov/air/tribal/pdfs/EERDraftGuidanceOverviewDoc_050211_external.pdf accessed 19 May 2011.

United States Environmental Protection Agency National Exposure Research Laboratory – Human Health & Atmospheric Sciences Division. April 2011c. *List of Designated Reference and Equivalent Methods*. Web publication www.epa.gov/ttn/amtic/criteria.html accessed 19 May 2011.

Wilton E. 2001. *Good Practice Guide for Preparing Emissions Inventories*, Report SMF1 prepared by Environet for the Ministry for the Environment. Wellington: Ministry for the Environment. Available on www.mfe.govt.nz.

World Health Organisation. 2006. *Air Quality Guidelines Global Update 2005, Particulate matter, ozone, nitrogen dioxide and sulphur dioxide*. Denmark. WHO Regional Office for Europe. Available on www.who.int

Appendix 1: Basel Convention: Annexes I and III

Annex I: Categories of wastes to be controlled

Waste streams

- Y1 Clinical wastes from medical care in hospitals, medical centres and clinics
- Y2 Wastes from the production and preparation of pharmaceutical products
- Y3 Waste pharmaceuticals, drugs and medicines
- Y4 Wastes from the production, formulation and use of biocides and phytopharmaceuticals
- Y5 Wastes from the manufacture, formulation and use of wood preserving chemicals
- Y6 Wastes from the production, formulation and use of organic solvents
- Y7 Wastes from heat treatment and tempering operations containing cyanides
- Y8 Waste mineral oils unfit for their originally intended use
- Y9 Waste oils/water, hydrocarbons/water mixtures, emulsions
- Y10 Waste substances and articles containing or contaminated with polychlorinated biphenyls (PCBs) and/or polychlorinated terphenyls (PCTs) and/or polybrominated biphenyls (PBBs)
- Y11 Waste tarry residues arising from refining, distillation and any pyrolytic treatment
- Y12 Wastes from production, formulation and use of inks, dyes, pigments, paints, lacquers, varnish
- Y13 Wastes from production, formulation and use of resins, latex, plasticisers, glues/adhesives
- Y14 Waste chemical substances arising from research and development or teaching activities which are not identified and/or are new and whose effects on man and/or the environment are not known
- Y15 Wastes of an explosive nature not subject to other legislation
- Y16 Wastes from production, formulation and use of photographic chemicals and processing materials
- Y17 Wastes resulting from surface treatment of metals and plastics
- Y18 Residues arising from industrial waste disposal operations

Wastes having as constituents

- Y19 Metal carbonyls
- Y20 Beryllium; beryllium compounds
- Y21 Hexavalent chromium compounds
- Y22 Copper compounds
- Y23 Zinc compounds
- Y24 Arsenic; arsenic compounds

- Y25 Selenium; selenium compounds
- Y26 Cadmium; cadmium compounds
- Y27 Antimony; antimony compounds
- Y28 Tellurium; tellurium compounds
- Y29 Mercury; mercury compounds
- Y30 Thallium; thallium compounds
- Y31 Lead; lead compounds
- Y32 Inorganic fluorine compounds excluding calcium fluoride
- Y33 Inorganic cyanides
- Y34 Acidic solutions or acids in solid form
- Y35 Basic solutions or bases in solid form
- Y36 Asbestos (dust and fibres)
- Y37 Organic phosphorus compounds
- Y38 Organic cyanides
- Y39 Phenols; phenol compounds including chlorophenols
- Y40 Ethers
- Y41 Halogenated organic solvents
- Y42 Organic solvents excluding halogenated solvents
- Y43 Any congener of polychlorinated dibenzo-furan
- Y44 Any congener of polychlorinated dibenzo-p-dioxin
- Y45 Organohalogen compounds other than substances referred to in this Annex (eg Y39, Y41, Y42, Y43, Y44)
 - (a) To facilitate the application of this Convention, and subject to paragraphs (b), (c) and (d), wastes listed in Annex VIII are characterised as hazardous pursuant to Article 1, paragraph 1 (a), of this Convention, and wastes listed in Annex IX are not covered by Article 1, paragraph 1 (a), of this Convention.
 - (b) Designation of a waste on Annex VIII does not preclude, in a particular case, the use of Annex III to demonstrate that a waste is not hazardous pursuant to Article 1, paragraph 1 (a), of this Convention.
 - (c) Designation of a waste on Annex IX does not preclude, in a particular case, characterisation of such a waste as hazardous pursuant to Article 1, paragraph 1 (a), of this Convention if it contains Annex I material to an extent causing it to exhibit an Annex III characteristic.
 - (d) Annexes VIII and IX do not affect the application of Article 1, paragraph 1 (a), of this Convention for the purpose of characterisation of wastes.

Annex III: List of hazardous characteristics

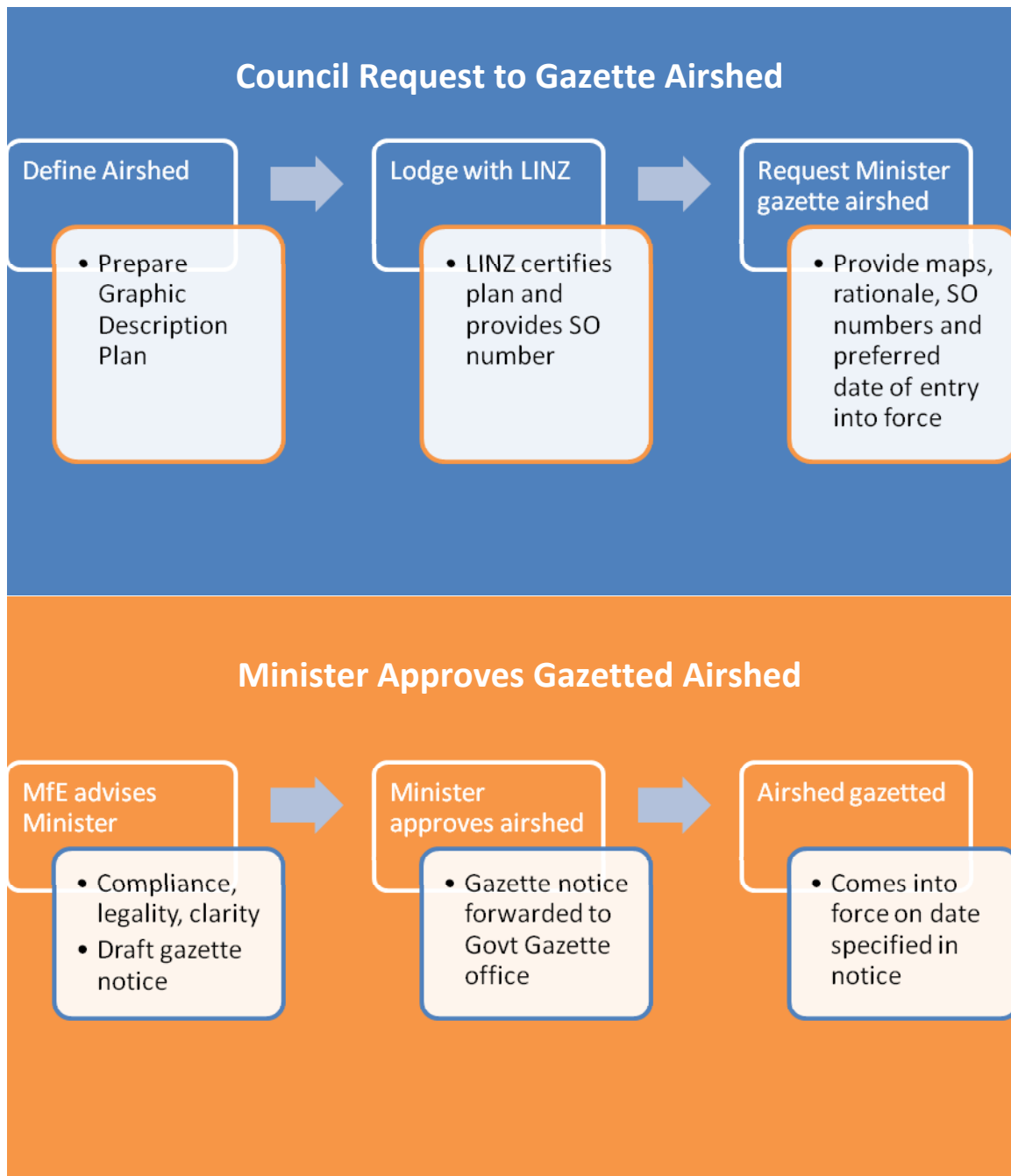
| UN class ¹⁹ | Code | Characteristics |
|------------------------|------|---|
| 1 | H1 | Explosive: An explosive substance or waste is a solid or liquid substance or waste (or mixture of substances or wastes) which is in itself capable by chemical reaction of producing gas at such a temperature and pressure and at such a speed as to cause damage to the surroundings. |
| 3 | H3 | Flammable liquids: The word “flammable” has the same meaning as “inflammable”. Flammable liquids are liquids, or mixtures of liquids, or liquids containing solids in solution or suspension (for example, paints, varnishes, lacquers, etc., but not including substances or wastes otherwise classified on account of their dangerous characteristics) which give off a flammable vapour at temperatures of not more than 60.5°C, closed-cup test, or not more than 65.6°C, open-cup test. (Since the results of open-cup tests and of closed-cup tests are not strictly comparable and even individual results by the same test are often variable, regulations varying from the above figures to make allowance for such differences would be within the spirit of this definition.) |
| 4.1 | H4.1 | Flammable solids: Solids, or waste solids, other than those classed as explosives, which under conditions encountered in transport are readily combustible, or may cause or contribute to fire through friction. |
| 4.2 | H4.2 | Substances or wastes liable to spontaneous combustion: Substances or wastes which are liable to spontaneous heating under normal conditions encountered in transport, or to heating up on contact with air, and being then liable to catch fire. |
| 4.3 | H4.3 | Substances or wastes which, in contact with water emit flammable gases: Substances or wastes which, by interaction with water, are liable to become spontaneously flammable or to give off flammable gases in dangerous quantities. |
| 5.1 | H5.1 | Oxidising: Substances or wastes which, while in themselves not necessarily combustible, may, generally by yielding oxygen cause, or contribute to, the combustion of other materials. |
| 5.2 | H5.2 | Organic peroxides: Organic substances or wastes which contain the bivalent-o-o-structure are thermally unstable substances which may undergo exothermic self-accelerating decomposition. |
| 6.1 | H6.1 | Poisonous (acute): Substances or wastes liable either to cause death or serious injury or to harm health if swallowed or inhaled or by skin contact. |
| 6.2 | H6.2 | Infectious substances: Substances or wastes containing viable micro organisms or their toxins which are known or suspected to cause disease in animals or humans. |
| 8 | H8 | Corrosives: Substances or wastes which, by chemical action, will cause severe damage when in contact with living tissue, or, in the case of leakage, will materially damage, or even destroy, other goods or the means of transport; they may also cause other hazards. |
| 9 | H10 | Liberation of toxic gases in contact with air or water: Substances or wastes which, by interaction with air or water, are liable to give off toxic gases in dangerous quantities. |
| 9 | H11 | Toxic (delayed or chronic): Substances or wastes which, if they are inhaled or ingested or if they penetrate the skin, may involve delayed or chronic effects, including carcinogenicity. |
| 9 | H12 | Ecotoxic: Substances or wastes which if released present or may present immediate or delayed adverse impacts to the environment by means of bioaccumulation and/or toxic effects upon biotic systems. |
| 9 | H13 | Capable, by any means, after disposal, of yielding another material, eg leachate, which possesses any of the characteristics listed above. |

¹⁹ Corresponds to the hazard classification system included in the United Nations Recommendations on the Transport of Dangerous Goods (ST/SG/AC.10/1Rev.5, United Nations, New York, 1988).

Appendix 2: Guidance on Gazetting Airsheds

The process for gazetting airsheds is summarised in Figure A2.1.

Figure A2.1 Process for Gazetting an airshed



A2.1 Define airshed

Councils will need to prepare ‘Graphic Description’ plans to define airsheds in a format suitable for Landonline’s database. LINZ specifies requirements for Graphic Description plans for statutory purposes in OSG Policy 2000/02 v1.4 *Use of Graphic Description Plans*. This policy details such things as format, manner of presentation and data to be shown on the plan. The LINZ website: www.linz.govt.nz provides up to date information.

Councils may wish to use licensed cadastral surveyors or professional map publishers. While councils will decide at a fairly high level where airsheds should be positioned, these professionals should be able to suggest where the boundaries would be best positioned to take advantage of existing boundaries.

Councils should ensure that the method of definition provides the required degree of accuracy, including clear descriptions of any boundary features, in case of dispute. Any plans should also note that the airsheds comprise a strata from ground level upwards as airsheds extend upwards from ground level, with no specified upper limit.

A2.2 Lodge Plans with LINZ

Once a council has defined an airshed in a way that is legally defensible (i.e. using a Graphic Description plan) the plan must be lodged by email with LINZ as a tiff image. At time of writing, the contact for plan lodgement was Gary Regaldo (gregaldo@linz.govt.nz).

Once the plans are lodged with LINZ they will be allocated an SO number and go through a verification process to certify that the boundaries are capable of identification. LINZ charges a standard fee for this certification process. Copies of the plans are available to the public on Landonline (www.landonline.govt.nz) through anyone with online access, such as surveyors, lawyers and territorial authorities.

A2.3 Council request to Minister to Gazette airshed

Once the plan is lodged with, and certified by LINZ, councils should provide to the Ministry for the Environment:

- map showing airshed
- rationale for the creation / amendment of the airshed
- SO numbers for Graphic Description plan(s) certified by LINZ
- electronic map of airshed to update Ministry website www.mfe.govt.nz
- preferred date for commencement of airshed.

A2.4 Ministry for the Environment advises Minister

The Ministry prepares a brief for the Minister which provides an overview of the council rationale for the airsheds gazettal, confirms the legality of the request and summarises pertinent issues such as implications for compliance. The Ministry also drafts a gazette notice for the Minister to sign.

A2.5 Minister approves airshed

The Minister considers the contents of the briefing and, if satisfied, approves the new airshed and signs the gazette notice.

A2.6 Airsheds gazetted

The airsheds are then published in the next issue of the *Gazette*, which is published weekly on Thursdays. A minimum period of 28 days must then elapse before the airshed comes into force.

Appendix 3: Breach Public Notice Example

Regulation 16 requires notice to be given once an ambient standard is breached in an airshed. This is discussed in detail in section 3.7. An example public notice is given in Figure A3.1.

Figure A3.1 Example Public Notice for a breach of an ambient standard

| Breach of ambient PM₁₀ standard [Model Airshed] |
|--|
| <p>The [<i>Want to be Clean Air Regional Council</i>] in accordance with the Resource Management (National Environmental Standards for Air Quality) Regulations 2004 is giving notice pursuant Regulation 16 that on [<i>date</i>] at [<i>monitoring station location</i>] in [<i>Model Airshed</i>], a measurement of [<i>x µg.m⁻³</i>] was recorded at [<i>time</i>]. This is [<i>althe insert number</i>] breach of the ambient standard for PM₁₀ of 50 µg.m⁻³ as a 24-hour average.</p> <p>For more information relating to this notice, please contact [<i>contact name</i>] or see our website [<i>website address</i>].</p> <p>CEO Name Want to be Clean Air Regional Council HAPPY CITY</p> |

Notes:

1. This notice must be given within **one month** of the exceedance.
2. This notice must be given in accordance with the requirement for public notices in the RMA (discussed in detail in section 3.7).
3. The information shown is the minimum required by law. Councils may wish to add other information or to bring the exceedance or its implications to the attention of the public in additional ways.

Appendix 4: PM₁₀ Monitoring Methods

Current as at 1 April 2011

For an updated list of acceptable methods refer to the Ministry for the Environment website.

A4.1 Australian and New Zealand standard methods

AS/NZS 3580.9.6:2003 High volume sampler

Continuous high volume sampling in accordance with AS/NZS 3580.9.6:2003 “Methods for sampling and analysis of ambient air – Determination of suspended particulate matter - PM₁₀ high volume sampler with size selective inlet – Gravimetric method”.

AS 3580.9.8:2008 TEOM

Continuous sampling in accordance with AS 3580.9.8 “Methods for sampling and analysis of ambient air – Determination of suspended particulate matter - PM₁₀ continuous direct mass method using a tapered element oscillating microbalance analyser”.

AS/NZS 3580.9.11:2008 Beta Gauge

Continuous sampling in accordance with AS/NZS 3580.9.11 “Methods for sampling and analysis of ambient air – Determination of suspended particulate matter - PM₁₀ beta attenuation monitors”.

A4.2 US methods

USEPA National Exposure Research Laboratory – Human Health & Atmospheric Sciences Division

List of Designated Reference and Equivalent Methods
(www.epa.gov/ttn/amtic/criteria.html)

Issue Date: April 1, 2011

These methods for measuring ambient concentrations of specified air pollutants have been designated as "reference methods" or "equivalent methods" in accordance with Title 40, Part 53 of the Code of Federal Regulations (40 CFR Part 53). Subject to any limitations (e.g., operating range or temperature range) specified in the applicable designation, each method is acceptable for use in state or local air quality surveillance systems under 40 CFR Part 58 unless the applicable designation is subsequently cancelled. Automated methods for pollutants other than PM₁₀ are acceptable for use only at shelter temperatures between 20°C and 30°C and line voltages between 105 and 125 volts unless wider limits are specified in the method description.

Prospective users of the methods listed should note (1) that each method must be used in strict accordance with its associated operation or instruction manual and with applicable quality assurance procedures, and (2) that modification of a method by its vendor or user may cause the pertinent designation to be inapplicable to the method as modified. (See Section 2.8 of Appendix C, 40 CFR Part 58 for approval of modifications to any of these methods by users.)

Further information concerning particular designations may be found in the *Federal Register* notice cited for each method or by writing to the National Exposure Research Laboratory, Human Exposure and Atmospheric Sciences Division (MD-D205-03), U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711. Technical information concerning the methods should be obtained by contacting the source listed for each method. Source addresses are listed at the end of the listing of methods, except for the addresses for lead method sources, which are given with the method. New analyzers or PM₁₀ samplers sold as reference or equivalent methods must carry a label or sticker identifying them as designated methods. For analyzers or PM₁₀ or samplers sold prior to the designation of a method with the same or similar model number, the model number does not necessarily identify an analyzer or sampler as a designated method. Consult the manufacturer or seller to determine if a previously sold analyzer or sampler can be considered a designated method or if it can be upgraded to designation status. Analyzer users who experience operational or other difficulties with a designated analyzer or sampler and are unable to resolve the problem directly with the instrument manufacturer may contact EPA (preferably in writing) at the above address for assistance.

This list will be revised as necessary to reflect any new designations or any cancellation of a designation currently in effect. The most current revision of the list will be available for inspection at EPA's Regional Offices, and copies may be obtained at the Internet site identified above or by writing to the National Exposure Research Laboratory at the address specified above.

Andersen Model RAAS10-100 PM₁₀ Single Channel PM₁₀ Sampler

Manual Reference Method: RFPS-0699-130

“Andersen Instruments, Incorporated Model RAAS10-100 Single Channel Reference Method PM₁₀ Sampler,” with RAAS-10 PM₁₀ inlet or the louvered inlet specified in 40 CFR 50 Appendix L, Figs. L-2 thru L-19, configured as a PM₁₀ reference method, and operated for 24-hour continuous sample periods at a flow rate of 16.67 liters/minute, and in accordance with the Model RAAS105-100 Operator’s Manual and with the requirements and sample collection filters specified in 40 CFR Part 50, Appendix J or Appendix M.

Federal Register: Vol. 64, page 33481, 06/23/99

Andersen Model RAAS10-200 PM₁₀ Single Channel PM₁₀ Audit Sampler

Manual Reference Method: RFPS-0699-131

“Andersen Instruments, Incorporated Model RAAS10-200 Single Channel Reference Method PM₁₀ Audit Sampler,” with RAAS-10 PM₁₀ inlet or the louvered inlet specified in 40 CFR 50 Appendix L, Figs. L-2 thru L-19, configured as a PM₁₀ reference method, and operated for 24-hour continuous sample periods at a flow rate of 16.67 liters/minute, and in accordance with the Model RAAS105-200 Operator’s Manual and with the requirements and sample collection filters specified in 40 CFR Part 50, Appendix J or Appendix M.

Federal Register: Vol. 64, page 33481, 06/23/99

Andersen Model RAAS10-300 PM₁₀ Multi Channel PM₁₀ Sampler

Manual Reference Method: RFPS-0699-132

“Andersen Instruments, Incorporated Model RAAS10-300 Multi Channel Sequential Reference Method PM₁₀ Sampler,” with RAAS-10 PM₁₀ inlet or the louvered inlet specified in 40 CFR 50 Appendix L, Figs. L-2 thru L-19, configured as a PM₁₀ reference method, and operated for 24-hour continuous sample periods at a flow rate of 16.67 liters/minute, and in accordance with the Model RAAS105-300 Operator’s Manual and with the requirements and sample collection filters specified in 40 CFR Part 50, Appendix J or Appendix M.

Federal Register: Vol. 64, page 33481, 06/23/99

BGI Incorporated Model PQ100 Air Sampler

Manual Reference Method: RFPS-1298-124

“BGI Incorporated Model PQ100 Air Sampler,” with BGI 16.7 Inlet Kit or the louvered inlet specified in 40 CFR 50 Appendix L, Figs. L-2 thru L-19, configured as a PM₁₀ reference method, for 24-hour continuous sample periods at a flow rate of 16.7 liters/minute, with original firmware Version 5.X and lower or new firmware version 6.0 and higher, operated in accordance with the original Model PQ100 Instruction Manual or manual revision Version 7.0, as appropriate, and with the requirements specified in 40 CFR Part 50, Appendix J or Appendix M, using either the original or the newer PQ200-type filter cassettes, and with or without the optional Solar Panel Power Supply.

Federal Register: Vol. 63, page 69625, 12/17/98

Latest modification: 01/2009

BGI Incorporated Model PQ200 Air Sampler

Manual Reference Method: RFPS-1298-125

“BGI Incorporated Model PQ200 Air Sampler,” with “flat plate” PM₁₀ inlet or the louvered inlet specified in 40 CFR 50 Appendix L, Figs. L-2 thru L-19, configured as a PM₁₀ reference method, and operated for 24-hour continuous sample periods in accordance with the Model PQ200 Instruction Manual and with the requirements specified in 40 CFR Part 50, Appendix J or Appendix M, and with or without the optional Solar Panel Power Supply.

Federal Register: Vol. 63, page 69625, 12/17/98

DKK-TOA Models FPM-222/222C, FPM223/223C, and DUB-222(S)/223(S) PM₁₀ Monitor

Automated Equivalent Method: EQPM-0905-156

“DKK-TOA Models FPM-222, FPM-222C, FPM-223, FPM-223C, DUB-222(S), and DUB-223(S) Particulate Monitor,” for monitoring PM₁₀ in Ambient Air (beta attenuation monitor), configured for PM₁₀, with Firmware Version DUB4-658355, Corrected Slope Factor (FACT SLOPE) set to 1.232, Corrected Zero Value (FACT ZERO) set to 1.8, and with or without any of the following options: Auto Check and Serial Recorder.

Federal Register: Vol. 70, page 56684, 09/28/05

Ecotech Model 3000 PM₁₀ High Volume Air Sampler

Manual Reference Method: RFPS-0706-162

“Ecotech Pty. Ltd. Model 3000 PM₁₀ High Volume Air Sampler,” configured with the Ecotech PM₁₀ Size-Selective Inlet (SSI)(P-ECO-HVS3000-02), with the flow rate set to 1.13 m³/min (67.8 m³/hour).

Federal Register: Vol. 71, page 42089, 07/25/06

Environnement S.A. Model MP101M PM₁₀ Monitor

Automated Equivalent Method: EQPM-0404-151

“Environnement S. A. Model MP101M PM₁₀ Beta Gauge Monitor,” configured with the louvered PM₁₀ inlet specified in 40 CFR 50 Appendix L or its flat-topped predecessor version and one of the three optional temperature-regulated sampling tubes (RST), and operated with a full scale measurement range of 0 - 0.500 mg/m³ (0 - 500 g/m³), with the sample flow rate set to 1.00 m³/h and flow regulation set to yes, the “norms selection” set to m³ (actual volume), the “cycle” set to 24 hours, the “period” set to none, and the “counting time” set to 200 seconds.

Federal Register: Vol. 69, page 18569, 4/8/04

Graseby Andersen/GMW Model 1200 High-Volume Air Sampler

Manual Reference Method: RFPS-1287-063

"Sierra-Andersen or General Metal Works Model 1200 PM₁₀ High-Volume Air Sampler System," consisting of a Sierra-Andersen or General Metal Works Model 1200 PM₁₀ Size-Selective Inlet and any of the high-volume air samplers identified as SAUV-10H, SAUV-11H, GMW-IP-10, GMW-IP-10-70, GMW-IP-10-801, or GMW-IP-10-8000, which include the following components: Anodized aluminum high-volume shelter with either acrylonitrile butadiene styrene plastic filter holder and motor/blower housing or stainless steel filter holder and phenolic plastic motor/blower housing; 0.6 hp motor/blower; pressure transducer flow recorder; either an electronic mass flow controller or a volumetric flow controller; either a digital timer/programmer, seven-day mechanical timer, six-day timer/programmer, or solid-state timer/programmer; elapsed time indicator; and filter cartridge.

Federal Register: Vol. 52, page 45684, 12/01/87 and Vol. 53, page 1062, 01/15/88

Graseby Andersen/GMW Model 321-B High-Volume Air Sampler

Manual Reference Method: RFPS-1287-064

"Sierra-Andersen or General Metal Works Model 321-B PM₁₀ High-Volume Air Sampler System," consisting of a Sierra-Andersen or General Metal Works Model 321-B PM₁₀ Size-Selective Inlet and any of the high-volume air samplers identified as SAUV-10H, SAUV-11H, GMW-IP-10, GMW-IP-10-70, GMW-IP-10-801, or GMW-IP-10-8000, which include the following components: Anodized aluminum high-volume shelter with either acrylonitrile butadiene styrene plastic filter holder and motor/blower housing or stainless steel filter holder and phenolic plastic motor/blower housing; 0.6 hp motor/blower; pressure transducer flow recorder; either an electronic mass flow controller or a volumetric flow controller; either a digital timer/programmer, seven-day mechanical timer, six-day timer/programmer, or solid-state timer/programmer; elapsed time indicator; and filter cartridge.

Federal Register: Vol. 52, page 45684, 12/01/87 and Vol. 53, page 1062, 01/15/88

Graseby Andersen/GMW Model 321-C High-Volume Air Sampler

Manual Reference Method: RFPS-1287-065

"Sierra-Andersen or General Metal Works Model 321-C PM₁₀ High-Volume Air Sampler System," consisting of a Sierra-Andersen General Metal Works Model 321-C PM₁₀ or Size-Selective Inlet and any of the high-volume air samplers identified as SAUV-10H, SAUV-11H, GMW-IP-10, GMW-IP-10-70, GMW-IP-10-801, or GMW-IP-10-8000, which include the following components: Anodized aluminum high-volume shelter with either acrylonitrile butadiene styrene plastic filter holder and motor/blower housing or stainless steel filter holder and phenolic plastic motor/blower housing; 0.6 hp motor/blower; pressure transducer flow recorder; either an electronic mass flow controller or a volumetric flow controller; either a digital timer/programmer, seven-day mechanical timer, six-day timer/programmer, or solid-state timer/programmer; elapsed time indicator; and filter cartridge.

Federal Register: Vol. 52, page 45684, 12/01/87 and Vol. 53, page 1062, 01/15/88

Graseby Andersen/GMW Models SA241 and SA241M Dichotomous Sampler

Manual Reference Method: RFPS-0789-073

"Sierra-Andersen Models SA241 and SA241M or General Metal Works Models G241 and G241M PM₁₀ Dichotomous Samplers," consisting of the following components: Sampling Module with SA246b or G246b 10 m inlet or the louvered inlet specified in 40 CFR 50 Appendix L, Figs. L-2 thru L-19, 2.5 m virtual impactor assembly, 37 mm coarse and fine particulate filter holders, and tripod mount; Control Module with diaphragm vacuum pump, pneumatic constant flow controller, total and coarse flow rotameters and vacuum gauges,

pressure switch (optional), 24-hour flow/event recorder, digital timer/programmer or 7-day skip timer, and elapsed time indicator.

Federal Register: Vol. 54, page 31247, 07/27/89

Graseby Andersen/GMW Model FH621-N Beta Monitor

Automated Equivalent Method: EQPM-0990-076

“Andersen Instruments Model FH621-N PM₁₀ Beta Attenuation Monitor,” consisting of the following components: FH101 Vacuum Pump Assembly; FH102 Accessory Kit; FH107 Roof Flange Kit; FH125 Zero and Span PM₁₀ Mass Foil Calibration Kit; FH621 Beta Attenuation 19-inch Control Module; SA246b PM₁₀ Inlet (16.7 liter/min) or the louvered inlet specified in 40 CFR 50 Appendix L, Figs. L-2 thru L-19; operated for 24-hour average measurements, with an observing time of 60 minutes, the calibration factor set to 2400, a glass fiber filter tape, an automatic filter advance after each 24-hour sample period, and with or without either of the following options: FH0P1 Indoor Cabinet; FH0P2 Outdoor Shelter Assembly.

Federal Register: Vol. 55, page 38387, 09/18/90

Met One or Sibata Models BAM/GBAM 1020, BAM/GBAM 1020-1 or Horiba APDA-371

Automated Equivalent Method: EQPM-0798-122

“Met One Instruments or Sibata Scientific Technology Models BAM 1020, GBAM 1020, BAM 1020-1, GBAM 1020-1, and Horiba APDA-371 PM₁₀ Beta Attenuation Monitor,” including the BX-802 sampling inlet, operated for 24-hour average measurements, with a filter change frequency of one hour, with glass fiber filter tape, and with or without any of the following options: BX-823, tube extension; BX-825, heater kit; BX-826, 230 VAC heater kit; BX-827 “Smart Heater” set for maintaining moisture between 35% and 45% and no ΔT control; BX-828, roof tripod; BX-902, exterior enclosure; BX-903, exterior enclosure with temperature control; BX-961, mass flow controller; BX-967, internal calibration device, BX-970 touch-screen display with USB interface. For software (firmware) versions V3.0 or higher, a user-selectable measurement time (COUNT TIME) of 4, 6, 8 or 10 minutes selected, along with appropriate sample time (BAM SAMPLE) setting of 50, 46, 42 or 38 minutes, respectively, to maintain a 60-minute measurement cycle. For software (firmware) versions V3.5 or higher, user-selectable option to sample under actual conditions (Flow Type: ACTUAL) and report under standard conditions (Reporting: STD), which requires the use of P/N BX-592 external temperature sensor or P/N BX-596 external temperature/barometric pressure sensor. The user may also sample under standard conditions (Flow Type: STD) and report under standard conditions (Reporting: STD) with any software/firmware 2.0 or higher. Instrument must be operated in accordance with the appropriate instrument manual.

Federal Register: Vol. 63, page 41253, 08/03/98

Latest modifications: 06/2009; 07/2010; 8/2010

Opsis Model SM200 PM₁₀ Monitor

Automated Equivalent Method: EQPM-0810-193

“Opsis Model SM200 Monitor,” beta gauge semi-continuous ambient particulate monitor operated for 24 hours at a flow rate of 16.67 LPM between 5° and 40°C using 47 mm PTFE membrane filter media, in the mass measurement range of 0 to 60 mg, configured with a BGI Model SSI25 PM₁₀ inlet meeting criteria specified in 40 CFR 50 Appendix L, with a roof mounting kit, and with or without an inlet tube heater (as recommended based on site RH conditions), according to the SM200 User’s Guide.

Federal Register: Vol. 75, page 51039, 08/18/10

Oregon DEQ Medium Volume PM₁₀ Sampler

Manual Reference Method: RFPS-0389-071

“Oregon DEQ Medium Volume PM₁₀ Sampler.” NOTE: This method is no longer commercially available.

Federal Register: Vol. 54, page 12273, 03/24/89

Thermo Andersen Series FH 62 C14 Continuous PM₁₀ Monitor or Thermo Scientific Model 5014i Beta (5014i Beta), Continuous Ambient Particulate Monitor

Automated Equivalent Method: EQPM-1102-150

“Thermo Andersen Series FH 62 C14 Continuous PM₁₀ Ambient Particulate Monitor and Thermo Scientific Model 5014i Beta (5014i Beta), Continuous Ambient Particulate Monitor,” operated for 24-hour average measurements, with the specified 10-micron inlet, inlet connector, sample tube with heater, roof flange kit, mass foil kit, pump kit, sample filter tape; with operational settings of 1000 L/h (16.67 L/min) sample flow rate, daily filter change, auto filter change at volumetric flow <950 L/h, auto filter change at mass >1500 micrograms, and factory default calculation mode settings operated with software version 1.07. Operated, calibrated and serviced according to the appropriate Operator Manual.

Federal Register: Vol. 67, page 76174, 12/11/02

Latest modification: 07/2009

Thermo Scientific or Rupprecht & Patashnick Partisol® Model 2000 Air Sampler

Manual Reference Method: RFPS-0694-098

“Thermo Scientific Partisol® 2000 Air Sampler” or “Rupprecht & Patashnick Partisol® Model 2000 Air Sampler,” consisting of a Hub Unit and 0, 1, 2, or 3 Satellite Units, with each sampling station used for PM₁₀ measurements equipped with a Rupprecht & Patashnick PM₁₀ inlet and operated for continuous 24-hour periods using the Basic, Manual, Time, Analog Input, or Serial Input programming modes, and with or without any of the following options: PM_{2.5}-style filter cassette holder; louvered inlet specified in 40 CFR 50 Appendix L, Figs. L-2 thru L-19 in lieu of standard inlet; 57-002320 Stand for Hub or Satellite; 59-002542 Advanced EPROM; 10-001403 Large Pump (1/4 hp); 120 VAC. Hardware for Indoor Installation consists of: 51-002638-xxxx Temperature Sensor (Extended Length); 55-001289 Roof Flange (1 1/4"); 57-000604 Support Tripod for Inlet; 57-002526-0001 Sample Tube Extension (1 m); 57-002526-0002 Sample Tube Extension (2 m). Hardware for Outdoor Installation in Extreme Cold Environments consists of: 10-002645 Insulating Jacket for Hub Unit.

Federal Register: Vol. 59, page 35338, 07/11/94

Thermo Scientific Partisol® 2000-D Dichotomous Air Sampler

Manual Equivalent Method: EQPS-311-197

“Thermo Scientific Partisol® 2000-D Dichotomous Air Sampler,” configured for dual-filter, single-event sampling of fine (PM_{2.5}) and coarse (PM_{10-2.5}) particles, using a virtual impactor to separate fine and coarse PM into two samples for collection on two separate filter membranes, operated for a 24-hour sample period and in accordance with the Thermo Scientific Partisol® 2000-D Dichotomous Operating Manual.

Federal Register: Vol. 76, page 15974, 03/22/11

Thermo Scientific Partisol® 2000-FRM PM₁₀ Air Sampler or Rupprecht and Patashnick Partisol®-FRM 2000 PM₁₀ Air Sampler

Manual Reference Method: RFPS-1298-126

“Thermo Scientific Partisol® 2000-FRM PM₁₀ Air Sampler” or “Rupprecht and Patashnick Partisol®-FRM 2000 PM₁₀ Air Sampler,” with PM₁₀ inlet or louvered inlet specified in 40 CFR

50 Appendix L, Figs. L-2 thru L-19, configured as a PM₁₀ reference method, and operated for 24-hour continuous sample periods in accordance with the Model 2000 Instruction Manual and with the requirements specified in 40 CFR Part 50, Appendix J or Appendix M.

Federal Register: Vol. 63, page 69625, 12/17/98

Thermo Scientific Partisol®-Plus 2025 PM₁₀ Sequential Air Sampler or Rupprecht and Patashnick Partisol®-Plus 2025 PM₁₀ Sequential Air Sampler

Manual Reference Method: RFPS-1298-127

“Thermo Scientific Partisol®-Plus 2025 Sequential Air Sampler” or “Rupprecht and Patashnick Company Partisol®-Plus Model 2025 PM₁₀ Sequential Air Sampler,” with PM₁₀ inlet or louvered inlet specified in 40 CFR 50 Appendix L, Figs. L-2 thru L-19, configured as a PM₁₀ reference method, and operated for 24-hour continuous sample periods in accordance with the Model 2025 Instruction Manual and with the requirements specified in 40 CFR Part 50, Appendix J or Appendix M.

Federal Register: Vol. 63, page 69625, 12/17/98

Thermo Scientific Dichotomous Partisol®-Plus Model 2025-D Sequential Air Sampler

Manual Equivalent Method: EQPS-0311-198

“Thermo Scientific Dichotomous Partisol®-Plus Model 2025-D Sequential Air Sampler,” configured for dual-filter sampling of fine (PM_{2.5}) and coarse (PM_{10-2.5}) particles, using a virtual impactor to separate the fine and coarse PM into two samples for collection on two separate filter membranes, and operated with the modified filter shuttle mechanism implemented May 31, 2008 and firmware version 1.500, or later, for 24-hour continuous sample periods and in accordance with the Dichotomous Partisol®-Plus Model 2025-D Sequential Air Sampler Operating Manual.

Federal Register: Vol. 76, page 15975, 03/22/11

Thermo Scientific TEOM® 1400AB/TEOM® 1405 Ambient Particulate Monitor or Rupprecht & Patashnick TEOM® Series 1400/1400a PM₁₀ Monitors

Automated Equivalent Method: EQPM-1090-079

“Thermo Scientific TEOM® 1400AB [PM₁₀] Ambient Particulate Monitor” or “Rupprecht & Patashnick TEOM® Series 1400 and Series 1400a PM-10 Monitors,” (including serial number prefixes 1400, 140A, 140AA, 140AB, 140AT, and 140UP, 1405A), consisting of the following components: TEOM® Sensor Unit; TEOM® Control Unit; Flow Splitter (3 liter/min sample flow); Teflon-Coated Glass Fiber Filter Cartridges; Rupprecht & Patashnick PM-10 Inlet (part number 57-00596), Sierra-Andersen Model 246b PM-10 Inlet (16.7 liter/min) or louvered inlet specified in 40 CFR 50 Appendix L, Figs. L-2 thru L-19; operated for 24-hour average measurements, with the total mass averaging time set at 300 seconds, the mass rate/mass concentration averaging time set at 300 seconds, the gate time set at 2 seconds, and with or without any of the following options: Tripod; Outdoor Enclosure; Automatic Cartridge Collection Unit (Series 1400a only); Flow Splitter Adapter (for 1 or 2 liter/min sample flow). Thermo Scientific TEOM® 1405 Ambient Particulate Monitor with combined sensor and control units and redesigned mass transducer and user interface, operated in accordance with the Thermo Scientific TEOM® 1405 instrument manual.

Federal Register: Vol. 55, page 43406, 10/29/90

Latest modification: 12/2008

Tisch Environmental Model TE-6070 PM₁₀ High-Volume Air Sampler or New Star Environmental Model NS-6070 PM₁₀ High-Volume Air Sampler

Manual Reference Method: RFPS-0202-141

“Tisch Environmental Model TE-6070 or New Star Environmental Model NS-6070 PM₁₀ High-Volume Air Sampler,” consisting of a TE-6001 PM₁₀ size-selective inlet, 8" x 10" filter holder, aluminum outdoor shelter, mass flow controller or volumetric flow controller with brush or brushless motor, 7-day mechanical off/on-elapsed timer or 11-day digital off/on-elapsed timer, and any of the high volume sampler variants identified as TE-6070-BL or NS-6070-BL, TE-6070D or NS-6070D, TE-6070D-BL or NS-6070-BL, TE-6070V or NS-6070V, TE-6070V-BL or NS-6070V-BL, TE-6070-DV or NS-6070-DV, or TE-6070DV-BL or NS-6070DV-BL, with or without the optional stainless steel filter media holder/filter cartridge or continuous flow/pressure recorder.

Federal Register: Vol. 67, page 15566, 04/02/02

Wedding & Associates' or Thermo Environmental Instruments Inc. Model 600 PM₁₀ High-Volume Sampler

Manual Reference Method: RFPS-1087-062

"Wedding & Associates' or Thermo Environmental Instruments, Inc. Model 600 PM₁₀ Critical Flow High-Volume Sampler," consisting of the following W&A/TEII components: PM₁₀ Inlet; Critical Flow Device; Anodized Aluminum Shelter; Blower Motor Assembly for 115, 220 or 240 VAC and 50/60 Hz; Mechanical Timer; Elapsed Time Indicator; and Filter Cartridge/Cassette, and with or without the following options: Digital Timer, 6 or 7 Day Timer, and 1 or 7 Day Pressure Recorder.

Federal Register: Vol. 52, page 37366, 10/06/87

Wedding & Associates' or Thermo Environmental Instruments Inc. Model 650 PM₁₀ Beta Gauge

Automated Equivalent Method: EQPM-0391-081

“Wedding & Associates' or Thermo Environmental Instruments, Inc. Model 650 PM₁₀ Beta Gauge Automated Particle Sampler,” consisting of the following W&A/TEII components: Particle Sampling Module, PM₁₀ Inlet (18.9 liter/min), Inlet Tube and Support Ring, Vacuum Pump (115, 220 or 240 VAC and 50/60 Hz); and operated for 24-hour average measurements with glass fiber filter tape.

Federal Register: Vol. 56, page 9216, 03/05/91

Appendix 5: Example Offset Consent Conditions

Section 4.10.2 discusses consent conditions for offsetting PM₁₀ emissions from substantial sources in more detail.

The example consent conditions below may be used as a reference and starting point for Councils. However, **they only provide guidance on the subject matter** that may need to be incorporated to achieve offsets. Specialist legal and planning advice should be sought to ensure that conditions are drafted in a manner that will be effective, efficient and enforceable in case of dispute.

Number of offsets required

- A. For the duration of this consent, the Consent Holder shall reduce a mass emission discharged from another source or sources (offset) of no less than x tonnes per annum of PM₁₀ (from 1 January to 31 December annually).

- B1. For the purposes of this consent, the requirement of condition A shall equate to the removal of no less than x open fires or y woodburners of over 10 years old each year (from 1 January to 31 December) and the replacement of these fires/woodburners with heat pumps or other forms of heating that do not discharge PM₁₀ to air.

Or

- B2. For the purposes of this consent, the requirement of condition A shall equate to the installation of particle traps that meet [insert relevant standard] on no less than z Euro 1, or Euro 2 buses.

Or

- B3. For the purposes of this consent, the requirement of condition A shall equate to the removal of no less than x 2 MW coal fired boilers.

- C. Should the Consent Holder wish to undertake a combination of offset measures calculations shall be provided to council detailing how many woodburners, open fires, coal boilers and/or particle traps on buses will need be replaced and how many of each form of heating that do discharge PM₁₀ to air (eg, NES compliant woodburners) will be used as replacements. These calculations shall be undertaken using the emission factors given in [insert reference].

Note: Realistically, once regional councils have developed their own emission factors for offsets, it is likely that **how** the offsets are to be undertaken will be developed during the consent application process and that the consent conditions will be more a record of these outcomes.

Process for offsetting

By Consent Holder

- D. The Consent Holder shall ensure that the requirements of condition A are met.

By Council or another party

- D. In order to meet the requirements of conditions A and B the Consent Holder shall pay to [council/other party] by [date] each year a sum of not less than \$[amount based on average cost per conversion]. Payment of this sum shall be deemed to meet the requirements of conditions A. and B.²⁰

Where offsetting must occur

- E. The offsets required by conditions A and B of this consent must be undertaken within the [airshed name] and within a distance of no more than x kilometres from the site boundary.

Monitoring and Recording

- F. At least every 12 months the Consent Holder shall provide a report to the Council detailing whether the requirements of conditions A and B have been met and how this has been achieved. The report shall contain at least the following information:
- a. The number, type and location of any [insert (eg, open fires/woodburners)] that have been replaced and what they have been replaced with.
 - b. An updated calculation showing how the number of [insert (eg, fires/woodburners)] replaced complies with the requirements of condition A.

²⁰ It is likely that where parties other than the Consent Holder (eg, Councils or community trusts) are paid to undertake offsets on the Consent Holder's behalf that contracts and/or head of agreements will need to be used to ensure that sufficient conversions are actually undertaken. Should the conversions not be undertaken then the Consent Holder may not be complying with the terms of their consent.

Appendix 6: Open Fire Ban Public Notice Example

Regulation 24A requires notice to be given of the new solid-fuel burning open fire ban. This is discussed in section 5.3.4. An example Public Notice is given in Figure A6.1.

Figure A6.1 Example Notice to advise of new solid-fuel burning open fire ban

| Solid-fuel burning open fire ban in [Utopian Airshed] from [date] |
|---|
| <p>The [Clean Air Regional Council] in accordance with the Resource Management (National Environmental Standards for Air Quality) Regulations 2004 is required to advise that pursuant to:</p> <ul style="list-style-type: none">• Regulation 16, notice [is/was] given that on [date] at [monitoring station location] in [Utopian Airshed], a measurement of [$x \mu\text{g.m}^{-3}$] was recorded at [time]. This is [the first/a] breach of the ambient standard for PM₁₀ of 50 $\mu\text{g.m}^{-3}$ as a 24-hour average.• Regulation 24A(3) and (4) the discharge of particles from solid-fuel burning open fires within the [Utopian Airshed] installed on or after [date – 12 months after date of the first breach] will be prohibited. <p>For more information relating to this notice, please contact [contact name] or see our website [website address].</p> <p>CEO Name Clean Air Regional Council HEALTHY CITY</p> |

Notes:

1. If this notice is also being used to meet the requirements of Regulation 16 then the notice must be given within **one month** of the first breach occurring (rather than the six months allowed by Regulation 24).
2. This notice must be given in accordance with the requirement for public notices in the RMA (discussed in detail in section 3.7).
3. The information shown is the minimum required by law. Councils may wish to add other information or to bring the open fire ban to the attention of the public in additional ways such as mail drops to professionals likely to be affected, or flyers sent out with new resource consent acknowledgements.