



Ministry for the
Environment
Manatū Mō Te Taiao

Review of the Ambient Air Quality Guidelines

**Meeting notes and analysis of
reviewers comments**

**Prepared by various authors for the
Ministry for the Environment's Review
of the *Ambient Air Quality Guidelines***

October 2000

Air Quality Technical Report No. 22

Technical Report Prepared by *Lauder et al.*
for the Ministry for the Environment
PO Box 10 362, Wellington, New Zealand

Air Quality Technical Report 22

This document is available on the Ministry for the Environment's Web site:
<http://www.mfe.govt.nz>



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Foreword by the Ministry for the Environment

This report has been prepared for the Ministry for the Environment's review of the *Ambient Air Quality Guidelines* (1994). It provides a summary of the issues raised by reviewers in written comments and at workshops on the draft technical reports and draft discussion document – *Proposals for Revised and New Air Quality Guidelines for New Zealand* (2000). Based on discussions and analysis of these issues the report authors recommend changes to the draft reports. Where possible and appropriate, the Ministry has taken on board these recommended changes in preparing the final reports released for information and discussion.

Section 1, by Glen Lauder (Chair of the meetings) and Caroline Austwick (Ministry for the Environment), provides notes from the workshops and brief analysis of the issues raised. Section 2 is a report-back on issues by Kevin Rolfe and Associates who prepared Air Quality Technical Reports 12, 13, 14 and 23, and Section 3 is a report-back by Philip Millchamp who assisted in the preparation of the Ministry's draft Discussion Document.

This report is for information purposes only – it is not Government policy.

The Ministry thanks all the reviewers who attended the meetings and who provided written comments on the draft reports. Comments from the reviewers were received without prejudice.

If any comments have been mis-quoted, omitted or incompletely recorded, please contact the Ministry for the Environment on (04) 917 7475.

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Section 1: Report by the Chair – Glen Lauder

*General discussion of issues raised at the
meetings and suggestions for the Ministry*

*Notes from discussions at the meetings,
7–10 March 2000*

Meetings to discuss the draft reports prepared for the review of the *Ambient Air Quality Guidelines*, 7 to 10 March 2000

Brief

To chair and co-ordinate three meetings to discuss the Ministry's draft proposals for new and revised Ambient Air Quality Guidelines with selected reviewers.

To summarise comments from each day and provide a commentary on discussions and points of view raised during the meetings, including, where appropriate, specific recommended changes to the discussion document.

Resources

Discussion Document – Proposals for the Revised and New Ambient Air Quality Working Draft Guidelines for New Zealand (Please note that the recommended amendments to the Guidelines by Kevin Rolfe and Associates that were in an Appendix in the Working draft now form *Air Quality Technical Report 23*).

Air Quality Technical Report # 12: Health Effects of Common Contaminants and Suggested Protective Ranges – Draft

Air Quality Technical Report # 13: Health effects of Priority Hazardous Air Contaminants and Recommended Evaluation Criteria – Draft

Air Quality Technical Report # 15: Effects of air contaminants on Ecosystems and Recommended Critical Loads and Critical Levels – Draft

Air Quality Technical Report # 14: Preliminary review of the potential costs and benefits of Ambient Air Quality Guideline Values – Draft

Submissions on report and background report.

Presenters and Presentations

Caroline Austwick Overview of guidelines review

Kevin Rolfe Summary of expert recommendations

Lyn Denison Health effects and recommended guideline values for common air contaminants

Jack Chiodo Health effects of hazardous air contaminants and recommended for criteria values

Caroline Austwick Summary of guidance for managing impacts on ecosystems

Kevin Rolfe and
Philip Millichamp

Applying guideline values to air quality management – regional
planning, resource consents and monitoring compliance with
guideline values

Kevin Rolfe and
Caroline Austwick

Do we need national environmental standards for air quality?

Key issues and recommendations

(Clarify the) purpose of the document

“The Ministry intends to spark debate ...” (p 7). With whom? With technicians or is a wider debate needed with the public (and Maori)? The “why” issues may warrant some consideration when redrafting the document. These issues may already be well covered in the Ministry’s work programme and council’s wider planning process, or they may not. Thus, the document is part of a wider public process, which includes communications as a key element.

Some steps to consider in the communications process are the following.

“Effective communication is generally based upon the following steps:

- 1. Identify your audience, and your audience’s interests in the particular topic.*
- 2. Prepare all material from this point of view (ie. wear the audience’s shoes and get advice from them in terms of how material should be framed).*
- 3. Know what communication vehicles reach the audience, and use them.*
- 4. Use simple language, graphics and visuals and clear formatting.”¹*

There are several audiences involved:

- technicians
- the general public (made up of affected individuals)
 - councils (including elected councillors, management and staff)
 - Maori
 - interested groups (ranging from environmental and health groups, to industry groups).

The question is: what are the key actions that you might seek or expect from each group? The following are some issues that came up in the workshops.

Address air quality as a governance issue

What is the principal signal that has come out of the workshops and submissions process so far? What do you expect local government to do in response?

Key comments are:

- Is it our general position to encourage greater monitoring of priority air contaminants?
- We need to be sure that the air plan process is/isn’t working. Undertake audit?
- Need a better Local Government Act “toolbox”.

¹ MAF Policy presentation (24 September 1998) *Towards a Communications Strategy for Sustainable Land Management*, unpublished paper.

I would also paraphrase two general questions:

- How much flexibility do we seek to leave regions to determine their own levels versus how much consistency do we seek?
- Is air quality being neglected as an issue (compared to other aspects of sustainable management)? And as a corollary, to what extent are the technicians involved pushing air quality as a key issue *because it is their hobby horse and livelihood, or because there are real health, or quality of life, or ecological issues involved?*

Address air quality as a public issue

The document does not provide the lay public with guidance as to how to engage with the issue. It gives a clear impression that air quality is a technical issue. But the workshop participants generally agreed that the public *are* able to engage in a discussion about relative risk, and this may be one way of helping them decide about their relative priorities for these issues. This discussion could be added to this document, or integrated into a communications process. The web site alone is unlikely to be enough, because this will tend to attract technically able people.

Key comments were:

- Let's make the guides user friendly and accessible (Kevin Duke).
- Suggest increase discussion on risk, as a basis for proposing levels.
- Articulate message as risk-choice rather than control. The public relate well to relative risk. Explain the approach, put up the number, and ride it through the public discussion.
- Parliamentary Commissioner for the Environment's office. Are we determining our standards by what we can measure (eg. PM_{2.5})?
- We must come back to minimising hazardous emissions of Best Available Technology (BAT) or Best Practicable Option (BPO).

The key issue is simplicity of feedback to the public and resource managers through the state of the environment reporting process. Use simple ordering indices, eg. high, medium, low rather than numeric values.

- The public needs to have a clear value, a clear standard, and reporting (Auckland Regional Council).
- Is excluding odour from "health" reasonable? It does affect quality of life.
- When we address only ambient levels we neglect the potential HSE risks eg. high levels of pollution inside vehicles.
- What should we do when air quality is degraded?
- Seek ordinary language, describe health effects.
- Use a flyer for public consumption, eg. website images.
- What is the appropriate level? How to get the message articulated.
- To get the public engaged there needs to be incentives.

Address a Maori discussion process

The proposal for a separate process for Maori seems sound. This highly technical audience only occasionally brought the discussion back to practical human issues in non-technical language. A separate process would be a better forum to address the issues of cultural interest. As a process, it could seek to involve iwi liaison staff in local government so as to help them take the kaupapa out to their people more effectively, and vice versa. It could be that the requirements for communicating with the general public (above) are similar to Maori needs.

Both need some local context:

- Air quality needs to be understood in the context of their home area (ie. their risk exposure or the risk to their whanau, or the environment).
- HSE issues may need to be addressed for target groups working in higher risk employment or environments.

Participants noted need to use and refer to new local research.

Scope of the guidelines

Some reformatting changes are needed.

A distinction is made between “common” and “hazardous” contaminants.

The workshops signalled a preference to combine these two sets into one table, with headings:

CONTAMINANT	MONITORING VALUES	MODELLING VALUES	RISK ASSOCIATED WITH IT
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Key comments were:

- propose combining Common and HAPS into one table, with a focus on their health effects.
- a greater focus on **relative risk**, eg. PM_{2.5}?
- what is acceptable risk? This is a big issue. People always diverge at this point. Proposed approach: expert group adopt an approach. Be transparent but nonetheless declare a view. Provide a short paragraph explaining relative risk. Make sure we bring something forward. See submission by Taranaki Regional Council, Gary Bedford. Come up with a number. It’s got to be clear.
- recommended insertion (of above) in technical document.

Need to address interplay between contaminants

This issue has not been addressed in the document.

Key comments were:

- the document does not mention the interplay between HAPS.
- what are the synergies between contaminants, and with pollen etc? Answer: it is when pollen shatters up that it is fine enough for it to be an issue.

The last point is a technical one which highlights the benefit of taking a “outcomes versus inputs” approach to the process. By asking: what are the results likely to be for me (or for one

or more vulnerable group in the community)? We could reframe the public part of the process into something that is meaningful to engage with.

Some points relating to specific contaminants and monitoring

There were many specific points raised. I have not noted them all in the notes. Should you find yourself uncertain as to what the audience said on a particular point, we could refer back to the detailed notes.

However, some key comments were:

- signal but do not adopt PM_{2.5}. Needs more data.
- leave the lead standard in but do not require monitoring?
- why monitor lead? A case for selective monitoring?
- NIWA argues for sampling of PM_{2.5} at hourly intervals (ie. less than 24-hours) because of structure. Be careful of sticking to traditional time periods with new contaminants.
- are some on the list really “bonus’s”?
- is it appropriate to have ambient standards for bio-accumulative substances?
- not appropriate to recommend a standard for PM_{2.5} yet – perhaps an interim standard or clarify how it should be applied.
- we should do more work on PM. If we started monitoring we’d get the data.
- does PM₁₀ deal with PM_{2.5}? The jury is still out.
- need a definition of “cumulative” and how to assess it.

Some points relating to methods

There were many specific points raised. As above, I have not noted them all in the notes. Should you find yourself uncertain as to what the audience said on a particular point, we could refer back to the day’s detailed notes.

However, some key comments were:

- need to agree how to approve equivalent methods. Perhaps annotate measure with eg. PM x by (method).
- seek process to develop alternative methods.
- why recommend poor methods (eg. TWA/100)? Rather, be upfront and note that it is imprecise but consistency is recommended.
- a protocol group could determine equivalence between techniques. High volume samplers are lab calibrated, and focus on the best fraction. Local calibration could be justified.
- TEOM calibration is too hard. Should only be used for investigations.
- high volume of continuous sampling have their own place, neither are necessarily always appropriate.

Some points relating to regional air quality guidelines

There seemed to be a need to get greater clarity about these matters.

Key comments were:

- the key issue is to distinguish modelling (issue for industry) from monitoring (background levels) criteria. These tend to get conflated and create confusion.
- perhaps there should be a separate modelling guide document, separate to the basic standards document.

Do we need national environmental standards for air quality?

There seemed to be a need to help people understand the relative merits of having or not having formal national environmental standards for air quality. The following are a number of points made in the discussion. They might help the Ministry to structure a decision path that could facilitate public input and help either the public or the Ministry come to a clear conclusion.

Key comments were:

- standards give greater profile to the issue than guidelines (is profile really needed, see above?)
- standards help focus the mind to change, help force the issue, eg. vehicle CO emissions
- standards give greater profile to the issue than guidelines
- standards help focus the mind to change, help force the issue, eg. vehicles CO
- PM₁₀ and CO may warrant standards
- you need to make sure your reach doesn't exceed your grasp!
- ensure that what is being done is getting into the air plan processes
- seek increased profile and national consistency – we need to force the issues, eg. vehicle CO
- undertake contaminant by contaminant reviews? Gives flexibility.
- do we need to turn guidelines into standards? Guidelines don't focus the mind. But it could be costly. Do the reviews. Public notification is critical
- articulate message as risk-choice rather than control. The public relate well to relative risk. Explain the approach, put up the number, and ride it through the public discussion.
- do it once cf many times? The benefit of standards
- would provide profile and drive?
- obtain consistency
- standards give less regulatory flexibility
- there are costs with standards. They take time and money to develop. Is the benefit there?
- alternatives: an NPS, legislative change (less easy to review)
- education, research, information, advocacy (the “old mix”)
- need to review other high leverage options – national standards do not avoid the need for debate. This is a *public* health issue.

- how easy would standards be to review?
- industry tends to favour national consistency compared to regional variation
- who pays for standards impose limitations?
- we need a national standard specifying an air shed monitoring regime. Leave the numbers out.
- risks of no standards? What are they? What about the risks of a Wellington standard?
- the aim would be to develop a national standard collaboratively
- does air quality have a high enough profile?
- need a better Local Government Act “toolbox”
- to get the public engaged there needs to be incentives.

Workshop notes

Quality control

These notes are attached as extracted from my working notes and the whiteboard record, both of which are available for future reference. They have not been edited to a fully coherent summary, but serve as prompts only.

Workshops One to Three: overall

- Technically-oriented workshops with a detailed focus.
- This is a public health issue. In the end, this must be a very public process that communicates to people and offers them risk-based alternatives. The debate must become less technical, more matter of fact in its language. However, this document may serve as the core technical reference.
- There was no clear consensus on the relative merits of standards versus guidelines, but a larger toolbox (of alternative approaches) was favoured by most. Analysis of the options is needed.

Workshop process evaluation

“Intentions” (and evaluation)

- “Establish what participants want to get out of the day” (moderately successful, some people were quiet).
- “Presentations” (a range of styles, and they were differentially effective with different groups. Not able to make an objective comparison).
- “Opportunity for “big questions” before morning tea”. (Didn’t generally work, because the presenters’ time management was poor, or, the discussion was allowed to delve into technical questions at will. This was probably appropriate to the audience, but is not generally “best practice” but it may be for a technical group.) Hard to see what else could have been done to manage the process.
- “Park” questions which could be addressed later. (People were resistant to defer issues because they wanted to make sure they got answers.)

Overall

- Positive workshops with people supporting the flexibility to change the programme to suit the group.
- General support for the summary report and the background reports.
- Process generally successful. Introductions served to get people engaged, but relatively little sense from participants about what they wanted to take away from the meeting. The

technical ones took the workshop as an opportunity to have their say; the quiet participants sat on the sideline and listened.

- This was a challenging group. There was a very wide range of technical fluency, assertiveness and seniority. Overall, the value of the process is the process. It will build a degree of collective ownership of the process and overall represents an important forum for technical people to have their say and input.

Workshop 1 report

Tuesday 7 March 2000

Attendance

Presenters plus the following participants (some absent because of airport closure).

Bruce Taylor	Parliamentary Commissioner for the Environment
Ron Pilgrim	Sinclair Knight Merz
Gavin Fisher	NIWA
Anna Lukey	Shell
Ian Gemmill	Shell
Paul Prendergast	Ministry of Health
Doug Gordon	NZ Mining
Ruben Mills	Solid Energy
Alistair Atherton	Fletcher Challenge Steel

Key issues

- Propose combining common and HAPS into one table, with a focus on their health effects.
- The document does not mention the interplay between HAPS.
- Some specific questions around some contaminants. See detailed notes and submissions.
- Suggest increase discussion on risk, as a basis for proposing levels.
- No clear steer on the merit of Standards versus Guidelines.

Kevin Rolfe: Summary of expert recommendations

Issues raised:

- Reduction of measures to 0°C. Accepted by group (although not WHO standard).
- Seek process to develop alternative, equivalent methods.
- Not appropriate to recommend a standard for PM_{2.5} yet.
- Start years inconsistent (perhaps clarify).
- Why monitor lead? A case for selective monitoring?
- Is it our general position to encourage greater monitoring of priority air contaminants?

Lyn Denison: Health effects and recommended guideline values for common air contaminants

- What are the synergies between contaminants, and with pollen, etc. Answer: it is when pollen shatters up that it is fine enough for it to be an issue.
- PCE's office. Are we determining our standards by what we can measure (eg. PM_{2.5})?
- NIWA argues for sampling of PM_{2.5} at hourly intervals (ie. less than 24-hours) because of structure. Be careful of sticking to traditional time periods with new contaminants.

Major issues

- Need to use and refer to new local research.
- Need to agree how to approve equivalent methods. Perhaps annotate measure with, eg. PM x by (method).
- Dates – suggest we should be able to undertake reviews of single contaminant and then declare the new guideline level.
- Signal but do not adopt PM_{2.5}. Needs more data.
- Leave the lead standard in but do not require monitoring?

Jack Chiodo: Health effects of hazardous air contaminants and recommended evaluation criteria values

- What is acceptable risk? This is a big issue. People always diverge at this point. Proposed approach: expert group adopt an approach. Be transparent but nonetheless declare a view. Provide a short paragraph to explain relative risk. Make sure we bring something forward. See submission Taranaki Regional Council, Gary Bedford. Come up with a number. It's got to be clear.
- Recommended insertion (of above) in technical document.
- We must come back to minimising hazardous emissions of BAT or BPO.
- The discussion document does not mention the interplay between HAPS.
- Why recommend poor methods (eg. TWA/100)? Rather, be upfront and note that it is imprecise but consistency is recommended.
- Need a definition of "cumulative".
- Are some on the list really "bonus's"?
- Is it appropriate to have ambient standards for bio-accumulative substances?
- Proposed addition of a new column in the table with health effects and why a value was adopted?
- Proposed one table.

Kevin Rolfe and Philip Millichamp: Applying guideline values to air quality management – regional planning, resource consents and monitoring compliance with guideline values

Refer Workshop 2.

- The key issue is to distinguish modelling (issue for industry) from monitoring (background levels) criteria. These tend to get conflated and create confusion.

Kevin Rolfe and Caroline Austwick: Do we need national environmental standards for air quality?

- Standards give greater profile to the issue than guidelines.
- Standards help focus the mind to change, help force the issue, eg. vehicles CO.
- PM₁₀ and CO may warrant standards.
- We need to be sure that the air plan process is/isn't working. Undertake audit?
- Need to make sure that your reach doesn't exceed your grasp. Do we need standards?

Workshop 2 report

Wednesday 8 March 2000

Attendance

Presenters plus:

Roger Cudmore	Aurora Environmental
Darren Baars	Ministry of Transport
Keiran Murray	Ravensdown Fertiliser Co-operative
Kevin Mahon	Auckland Regional Council
Andrea Marshall	Genesis Power
Perry Kerr	Vehicle Industry Association
Vera Hally	Environmental Science Research (also author of the work on ecosystems)
Leif Pigott	Environment Waikato

Key issues

- General support for the document.
- The key issue is simplicity of feedback to the public and resource managers through the SER process. Use simple ordering indices, eg. high, medium, low rather than numeric values.
- A protocol group could determine equivalence between techniques. High volume samplers are lab calibrated, and focus on the best fraction. Local calibration could be justified.
- TEOM calibration is too hard. Should only be used for investigations.
- High volume of continuous sampling have their own place, neither are necessarily always appropriate.
- The public needs to have a clear value, a clear standard, and reporting (ARC).
- Is excluding odour from “health” reasonable? It does affect quality of life.
- Despite much research being done on particulates, conclude we can’t separate out the confounding effect of one on another. Emerging evidence that crustal PM is as much a problem as combustion PM.
- We should do more work on PM. If we started monitoring we’d get the data.
- Does PM₁₀ deal with PM_{2.5}? The jury is still out.
- When we address only ambient levels we neglect other potential risks, eg. high levels in vehicles.
- Could risk be applied to PM_{2.5}?
- The greatest area of confusion is the use of guidelines for air shed. These must be clearly different.

- What should we do when air quality is degraded?
- There should be consistency but flexibility – give priority to “common air contaminants”. These should be based on monitoring results locally, ie. on data they have gathered. The Ministry could take an audit role over this monitoring data.
- Perhaps there should be a separate modelling guide document, separate to the basic guidelines document.

Workshop 3 report

Thursday 9 March 2000

Attendance

Presenters plus:

Sarah Smellie	Otago Regional Council
Prue Harwood	Otago Regional Council
Chris Drayton	Carter Holt Harvey
Kevin Duke	Comalco Invercargill
Kevin Wilson	Carter Holt Harvey
Phil Gurnsey	Environment Canterbury
Perry Davy	Wellington Regional Council
Dr Michael Del Grosso	De Gussa Peroxide
Bill Birch	NZ Chemical Industry Council
Keith Hopkins	Genesis Power, Huntly

Observers

Ian Ray	Environment Australia
Paul Dworjanyyn	Environment Australia

Key issues

- Let's make the guide user friendly and accessible (Kevin Duke).
- Doubts H₂S role (odour not health).
- Perhaps expand on the uncertainties and risks in the document, eg. a table of
MONITORING VALUES MODELLING VALUES INDICATION OF RISK ASSOCIATED WITH IT

Some alternative views re standards versus guidelines

- You need to make sure your reach doesn't exceed your grasp!
- Ensure that what is being done is getting into the air plan processes.
- Seek increased profile and national consistency – we need to force the issues, eg. vehicle CO.
- Undertake contaminant by contaminant reviews? Gives flexibility.
- Do we need to turn guidelines into standards? Guidelines don't focus the mind. But it could be costly. Do the reviews. Public notification is critical.
- Seek ordinary language, describe health effects.
- Use a flyer for public consumption, eg. website images.

- What is the appropriate level? How to get the message articulated.
- Do it once compared to many times? The benefit of standards.
- Provide profile and drive?
- Obtain consistency.
- Standards give less regulatory flexibility.
- There are costs with standards. They take time and money to develop. Is the benefit there?
- Alternatives: an NPS, legislative change (less easy to review).
- Education, research, information, advocacy.
- Need to review other high leverage options – national standards do not avoid the need for debate. This is a *public* health issue.
- How easy would standards be to review?
- Industry tends to favour national consistency compared with regional variation.
- Who pays if standards impose limitations?

We need a national standard specifying an air shed monitoring regime. Leave the numbers out.

- Risks of no standards? What are they? What about the risks of a Wellington standard?
- The aim would be to develop a national standard collaboratively.
- Does air quality have a high enough profile?

Workshop 4 report (By C. Austwick)

Friday 10 March 2000

Attendees

Rhys Kevern	Environment Bay of Plenty
Bob Ayrey	Canterbury Regional Council
Lynda Neame	Marlborough District Council
Gary Bedford	Taranaki Regional Council
Stephen Yeats	Wellington Regional Council, Masterton
Chris Edmonds	Public Health – Hutt Valley
Lorraine Marsh	Carter Holt Harvey Pulp and Paper
Kit Wilson	BOP Fertiliser
Michael Bird	Independent
Carl Reller	Greenpeace
Dennis Butler	Alliance Group Limited

Observers

Ian Ray	Environment Australia
Paul Dworjanyyn	Environment Australia

Kevin Rolfe's Overview

PM₁₀ monitoring

- Monitoring methods for particles – is there some factor that could be applied to TEOM results to bring them into line with Hivols? This is being explored in the UK – however, often difficult to do – best to run both together where possible. CRC has some good overlapping data for the different particle methods.
- Hivols have the highest results, TEOMs the lowest with beta gauges somewhere in-between.
- Protocol required for agreeing any additional equivalent monitoring methods.
- Averaging times – what does US recommend? 12 am to 12 am but New Zealand has made allowance for CRC to use 9 am to 9 am. So there does need to be some flexibility for New Zealand in relation to monitoring methods and reporting. Most of this is covered in the *Good-Practice Guide to Air Quality Monitoring and Data Management*.
- PM_{2.5} should be an interim guideline to encourage monitoring, rather than having it as a formal guideline value.

Other Contaminants

Do we need an odour guideline value for H₂S? Levels of up to 700 µg/m³ occur in some geothermal areas – perhaps a health and an odour one would be valuable with a note that further studies on the potential long term health effects of H₂S may have implications.

Why is there a 10-year goal for benzene? Based on level of protection or feasibility of achieving the level? Is it needed as a prompt for improvements in fuel quality?

Acceptance of all the guideline values should be with the New Zealand community and to provide more options. Risks with each guideline value should be explained – there needs to be greater transparency and opportunity for public input – especially for particles where the risk of the 50 µg/m³ guideline value would be 1 in 5 increase risk of mortality. Consider dropping the guideline to 10 µg/m³. However, it would be difficult to meet this guideline value especially in areas with domestic fire emissions. CRC are having trouble meeting 50µg/m³. Having a lower guideline values might drive technology and hence air quality improvements. Also problems taking into account natural background levels that may be above 10µg/m³ in some areas already.

- Monitoring techniques are still not refined enough to accurately identify where the PM₁₀ is coming from (when sampling).
- There needs to be a cost benefit assessment on reducing particular emissions and achieving the background levels – and the value of doing that verses costs. This type of cost benefit analysis would be done as part of the process for pursuing national environmental standards for these contaminants.
- It needs to be clear that SO₂ guideline value did not apply to acid mists (need to put a note with the table).

Hazardous air contaminants

- Risk values used to develop the guideline values vary considerably. Guidelines should be based on minimal risk of 1 in 1,000,000 (this is discussed further in Kevin Rolfe's report back).
- The ratio between the long- and short-term guideline values for formaldehyde differs to that of the others contaminants. This is because the calculation has gone from short to long rather than long to short term. The ambient guideline values should be clearly separated from the modelling guideline values.
- Need to take into account dietary intake when using the mercury guideline values.
- Need to look at cadmium and possibly boron.
- Take more of a cross media approach to developing the guideline values – more like the Organochlorines Programme.
- Cr is mainly in particle form therefore it is relevant to have it measured in particles.
- Chloroform is another potential contaminant that should be considered – it is commonly discharged from pulp and paper mills and treatment plants.
- Put lead into the hazardous air contaminant list.
- Need to allow for TSP monitoring of lead for consent monitoring purposes.

Ecosystems

Support for the work that is being done. Several participants were interested in attending a further meeting on the ecosystems part of the report.

Application of guideline values in resource management

There was strong industry support for more consistency in the way regional councils apply guideline values.

- Allow a minimal level of incremental degradation.
- There are huge problems with applying guidelines values and that it would be inequitable to have flexibility in applying the guideline values. There is therefore a need for national standards and specific methods of applying guideline values.
- Councils would want freedom to do something that differs from the national stance.
- PM_{2.5} needed for air quality management but not for individual source emissions assessment – national guidance should be in guide to dispersion modelling.
- Support for DGLCs to be included within a guide to dispersion modelling.
- Perhaps there is a need to look more closely at emission limit criteria.

There was considerable debate over the need for another term – “pristine” – it might be better to simply refer to areas where air quality is excellent or good.

Also need to discuss the use of guideline values as trigger levels in consents and compliance monitoring.

Compliance with emissions limit

There was some debate and differing views over whether percentile limits should be used for compliance monitoring.

Standards

Seriousness of standards

There was some discussion on how ambient standards might be enforced – Dave B pointed out that theoretically regional councils would have to ensure the environment meets ambient standards through regional plans/policy statements etc, although working out enforcement procedures against councils might be difficult.

- Application of NES could be dealt with in an NPS in conjunction with an NES.
- Emission limit standards would be enforced through rules in regional plans and within resource consents.
- Transitional provisions should be able to sort some of these things out.

New Zealand has come along way with guidelines although it might have come further and faster with standards – but there is still a concern that people would see standards as limits to pollute up to rather than as the absolute minimum requirements that air quality should meet, especially if the NES has precedent over a regional plan. They also take a long time to change and therefore an NPS may be a better option.

- Also need to recognise that New Zealand has good air quality compared with many overseas countries with instigated standards – they need them to reduce concentrations to meet the guideline values.
- Industry representatives were generally supportive of National Environmental Standards although views differed.
- Need to ensure that the contaminants chosen for NES address home heating and vehicle emissions and we need more analysis of the advantages and disadvantages of standards.
- People are generally shocked to hear that New Zealand does not have national environmental standards for air quality. The community has greater confidence in standards than guidelines.
- Standards may have had greater impetus for the VFECS and getting things moving on changing the fuel specifications etc.
- MfE should add an appendix containing experience of those who have been involved in the process (authors of the technical documents etc).

Section 2: Report from Kevin Rolfe et al

*Summary and critique of discussions and
written comments*

Technical Reports 12, 13 and 14

Review of the New Zealand Ambient Air Quality Guidelines Consultation Meetings, Wellington, March 2000

Report relevant to Technical Reports 12, 13 and 14, and Appendix 1 of the Draft Discussion Document (Please note: Appendix 1 of the draft Discussion Document has become Air Quality Technical Report 23).

Introduction

Consultation meetings on aspects of the review of the New Zealand *Ambient Air Quality Guidelines* were held at the Ministry for the Environment, in Wellington, 7-10 March 2000. In addition to the Chairperson (Glen Lauder, Environmental Consultant, on three days and Dave Brash of the Ministry for the Environment on the final day) and five presenters, there were a total of 39 people that attended.

There were also two observers from Australia (Ian Rae, distinguished academic and Chairman of a consultation process for Air Toxics in Australia, and Paul Dworjanyn, Director of the Air Toxics Programme, Environment Australia).

The number of participants (“reviewers”) each day was surprisingly even: 10 on Tuesday, nine on Wednesday, nine on Thursday, and 11 on Friday. Largest representation was from industry (including State Owned Enterprises) – 18. There were 11 people from regional and local government, four from central government, and five consultants (including Crown Research Institutes). The poorest representation was from non-governmental organisations, there being only one (although, in common with other categories, others were invited).

The scope of this report covers only those matters relevant to material prepared by the three authors, viz., Technical Reports 12, 13 and 14, and Appendix 1 of Technical Report 16. The style of this report takes the form of headings related to particular issues, then gives a commentary on opinions expressed (both in the written submissions and discussion at the meetings), and finally offers a recommendation to the Ministry on how the issue might be addressed. Supplementary information is given as Appendices.

Because of the importance of the Christchurch situation to the air quality scene in New Zealand, a review of the Christchurch health effects studies is attached, as Appendix A.

Issue 1: Common air pollutants

Commentary

The order of presentation at the consultation meetings of information about the common air pollutants (particles, sulphur dioxide, carbon monoxide, ozone, and nitrogen dioxide) was first to give the recommendations and then the supporting background health research information (from Technical Report 12) on which the recommendations were based. This gave participants two opportunities to comment on the recommended changes. In fact, there was very little comment at the meetings, and in the written submissions, on this issue. Indeed, there seemed to be a strong sense of support for them.

The approach taken in the supporting background health research information, of focusing on susceptible groups within the population, was strongly endorsed in one submission.

It became obvious that PM_{2.5} is a separate issue (and is addressed as such in a later section of this report).

There were no strong objections to the recommended changes to the concentrations for PM₁₀, sulphur dioxide, and nitrogen dioxide. In addition, no-one expressed a negative view about the deletion of the annual average concentrations for PM₁₀ and sulphur dioxide. Explanations were given regarding equivalence between various combinations of concentrations and averaging times for sulphur dioxide, and, probably as a consequence, no comments were received about that. More surprisingly, though, nor were there any comments about the differences between the recommended concentrations for carbon monoxide, ozone, and nitrogen dioxide (more stringent) and those in the background health research information. There seemed to be universal acceptance of the recommendation to review the carbon monoxide values in the near future, in view of the emerging research on adverse health effects at lower than expected carboxyhaemoglobin levels in blood.

More debate was generated on the question of monitoring methods. The recommended method for particles was changed from the Australian standard to the United States standard method, specified in US 40 CFR Part 50, Appendix J, or an equivalent method. So, although the standard method (high-volume sampling) remains the same, this allows use of methods which are deemed (by the US EPA) to be “equivalent”. These include most low-volume or continuous methods used in New Zealand.

The view was expressed that we need to develop our own mechanisms for approving equivalence between monitoring methods. As a corollary to that, there is a need to encourage more side-by-side operation of different types of monitors for the same pollutant. Criteria for siting monitors, especially ozone monitors, was also mentioned as a matter which needs to be given greater consideration. So, although some progress has been made in New Zealand on these matters (for example, the agreement on an operating temperature for the TEOM monitor), it seems to be an area requiring more work. (It should be noted, however, that the TEOM is not favoured as a monitoring method by one of the major regional councils.)

A related matter is whether requirements for monitoring should be more prescriptive, over and above the “duty” of section 35 of the Resource Management Act. The general view seemed to be that detailed guidance on monitoring is necessary, particularly if standards are adopted. There is less agreement about whether the guidance should be prescriptive, with a minor, but significant, opinion that it should not.

The main arguments against prescriptive monitoring are related to costs and who bears them, the extent of monitoring that may be required, the perceived lack of flexibility that might result, and that there are other ways of improving environmental performance. In terms of the amount of monitoring, a minimum prescribed level is favoured based on various criteria, including population, topography and meteorology, and sources, particularly roadsides and other hotspots.

The Australian experience with the National Environment Protection Measure (NEPM) for Ambient Air Quality is that some jurisdictions are finding it difficult to argue for monitoring resources beyond the minimum needed to meet NEPM reporting requirements. Clearly, the need for monitoring data in most jurisdictions goes beyond the single objective of meeting minimum reporting requirements and has been meeting these needs to greater or lesser degrees. The main advantage of a minimum requirement, however, is that all jurisdictions will be providing at least the minimum level of data for national assessment and on a comparable basis.

A view was expressed that the Australian NEPM formula is not appropriate for New Zealand because of its smaller cities. Instead, the number of monitors actually required in an air-shed should be determined more by the range of air quality issues in that air-shed. For those cities and towns with a dominant air quality issue, namely poor air quality in winter-time as the result of domestic heating, a very small number of monitoring stations may be quite appropriate at this time. However, after that problem has been addressed, and for those urban areas with more diverse sources of air pollutants, a greater number of monitors may be desirable. Comparisons of the conclusions reached in reviews of ambient air monitoring programmes in Auckland and Timaru were referred to this regard. The basic premise is that the number of ambient air monitors should be such as to produce adequate information about the priority air quality issues existing in the air-shed.

Recommendation:

That the Ministry for the Environment:

- adopt the revised ambient air quality guidelines (including deletions) for PM₁₀, sulphur dioxide, and nitrogen dioxide
- confirm the guidelines for carbon monoxide and ozone, and agree to a review of the former in the near future
- encourage more side-by-side monitoring of air pollutants, especially PM₁₀, using different types of monitoring systems
- establish a mechanism for approving equivalence between monitoring methods, and to address such issues as siting criteria (especially for ozone monitoring)
- review whether there is a need for more prescription in ambient air monitoring requirements, especially if national ambient air quality standards are to be introduced.

Issue 2: Possibility of national ambient air quality standards for common air pollutants

Commentary

There is considerable divergence in views on the need for national ambient air quality standards, as opposed to retaining guidelines. Arguments for standards include that they provide greater certainty, they may make it easier for regional councils to develop regional air quality plans, they are seen as giving greater status to air quality as an environmental issue, they could provide more leverage for the Ministry for the Environment to influence the policies of other departments, and they would be viewed favourably internationally to demonstrate New Zealand's seriousness towards environmental management.

A number of respondents argue that standards are more rigid and difficult to change in the light of new information, are time-consuming and hence wasteful of resources in their development, and they do not change the environmental outcome to any significant degree. Respondents almost universally agreed that if standards are developed, they should only be for a limited set of substances, ie. the common five air pollutants.

The overall impression is that a majority view is for the development of national ambient air quality standards for common air pollutants.

Recommendation:

That the Ministry for the Environment commence the process of adopting national ambient air quality standards for PM₁₀, sulphur dioxide, carbon monoxide, ozone, and nitrogen dioxide.

Issue 3: PM_{2.5}

Commentary

In the recommendations contained in Appendix 1 of Technical Report 16, and as presented to the consultation meetings, PM_{2.5} was given a similar status to the other contaminants with air quality guidelines. The only difference was a caveat that consideration of adopting the PM_{2.5} guideline as a national ambient air quality standard should await the results of ambient air monitoring, but should be done no later than 2004. Three interlocking factors are evident here – that the issue of PM_{2.5} needs to be addressed, that ambient air monitoring for PM_{2.5} needs to be encouraged, and that a sufficient database of monitoring data is required before the possibility of PM_{2.5} being adopted as a national ambient air quality standard be considered.

Although these factors have not been formally expressed quite like this before, it would seem, from the content of both the written submissions and the comments at the meetings, that they would have been generally supported. There is, however, concern about the lack of monitoring data. Also, from what data is available, there appears to be a problem in certain urban areas regarding the high proportion of PM₁₀ that is PM_{2.5}. In Christchurch, for example, the proportion of PM₁₀ that is PM_{2.5}, on those occasions in winter with elevated concentrations of particles, can be as high as 80–90%. Achieving a numerical value of 25 µg/m³, or one half the concentration guideline/standard for PM₁₀, in Christchurch (and other urban areas with a similar air quality situation) will be extremely difficult.

An alternative view is that, because of the health effects data, such a low concentration for PM_{2.5} should be a primary air quality objective. The issue then becomes one of describing it more accurately. It would appear that, at least in the short term, its status should be somewhat less than PM₁₀. Maybe it could be considered “a criteria against which the results of the ambient air monitoring could be compared”, or something similar. Hopefully that would not diminish the need for encouragement of greater ambient air monitoring for PM_{2.5}.

The situation in Australia, with the National Environment Protection Measure for Ambient Air Quality, is that a concentration for PM₁₀ is set as a standard. The supporting Impact Statement indicates that by 2001 a review of the particles standard will commence, to address, in particular, the need for a standard for PM_{2.5}.

Recommendation:

That the Ministry for the Environment:

- strongly encourage greater ambient air monitoring for PM_{2.5}
- recommend the results of the ambient air monitoring be compared with a criteria of 25 µg/m³
- agree to a review of the situation in the near future, to consider whether an ambient air quality guideline/standard for PM_{2.5} should be adopted.

Issue 4: What to do with lead, fluoride and hydrogen sulphide

Commentary

The recommended ambient air quality guidelines/standards were presented in tabular form in precisely the same format as the table in the existing guidelines document. In retrospect, this was not a good idea, for three reasons. First, through their non-inclusion, it places the guidelines for hazardous air pollutants in a lesser light. Second, and conversely, it gives greater prominence than what is desired for fluoride and hydrogen sulphide. Third, lead (not included as either a common air pollutant or a hazardous air pollutant) is given particular recognition without any supporting documentation.

There was debate, but no apparent agreement, about whether there should be one comprehensive list of air quality guidelines, or that differentiation between the various categories remain. Arguments for and against were given. Resolution of this matter very much depends on the Ministry's response to other recommendations made in this report, including the possibility of adopting national ambient air quality standards for the common air pollutants, ambient air quality guidelines for hazardous air pollutants, and dispersion modelling criteria.

In most jurisdictions the lead content of particles is included as a common/criteria air pollutant. It was given that standing in the current guidelines document, but was excluded from this review of common air pollutants. It was also not included as a hazardous air pollutant, which, in retrospect, may have been a mistake.

The reason for those decisions – that, with the removal of lead from petrol, the main air pollution source has disappeared from the New Zealand environment – is understandable. However, there remain other sources, both area (the previous use of lead-based house paint) and point (a couple of lead smelters and battery factories). Also, as the Ministry of Health representative to the consultations observed, it is still a pollutant of considerable public interest. There was a view expressed that the relevant ambient air quality guideline should be $0.20 \mu\text{g}/\text{m}^3$, annual average. (The equivalent 1-hour average concentration, as a modelling criteria for point source control, is $1.2 \mu\text{g}/\text{m}^3$.)

On another aspect related to lead, there seemed to be general consensus that, for air-shed (as distinct from source-specific ambient air monitoring), the lead content of PM_{10} was appropriate. This means that those regional councils interested enough to do such monitoring would not be faced with the additional cost of having to provide a network of TSP monitors (as well as for PM_{10}). As part of the air quality management of point sources of lead, it should also be included in the dispersion modelling criteria.

Fluoride is the only phytotoxin included in the existing guidelines document. It is an important air pollutant in the New Zealand context, and it is associated with the point sources of phosphatic fertiliser works and the aluminium smelter. There are, however, other phytotoxins important in the New Zealand air environment – hydrogen sulphide (associated with both point and area sources), boron, formaldehyde, etc, as well as the more general question of lichen diversity (which is a proposed (Stage 2) Environmental Performance Indicator, relevant to both area sources and the point source of the oil refinery). Although the discussion at the consultation meetings on this matter mainly occurred on the day the ESR representative (and author of the ecosystems report) attended, there seemed to be a view that the ecosystems guidelines list is where fluoride should reside.

Hydrogen sulphide is another important air pollutant in the New Zealand context. It is associated with both point sources (chemical pulp mills, geothermal power stations, tanneries, etc) and area sources (surface geothermal activity). Air quality guidelines (as distinct from

criteria for occupational exposures) for hydrogen sulphide are based on the prevention of odour nuisance.

Recommendation:

That the Ministry for the Environment remove lead, fluoride and hydrogen sulphide from the primary list of ambient air quality guidelines/standards, and instead:

- lead be included as a hazardous air pollutant (with suitable background documentation prepared)
- fluoride move into the list of guidelines for prevention of potential impacts on ecosystems (where it already is)
- hydrogen sulphide be included in the review of the odour management guidance material (and, along with lead, also be included, for point source control, in the dispersion modelling criteria).

Issue 5: Ambient guidelines for hazardous air pollutants

Commentary

There were submissions/comments on two aspects of this issue – the approach used and the actual numerical values derived. In response to those submissions, and in addition to the following commentary, a table of background information on hazardous air pollutants is attached as Appendix B. Also, a table of Guidelines for Hazardous Air Pollutants (including those that would apply if a constant one in one million risk factor is used) is given in Appendix C.

1 *Comments on the approach used*

A range of approaches was examined in developing the ambient guidelines, and that considered most appropriate for each substance was used. These included:

- a risk-based approach
- dividing the occupational exposure standard (time-weighted average) by a factor (100)
- adoption of overseas guidelines, including those used in Europe (and the United Kingdom), the United States, and the World Health Organization.

Issues arose in written submissions and consultation meetings on these approaches. In particular, many submissions/comments were received on points relating to the risk values used, especially the issue of acceptable risk. The submissions included why different levels of risk were used, that the results were overly conservative, and (from one reviewer) a strong view that one in one million should be used uniformly as the acceptable risk value. A related point, therefore, is the apparent need to develop a consensus on what acceptable level of risk (or range of acceptable risks) should be used for air contaminants in New Zealand.

Because the range of unit risk factors published by different organisations spanned a wide range of values for the same substance, and, for a few substances, even by the same organisation, the value selected involved a judgement about what might be considered appropriate and acceptable in New Zealand. A cross check against other approaches was made where possible.

There appears to be some support for a wider debate on acceptable risks for New Zealand. It is unlikely that this would result in a single uniformly applicable value for acceptable risk but more likely to result in a range, as has been suggested by at least one respondent. Certainly, an examination of the ambient guideline concentrations corresponding to a risk of one in one million make it clear that such a value would be extremely difficult to sustain. For example, for benzene, the corresponding guideline concentration would need to be 0.13–0.23 $\mu\text{g}/\text{m}^3$, ie. around one-50th of the long-term United Kingdom goal (and the recommended 10-year New Zealand guideline) of 3.6 $\mu\text{g}/\text{m}^3$.

A variety of views were expressed about the use of occupational health standards to derive ambient (and design) guideline values. The view expressed by a few respondents was that they should never be used, and that indeed it would be unprofessional to formally endorse such an approach. The more general view recognised the necessary pragmatism involved in using the approach, although some unease was clearly evident. One suggestion was that the approach could be used where other options are unavailable. This is consistent with the approach taken in developing the guidelines. Again, a check against other approaches was made where possible.

There were no substantive comments from reviewers on the adoption of overseas guidelines, even though this was the approach used to derive some of the guideline values.

2 Comments on the guideline values

There were surprisingly few comments on the recommended values, which may suggest a need for more time to digest the implications and approaches used. This is particularly so because a number of issues in relation to hazardous air pollutants have not received as much exposure in New Zealand, as has been the case elsewhere.

Some respondents believed the guideline values were too strict (usually limited to a few pollutants), or that there should be different values for urban and rural (less strict) areas on the basis that few people would be affected. This may be reasonable from a purely economic viewpoint, but does raise other issues including the equity of the approach. Contrary views expressed include that no cost is too high when human health is involved, which is laudable but probably unrealistic, or more pragmatically, because New Zealand enjoys relatively cleaner air than more populated countries, then tighter standards could be entertained, which would foster its clean and green image.

On specific pollutants, the value for benzene was considered too tight by one respondent, which is contrary to the fact that similar guidelines are applied overseas, where, because of population densities, far greater difficulties will be faced in meeting them. There was some discussion on whether an annual average for formaldehyde was appropriate, with some consensus that it probably was. There was also some discussion that the guideline value for formaldehyde, particularly the design value, was too strict and costly for industry, but the general consensus appeared to be that it was achievable.

Some respondents questioned the inclusion of toluene, xylene, and possibly acetaldehyde as being relatively non-hazardous, while others considered that cadmium and nickel should have been included (without identifying current sources of those metals in the New Zealand air environment). The basis for what hazardous air pollutants were included was a combination of toxicity and expected prevalence in the urban environment. Clearly, other substances could be included if they are considered important in New Zealand.

Some comments were received on the assessment of control implications and possible approaches in New Zealand. This was considered necessary as a reality check on the recommended guideline values. The control approaches suggested were not intended to be

exhaustive or to cut across strategies already developed in New Zealand, particularly decisions taken (but not published) since the release of the *Vehicle Fleet Emissions Control Strategy*. Of course, this more recent information was not available at the time the technical report was prepared.

Recommendation:

That the Ministry for the Environment:

- initiate a wider community discussion as to whether a risk based approach is sustainable in New Zealand, given the current limited database, and what range of risks may be considered acceptable
- decide whether other substances should be added to the list of hazardous air pollutants
- issue the recommended guideline values for interim use, with strong encouragement that more monitoring be done to build up the database.

Issue 6: Dispersion modelling criteria for hazardous air pollutants

Commentary

Except for formaldehyde, which was adapted from short-term guideline values from overseas, dispersion modelling criteria for the hazardous air pollutants were derived either from the recommended ambient guideline values using a power law extrapolation, or from odour criteria. The bases of each of the modelling guidelines are given in the table attached as Appendix C.

A number of comments were received on the use of the power law, and the chosen exponent of 0.2. Some respondents questioned the appropriateness of using the power law at all, others believed a single exponent was not correct, and one submission indicated that a different exponent was preferable.

The use for which modelling guidelines are intended needs to be borne in mind. They are ambient criteria, expressed in terms of short (in this case the recommendation is, one-hour) averaging times. They are a way of assessing whether point source emissions are likely to cause a local problem, and the assessment is made, usually but not only, before a plant is approved for construction. Thus, it is expected that sources are designed using an appropriate (BACT, MACT, Good Control Practice, BPO, etc) level of technology, and appropriate management systems. Residual emissions are then modelled and compared to the dispersion modelling criteria, and the design and management systems adjusted (stack heights, control equipment, process technology, etc) until the predicted concentrations conform to the criteria.

Contrary to one opinion, the use of a 0.2 exponent is reasonably conservative when converting from annual averages. For example, using an exponent of 0.5 for converting annual averages to one-hour averages would result in design criteria 15 times higher than using 0.2. Obviously, converting from a 1-hour to an annual average would be 15 times less conservative using 0.2 instead of 0.5. (The latter was done for formaldehyde and on this basis, a lower ambient guideline value could be argued. However it should be noted that the recommended guideline concentration is consistent with a risk value of 1 in 10,000, which seems reasonable given the ambiguous status of formaldehyde as a carcinogen, and a tighter value may be difficult to justify.)

Overall, a consensus view did not appear to emerge although it seemed clear, but there was no strong opposition to the use of the power law *per se*.

The use of odour criteria was variously seen as appropriate or inappropriate. The view that design values should be based solely on health was put by a number of respondents. The contrary view that avoidance of nuisance is an equally valid criteria was also put by other respondents, and is the view adopted in developing these guidelines. The difficulties in using odour thresholds, because of the range of values determined by different groups, are acknowledged, however. In general, there was more consensus for using odour criteria to assess new sources than to remedy existing odour problems, which were seen more as management and planning issues.

There was support for developing New Zealand specific dispersion modelling criteria, and for the use of models. A few respondents questioned the use of models at all and preferred expert judgement on a case-by-case basis. Or they expressed concern that modelling criteria would encourage undue emphasis to modelling, to the exclusion of proper consideration of design in reviewing consents. This is more an issue of providing better guidance on the application of models and when and how to use them.

There was also a view that more consistency is required which would be better achieved by well-developed modelling guidelines and criteria than by the vagaries of expert judgement. This is not to imply that a high level of expert judgement is not required in the proper use and application of modelling tools, and a formularised approach is certainly not desirable.

The issue of using TWA (say, divided by 50, as discussed in the draft discussion document) as dispersion modelling criteria for pollutants for which specific criteria have not been developed was discussed. There seemed to be a reasonable level of support for this approach, although some respondents believed this was unduly strict and preferred the use of TWA/30. It should be noted that TWA/50 as a one-hour modelling criteria is approximately the same as the Victorian EPA TWA/30 three-minute design ground level concentration criteria, when converted to the same averaging time.

There was some confusion about the direct use of the ambient air quality guidelines, or some multiple of them, as dispersion modelling criteria. They are quite different things, intended to be separate parts of the air quality management “toolbox”. This is especially so for particles (TSP and PM₁₀), and, of course, ozone. A failure to recognise the differences came to light in a hearing for a coal mine in Maryvale, Victoria, with a New Zealand consultant a major contributor to the problem. In that case it was incorrectly assumed that the PM₁₀ air quality standard was a *de facto* dispersion modelling criteria.

Recommendation:

That the Ministry for the Environment:

- initiate a wider discussion on the approaches to be used to develop New Zealand specific dispersion modelling criteria
- commence the process of preparing a guidance document on aspects of atmospheric dispersion modelling (covering such things as the appropriateness of modelling to particular situations, preferred models, evaluation criteria, etc)
- issue the recommended dispersion modelling criteria for hazardous air pollutants for interim use, and as examples of approaches that could be used to produce a more comprehensive listing.

Issue 7: Costs and benefits, economic instruments, technology standards

Commentary

Scoping costs and benefits, the topic of Technical Report 14, was not a major conversation point at the consultation meetings. There seemed to be a general attitude that a section 32 analysis is just something that would “need to be done”, if national ambient air quality standards are to be introduced.

Technical Report 14 was referred to more extensively in some of the written submissions – one prominent air quality scientist questions “what is this document saying?” He goes on to say, that, “it has no real conclusion nor substantive recommendations. It leaves one wondering what is it for.” Others were less ingenuous. They generally thought that the document provided “good guidance for policy analysts”, and consequently didn’t have much to comment on. The Ministry of Transport wanted various extracts from the *Vehicle Fleet Emissions Control Strategy* to be used instead of the wording that is currently used in the Technical Report.

A related matter discussed at the consultation meetings, at least on one day (Wednesday), was the use of economic instruments in air quality management. The forthcoming report of the study for the Auckland Regional Council, led by Sir Geoffrey Palmer, was mentioned. The conclusion of that work is that both the Local Government Act and the Resource Management Act limit (legitimate) grounds for regional councils to introduce economic instruments. Constitutional issues dating back to the Magna Carta are raised. This all seems rather unfortunate, as there is general acceptance that economic instruments are useful tools, as an adjunct to more traditional instruments.

A most lively debate surrounded the possible introduction of technology based standards. Maybe, overall, a slight majority view was in favour of the development of national technology-based standards. However, there was a disparity of views as to what these actually mean. Some view technology-based standards as an alternative to modelling criteria and ambient air quality guidelines. That is clearly not what the Ministry for the Environment is suggesting, in Technical Report 16 and in presentations to the consultation meetings.

Some view technology-based standards as numerical emission limits, while others understand them to cover the broad spectrum of process and emission control technologies. The suggestion that there should be national emission (discharge) limits for industrial processes was greeted with concern by some regional council people. Industry representatives, with a couple of notable exceptions (from the pulp and paper sector), were strangely silent on the matter. It was seen by some that the introduction of such standards, which would influence most resource consents issued by regional councils, is not something the Ministry should be involving itself in. There was more support for such things as performance criteria for domestic heating appliances and, of course, automotive fuels and motor vehicle emission standards.

A number of respondents drew attention to the differences in philosophy between the BPO in the Resource Management Act, and the United States’ concepts such as BACT and MEAT. BACT and MEAT were seen by some as best suited and desirable approaches for highly toxic and carcinogenic emissions, with lesser standards being perhaps acceptable for other pollutants.

To summarise, while a need was perceived for increased uniformity across regional jurisdictions in conditions developed in resource consents for point sources, and technology-based standards is seen as one method for fostering uniformity, a need for uniformity was not universally accepted. There were no strong concerns expressed about automotive fuels and motor vehicle

emission standards, and (although it wasn't discussed to quite the same extent) neither for national performance standards for domestic heating appliances.

Recommendation:

That the Ministry for the Environment clarify what they mean by national technology-based standards, and the likely extent of their coverage (ie. just to nationally significant matters such as automotive fuels and motor vehicle emission control standards, or that they should also extend to more regionally important matters of performance standards for domestic heating appliances and, even, emission discharge limits for industrial processes).

Issue 8: Relationship of this review with other air quality initiatives

Commentary

A significant topic in both submissions and at the consultation meetings was the other air quality initiatives of the Ministry for the Environment. There was some confusion, in a couple of submissions, about matters previously part of the review, viz., visibility, odour management, and dust nuisance, but which had subsequently been moved to other areas of the Ministry's air quality programme. Of course, the Ministry's Environmental Performance Indicators Programme was frequently discussed.

The point was also made that the review of air monitoring methods, carried out as part of the author's contract, was more extensive than just for the five common air pollutants listed in Technical Report 12. Although it is a separate, unpublished, document, that review has nothing that is at variance with the Good Practice Guide for Monitoring and Data Management.

The Ministry's Organochlorines Programme was mentioned several times during the consultation meetings, especially the day (Thursday) the Australian observers attended, and again on Friday (when Dave Brash was the Chairperson). The possibility that national standards for dioxins and dioxin-like polychlorinated biphenyl compounds (PCBs) may be the first such air quality standards in New Zealand concerned a few. It was felt that that "would send the wrong message" about our priorities, internationally. On the other hand, it seems that many don't have a strong view on this matter.

Although, through the Organochlorines Programme, we have acquired considerable information about concentrations of dioxins and PCBs in the New Zealand environment, this is miniscule compared with a record of more than 30 years of ambient air monitoring for common air pollutants, which are present in urban environments in hugely greater concentrations.

Organochlorines and spray drift were specifically excluded from the list of hazardous air pollutants, because they are covered in other programmes and in other legislation (such as, the Hazardous Substances and New Organisms Act). No-one raised that as a point of concern.

Another hotly debated topic was that of motor vehicle emission control, most especially the *Vehicle Fleet Emissions Control Strategy*. Although the Ministry of Transport representative remained largely silent at the consultation meetings, his written submission is highly critical of the Technical Reports. He wants, for example, changes to wording to reflect Government decisions (not made public) on aspects of the Strategy, while at the same time not wanting

anything that apparently pre-empts (even though it may be universally accepted) anything that is still to be tested in the New Zealand context.

The representative of the motor industry, and the representatives of the oil industry (except for wanting a higher numerical value for the benzene guidelines), were more supportive of the content of the Technical Reports. The Ministry of Transport's concerns are really matters best addressed by the Ministry for the Environment, because the authors of this report do not have access to decisions made since the publication of the *Vehicle Fleet Emissions Control Strategy - Final Report*.

Recommendation:

Given that the planned motor vehicle-related air quality initiatives are largely the purview of the Ministry of Transport, the Ministry for the Environment would be seen as having a more encompassing ("technology-forcing") role, and at the same time provide support for regional council initiatives in this area, by adopting national ambient air quality standards (most of which are related to air pollutants from motor vehicles).

Concluding comments

"Compromise" was a word frequently used, at least by presenters, at the consultation meetings. It is relatively easy to criticise particular recommendations, especially those with numerical values. Although, as mentioned above, there was surprisingly little debate on the approach taken and the recommended values for the common air pollutants, the same can not be said about the approach taken to derive guidelines for hazardous air pollutants.

Throughout, and including the additional material provided with this report, the authors have maintained a high degree of transparency about the assumptions made. The question of what is an acceptable level of risk is not easy to answer, but the approach taken in our work is, we believe, both defensible and pragmatic.

The Ministry for the Environment now has the task of deciding the relative merits of various points of view given. The most difficult tasks will be to resolve issues 2, 5 and 6. They are not mutually exclusive, as, for example, a decision to adopt national ambient air quality standards will directly impact on other decisions.

Appendices

- A Review of Christchurch Health Studies
- B Background Information on Hazardous Air Pollutants
- C Guidelines for Hazardous Air Pollutants

Kevin Rolfe & Associates Limited

(Kevin Rolfe, Lyn Denison and Jack Chiodo)

28 March 2000

Appendix A: Review of Christchurch health studies

Studies into the health effects of air pollution in Christchurch have focused on particles (as PM₁₀), NO₂ and CO. A study conducted to investigate the effects of air pollution on patients with chronic obstructive pulmonary disease (COPD) was conducted over a period of three months during the winter of 1994 (Harré et al., 1997). Forty subjects completed twice daily diaries recording respiratory symptoms, peak expiratory flow rate (PEFR), outdoor activity, doctor or hospital visits, and medication usage. Significant positive associations were found for PM₁₀ and increases in night time chest symptoms (relative risk, 1.42, 95% CI 1.13 to 1.79, per 35.04 µg/m³ increase in 24-hour PM₁₀). Daily average NO₂ was significantly associated with increased inhaler and nebuliser use (relative risk, 1.42, 95% CI 1.13 to 1.79 per 9.74 µg/m³ increase in 24-hour NO₂). No significant associations were found for any pollutant and decreases in lung function. High levels of SO₂ were found to be associated with eye irritation.

A recent study into the effects of air pollution and weather on daily mortality have shown that PM₁₀ levels in Christchurch are associated with increases in daily mortality (Hales et al, in press). A 10 µg/m³ increase in 24-hour PM₁₀ (lag 1) was associated with a 1% (95% CI: 0.5 to 2.2%) increase in all cause mortality and a 4% (95% CI: 1.5 to 5.9%) increase in respiratory mortality. The effects were slightly stronger in the 65+ age group. Warm temperatures were also found to be associated with increases in daily mortality but these effects were independent of the effects attributed to PM₁₀. Daily average PM₁₀ levels during the study period (1988 to 1993) ranged between 0 and 187 µg/m³. The results of this study are consistent with studies overseas.

Appendix B: Background information on hazardous air pollutants

Contaminant	Health Effects	Classification		Unit Risk x 10 ⁶			Various Guidelines (µg/m ³) (annual averages unless otherwise stated)				
		IARC	US EPA (potency)	WHO	USEPA	CARB	UK	EC	TWA/100	WHO	US
Benzene	Haemotoxic, genotoxic, carcinogenic	1	A (M)	4.4-7.5	8.3	29	18 (now) 3.6 (goal)	10 (now) 5 (2010)	18	–	–
Toluene	CNS, irritation of eyes, skin and respiratory system	3	D	–	–	–	–	–	190	290 (1-week) 1000 (30-min)	400 (RfC)
Xylene	Neurological, irritation of eyes, nose and throat, gastrointestinal	3	D	–	–	–	–	–	2400	950 4800 (30-min)	–
1,3-Butadiene	Neurological, irritation of eyes, throat, lungs and nose, mutagenic, carcinogenic (?)	2A	B2 (M)	(RIVM: 7-33)	280	170	2.4	–	24	–	–
Formaldehyde	Irritation of eyes, throat, nose and respiratory symptom, nasal cancer	2A	B1 (M)	very low	13	6	–	–	9.2	100 normal 10 hypersensitive (30-min)	–
Acetaldehyde	Irritation of eyes, throat, nose and respiratory system, nasal cancer	2B	B2 (L)	15-90	2.2	2.7	–	–	3600	2400 (24-hour)	9 (RfC)
Benzo(a)pyrene	Dermatitis, photosensitisation, eye irritation, cataracts, lung cancer (?)	1	B2 (M)	87000	–	–	–	–	–	–	–
Mercury*	CNS, gastrointestinal, respiratory system, kidney	2B(m) 3(l)	C(m) D(l)	–	–	–	–	–	0.1(al) 0.25(l) 1.0(ar)	1(l)	0.3(l) RfC 0.3(l) (REL)
Chromium (VI) Chromium II,III	Respiratory, gastrointestinal, liver, kidney, immune system, blood	1 3	A (H) D	11000-130000 –	1200 –	150000 –	– –	– –	0.1 – 0.5 5.0	– –	0.0023 –
Arsenic (Inorg) Arsine	Gastrointestinal, haemolysis, central and peripheral NS, eyes, skin, mucous membranes	1	A (H)	1500	4300	1500	–	–	0.1 1.7	– –	0.41 (REL) 0.055 (RfC)

* Abbreviations for mercury: Organic (o) = {methyl (m), aryl (ar), alkyl (al)}; Inorganic (l) = elemental and other inorganic compounds

Appendix C: Guidelines for hazardous air pollutants

Contaminant	Recommended Guideline Values ($\mu\text{g}/\text{m}^3$)				Implied Risk (per 10^6)	Levels for Risk of 1 in 10^6 ($\mu\text{g}/\text{m}^3$)	Ambient levels (annual average, or as specified)	Comment
	Ambient (annual average)	Basis	Design (1-hour average)	Basis				
Benzene	10 (now) 3.6 (2010)	EC(now) UK (long-term goal)	22	Annual (2001) converted	44-75 (WHO) 16 (WHO)	0.13-0.23	~7 (urban) 20+ (traffic)	
Toluene	190	TWA/100	500	Odour	–	–	<20 (urban) ~50 (traffic)	
Xylene	950	WHO (health)	1000	Odour	–	–	<20 (urban) 50+ (traffic)	
1,3-Butadiene	2.4	UK	15	Annual converted	17-72 (RIVM) 670 (USEPA)	0.03-0.14 0.0036	~1 (24-hour)	
Formaldehyde	15	WHO (health) converted	20	WHO < design < Vic EPA	196 (USEPA)	0.077	12 (17-day) ~30 (1-hour)	
Acetaldehyde	30	WHO (health) converted	45	Odour (Vic EPA)	450-2700 (WHO) 66 (USEPA)	0.001-0.067 0.45	No NZ data US ~ (2-4)	
Benzo(a)pyrene	0.0003	Risk of 2-3 in 10^5 assumed acceptable	Not specified	–	26 (USEPA)	0.00001	7-72 (24-hour)	
Mercury (organic) Mercury (inorganic)	0.13 0.33	TWA/100 TWA/100	0.8 2.0	Annual converted Annual converted	– –	– –	No urban data <50 (7-day)	
Chromium (VI) Chromium (other)	0.0011 0.11	Assume risk of 1 in 10^5 is acceptable (between WHO and USEPA) 100 x Cr (VI)	0.0067 0.67	Annual converted Annual converted	12-140 (WHO) 1.3 (USEPA)	0.000007-0.00009 0.00083	No NZ data	Ignores dietary intakes
Arsenic (Inorg) Arsine	0.0055 0.055	Risk of 1 in 10^5 assumed acceptable (between WHO and USEPA) RFC (US EPA)	0.033 0.33	Annual converted Annual converted	8.3 (WHO) 24 (USEPA)	0.00067 0.00023	No NZ data	

Background report for information – this is not Government policy

Section 3: Report from Philip Millichamp

*Discussion on issues raised at the meeting
on 7-10 March 2000*

*Review and critique of comments on the
Proposals for Revised and New Ambient
Air Quality Guidelines – Discussion
Document – Working Draft*

Guidelines Review: Response to comments from reviewers

The following notes represent a summary of the response to comments from reviewers received both verbally and in written form. These notes do not cover all issues, but focus on what are considered the key concerns. A more detailed response was discussed with Caroline Austwick at a meeting on 20 March 1999, and a revised draft report has also been submitted with many of the recommended changes incorporated.

Furthermore, none of the recommendations below address typographical errors or formatting issues.

1 Implied criticism of regional councils

Some reviewers believed the tone of the discussion document may have been too negative in some areas, with an implication that local authorities have either not done a good job or need some kind of control. While this was clearly not the intent, it is recognised that some criticism could be implied by some and some minor changes could avert the risk of misunderstandings. They are:

- give more attention to the fact that air quality management has improved since 1994
- acknowledge that local authorities are able to develop policies based on local issues, etc
- highlight advantages of national consistency, etc.

2 Distinction between air-shed management and resource consents

The need to clearly indicate that the guidelines should primarily be used as air-shed management tools was a common point made by reviewers and by the Ministry's consultants. There was also some views expressed that resource consents and modelling issues should in fact be treated in a separate project. In order to clarify the distinction between air-shed criteria and modelling criteria it is necessary to:

- structure the report so that modelling criteria and associated discussion is in separate, stand-alone sections.

3 Modelling design concentrations for common pollutants – formula or values

There was probably more discussion on this issue among the Ministry's consultants than expressed by reviewers. However, it is considered an important issue. There may be a risk of confusion if the Ministry advocated a general approach, as opposed to recommending specific modelling criteria (MDC). Three problems arise however: firstly we need to establish modelling design concentrations for the common air pollutants (PM₁₀ etc.); secondly, we need to allow for circumstances when the MDC are not appropriate, such as when the background is very high; finally, many decision-makers are keenly interested in how the discharge relates to effects.

It is therefore suggested that:

- much of the original discussion be maintained so the issues can be debated
- consider developing specific modelling criteria for common pollutants and modify text (remove formula)
- modify text to make it easier to understand.

4 Remove MDC from discussion and shift to modelling guidance

I do not believe it is appropriate to ignore discussion on modelling design concentrations. This issue needs to be dealt with. The guidelines have been widely used as criteria for modelling and continue to be used as such and at the very least some debate must be heard on this issue.

5 “Common” contaminants versus “priority hazardous air contaminants”

- Include Tables 1 and 3 (uniting MDC removed) in same section, possibly the same table.
- Retain some form of prioritisation by distinguishing between those contaminants included in 1994 and the new contaminants, and by making reference to EPI ‘Stage 1’ indicators.
- Retain explanatory text for HAPs but include with ‘common contaminants’ in air-shed section.
- Include a table on risks (for carcinogenic contaminants only).

6 Averaging times for HAP Guidelines

This issue was not discussed in depth, but only raised briefly. I believe however that it is an important issue, and the following should be considered:

- Provide guidelines for one week average for toluene; 24-hour for xylene; one-hour and annual for formaldehyde. Review reason to just have annual average guidelines for these.
- At least discuss issue in text and ask question.

7 Monitoring guidance

- Clarify discussion. Formula from NEPM is example only. It demonstrates this approach is not easily transferable to New Zealand.

8 Uncertainties in determining guideline values and risk

- Include brief discussion on issue. Include discussion on variable risks and what is acceptable for New Zealand.

9 Technology-based emission limits

- Make discussion more RMA-friendly, ie. refer to BPO in more detail. Reduce reference to MACT and BACT.

10 Definition of ‘clean air’

- Modify text on p 25 slightly so that it does not appear to rigidly define clean air.
- Emphasis on when to maintain and when to enhance.

11 WES divided by factor

- Generalise and recommend as last resort.

Section 4: List of Invited Reviewers

First Name	Last Name	Company/Organisation	City
Andrew	Gordon	Auckland City Council	AUCKLAND
Kevin	Mahon	Auckland Regional Council	AUCKLAND
Rhys	Kevern	Environment BoP	WHAKATANE
Phil	Gurnsey	Environment Canterbury	CHRISTCHURCH
Bob	Ayrey	Environment Canterbury	CHRISTCHURCH
Peter	Burrows	Gisborne District Council	GISBORNE
Katherine	Hughes	Hawkes Bay Regional Council	NAPIER
Ruth	Young	Manukau City Council	MANUKAU CITY
James	Corbett	Manukau City Council	MANUKAU CITY
Ewan	Robertson	horizons.mw	PALMERSTON NORTH
Lynda	Neame	Marlborough District Council	BLENHEIM
David	Jackson	Nelson City Council	NELSON
Geoff	Taylor	Northland Regional Council	WHANGAREI
Prue	Harwood	Otago Regional Council	DUNEDIN
Gary	Bedford	Taranaki Regional Council	STRATFORD
Jane	McGibbon	Tasman District Council	NELSON
Leif	Pigott	Environment Waikato	HAMILTON EAST
Perry	Davy	Wellington Regional Council	WELLINGTON
Stephen	Yeats	Wellington Regional Council	MASTERTON
Trevor	James	West Coast Regional Council	GREYMOUTH
C/- Paul	Dell	Resource Managers Group Environment Bay of Plenty	WHAKATANE
Andrea	Tunks	Auckland University Law School	AUCKLAND
Chris	Edmonds	Public Health Service Hutt Hospital	LOWER HUTT
Shaun	O'Neill	NZ Aluminium Smelters	INVERCARGILL
Kevin	Duke	NZ Aluminium Smelters	INVERCARGILL
Barry	Dyer	NZ Chemical Industry Council	WELLINGTON
Bill	Birch	NZ Chemical Industry Council	WELLINGTON
David	Murphy	NZ Manufacturers Federation	WELLINGTON
Chris	Drayton	Carter Holt Harvey	AUCKLAND
Jim	Newfield	Carter Holt Harvey Pulp & Paper	TOKOROA
Lorraine	Marsh	Carter Holt Harvey Pulp & Paper	TOKOROA
Kevin	Wilson	Carter Holt Harvey	TOKOROA

First Name	Last Name	Company/Organisation	City
Alistair	Atherton	Fletcher Challenge Steel Makers	AUCKLAND
Helen	Jenkins	Tasman Pulp	KAWERAU
Maria	Robertson	Comalco Aluminium Ltd	BRISBANE QLD AUSTRALIA
Ian	Gemmill	Shell New Zealand Ltd	WELLINGTON
Kieran	Murray	Ravensdown Fertiliser Co-op Ltd	NAPIER
Anna	Lukey	Shell NZ	WELLINGTON
Richard	Christie	Ravensdown Fertiliser Co-op Ltd	CHRISTCHURCH
	Environmental Manager	Anchor Products Ltd Private Bag	CAMBRIDGE
Karl	Mischweski	AFFCO Ltd Horotiu	HOROTIU
Dennis	Butler	Alliance Group Limited	CHRISTCHURCH
Keith	Hopkins	Genesis	HUNTLY
Peter	Wilcox	Hayes Metal Refineries Ltd	NEWMARKET
Doug	Gordon	New Zealand Minerals Industry Association	WELLINGTON
Perry	Kerr	Motor Industry Association	LOWER HUTT
Reuben	Mills	Solid Energy	HUNTLY 2191
Mercedes	Lentz	Winstone Aggregates	AUCKLAND
David	Hayden	Methanex	NEW PLYMOUTH
Neville	Queree	Lever Rexona NZ Limited	PETONE
Tom	Barratt	De Gussa Peroxide	MORRINSVILLE
Don	Jenkin	Dynochem NZ Limited	
Steve	Carrol	Orica Adhesives	MT MAUNGANUI
Jim	Guidarini	Dow Agrosiences NZ Ltd	NEW PLYMOUTH
Wayne	Koedyk	EKA Chemicals NZ Ltd	MT MAUNGANUI
Kit	Wilson	BOP Fertiliser Limited	MT MAUNGANUI
Fred	Holland	Nuplex Industries Limited	PENROSE
Andy	Sommerville	Contact Energy Ltd	WELLINGTON
Regina	Thompson	US EPA Region 10	SEATTLE WA 98101 USA
Merv	Jones	Woodward Clyde	AUCKLAND
James	Bains	Taylor Bains and Associates	CHRISTCHURCH 1
Ron	Pilgrim	Kingston Morrison	WELLINGTON

First Name	Last Name	Company/Organisation	City
Roger	Cudmore	Aurora Environmental	CHRISTCHURCH
Kevin	Rolfe	Rolfe and Associates	AUCKLAND
Tracy	Freeman	Beca Stevens	CHRISTCHURCH
Don	Hannah	ERMA	WELLINGTON
Paul	Prendergast	Ministry of Health	WELLINGTON
Jenny	Dickenson	Ministry of Transport	WELLINGTON
Richard	Elwin	Ministry of Economic Development	WELLINGTON
Darren	Baars	Ministry of Transport	WELLINGTON
Jo	Breese	World Wide Fund for Nature	WELLINGTON
Sarah	Thomson	Asthma and Respiratory Association of New Zealand	WELLINGTON
Linda	Sutherland	Environmental and Conservation Organisations of New Zealand	WELLINGTON
Carl	Reller	Greenpeace	AUCKLAND
Lindsay	Robertson	Dairy Research Institute	PALMERSTON NORTH
Tony	Forskett	Dairy Research Institute	PALMERSTON NORTH
Gavin	Fisher	National Institute of Atmospheric and Water Research	AUCKLAND
Vera	Hally	Environmental Science Research Limited	AUCKLAND
Craig	Stevenson	Environmental Science Research Limited	AUCKLAND
Ian	Town	Christchurch School of Medicine	CHRISTCHURCH

Written comments were received from those highlighted in bold.