OTAGO REGIONAL COUNCIL

Agenda for a meeting of the Technical Committee to be held in the Council Chamber, 70 Stafford Street, Dunedin on Wednesday 29 January 2014 following the Regulatory Committee meeting

Membership:

Cr Bryan Scott (Chairperson)
Cr Doug Brown (Deputy Chairperson)
Cr Graeme Bell
Cr Louise Croot MNZM
Cr Michael Deaker
Cr Gerrard Eckhoff
Cr Gary Kelliher
Cr Trevor Kempton
Cr Sam Neill
Cr Gretchen Robertson
Cr David Shepherd
Cr Stephen Woodhead

Apologies:

Leave of Absence:

In attendance:

Please note that there is an embargo on agenda items until 8.30 am on Monday 27 January.

CONFIRMATION OF AGENDA

PUBLIC FORUM

MINUTES **Page Nos.**

The minutes of the meeting held on 20 November 2013, having been circulated, for adoption. 3 - 6

Matters arising from minutes

Otago Regional Council

Page Nos.

PART A - RECOMMENDATIONS

PART B - ITEMS FOR NOTING

OTAGO REGIONAL COUNCIL

Minutes of a meeting of the Technical Committee held in the Council Chamber, 70 Stafford Street, Dunedin on Wednesday 20 November 2013 commencing at 11.06 am

Present: **Cr Bryan Scott** (Chairperson)
Cr Doug Brown (Deputy Chairperson)
Cr Graeme Bell
Cr Louise Croot MNZM
Cr Michael Deaker
Cr Gerrard Eckhoff
Cr Gary Kelliher
Cr Sam Neill
Cr Gretchen Robertson
Cr David Shepherd
Cr Stephen Woodhead

Leave of Absence: **Cr Trevor Kempton**

In attendance: **Peter Bodeker**
Wayne Scott
Jeff Donaldson
Fraser McRae
Gavin Palmer
John Threlfall
Peter Taylor
Janet Favel

CONFIRMATION OF AGENDA

There were no changes to the agenda.

ITEMS FOR NOTING

Item 1
2013/1147 **Director's Report on Progress (Engineering).** DEENH, 8/11/13

The report described progress with Council's flood protection, land drainage and river management programmes, and the management of natural hazards and civil defence and emergency management.

The report of the public meeting held in Maheno to present the findings of the investigation into the channel morphology of the Kakanui and

Kauru Rivers was noted. Dr Palmer explained that the meeting had been arranged as a result of the June flood, and noted that there were different views in the community on whether gravel should be extracted, and whether riparian vegetation was beneficial. A community group was to be formed before Christmas to discuss issues of concern, and Terms of Reference and Objectives would be drafted.

In response to a question about work on the St David Street-Union Street reach of the Leith, Dr Palmer advised that relocation of services to enable the rest of the construction works to proceed was progressing well. There had been no change in terms of the award of the civil construction contract, and staff were liaising with the University around the awarding of the contract. Dr Palmer confirmed that any delay would impact on the University, but also on the ORC in terms of time, and on contractors, subcontractors and suppliers.

It was noted that the upgrade work on the Waipori Pump Station was expected to be complete by the end of the month. Mr Bodeker advised that planning was under way for a formal opening of the upgraded pump station.

A question was asked as to the effectiveness of the Shotover training line during high river flows. Dr Palmer explained that the training line effectively mitigated the constraining effect of the Shotover River on flow in the Kawarau River, and consequently on the level of Lake Wakatipu. It would prevent the flow from being worse than a 1999 flood, and he was confident that it was working as expected. Dr Palmer confirmed that sediment deposition occurred adjacent to the delta, further down the Kawarau River. He noted that removal of the willow islands also helped alleviate the situation at the delta, and confirmed that the training line did not create further problems downstream.

Reference was made to the review of flood protection at Henley, and it was noted that the township was in a floodprone area. Dr Palmer explained that the aim of the review was to improve the limited existing flood protection, and residents would have the opportunity to give feedback through the annual plan process on further proposed work.

Cr Croot moved
Cr Robertson seconded

That the report be noted.

Motion carried

Item 2
2013/1148 **Director's Report on Progress (Resource Science).** DEIS, 1/11/13

The report provided an overview of significant activities undertaken by the Resource Science Unit.

Air Quality
The importance of using dry firewood for domestic fires in Air Zone 1 was noted. Dr Threlfall advised that moisure meters were relatively inexpensive to purchase, and there were three at the ORC's Alexandra office available for public use. He noted that dry storage for firewood was also important. Mr Donaldson advised that contractors installing fires in Air Zone 1 areas also provided information on moisture testing of firewood. Dr Threlfall noted that the air quality strategy for the Council was under review, and reference to the importance of using dry firewood would be included.

Cr Woodhead noted that Bill Bayfield, CE of Environment Canterbury, was preparing a report on air quality progress and challenges for consideration by South Island-wide local government. He noted that as well as the health aspect for residents and visitors, the marketing advantage of clean air for tourism and development was becoming more important.

Water Quality
Dr Threlfall commented on the most recent results of blue green algae in Lake Waihola and Tomahawk Lagoon. Varying cell density and toxicity meant that some instances were dangerous to people and animals, and sometimes would cause lesser dermatological reactions. Signs had been put in place warning people of the dangers of the algae. Tomahawk Lagoon was in the amber (surveillance) category; the Lake Waihola bloom was not toxic, but it could change, and big slicks could cause irritations.

Plan Change 6A
A question was raised about the use of water quality test strips for nitrate nitrogen. Dr Threfall explained that the strips were dipped in the water to be tested, and compared with the colour chart on the container to determine the nitrate level. A nitrate probe would soon be available which would give a more accurate reading. Dr Threlfall advised that phosphorus test strips were available but were not so easy to use in the field. E. coli testing was a more difficult test again, and he considered that it was better at this stage to send samples for laboratory testing.

Dr Threlfall further advised that the Council now had a full supply of the test strips and staff would be trained in their use.

Cr Kelliher moved
Cr Shepherd seconded

That the report be noted.

Motion carried

The meeting closed at 11.42 am

Chairperson

Otago Regional Council

REPORT

Document Id: A564609

Report No: 2013/1105
Prepared For: Technical Committee
Prepared By: Deborah Mills, Air Quality Scientist
Date: 16 January 2014

Subject: 2013 Air Quality Results

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1. Précis

Last year (2013) marked two milestones in air quality management for the country and the region. The National Environmental Standards for Air Quality (NESAQ) entered its 10th year, and The Regional Plan: Air for Otago (Air Plan) target date for compliance with the air quality standards of the NESAQ occurred (1 September 2013).

The NESAQ sets a daily threshold concentration of 50 micrograms per cubic metre of air ($\mu g/m^3$); one day a year over that threshold is allowed. The Air Plan set the compliance date at 1 September 2013; the NESAQ sets the final compliance date at 1 September 2020.

This report presents Otago's ambient air quality monitoring results for 2013 and examines them in relation to these milestones. Currently, of the places that are monitored, only Central Dunedin and Palmerston have met their Air Plan targets. The remainder of the monitored centres did not achieve compliance with the Air Plan targets.

The following table shows the numbers of days with PM_{10} values exceeding $50\mu g/m^3$: Historical data are shown in Appendix 1.

Location	Number of exceedance days
Alexandra	47
Arrowtown	17
Balclutha	4
Clyde	10
Cromwell	33
Dunedin	1*
Milton	42
Mosgiel	5
Palmerston	0 **

* granted an exemption for this exceedance by the MfE
** limited data available for 2013

It seems likely that air quality in several towns will not meet the NESAQ given the trends in the monitored air quality data. Council has already programmed a review of its air quality management strategy in light of the 2013 monitoring results and the

approach of the 2020 NESAQ deadline. The information in this report will inform the strategy review.

2. Introduction

Otago air quality is measured against national and regional limits. The National Environmental Standard for Air Quality (NESAQ) sets a threshold concentration of 50µg/m^3; one exceedance per year of this limit is allowed.

Originally, these standards were to be met by 2013, but in 2011 the NESAQ was revised to extend the date of final compliance to 2020. An interim target of three allowable exceedances per year was set for 1 September 2016.

The Regional Plan: Air for Otago (Air Plan) contains straight- and curved-line paths which were meant to measure progress towards complying with the original NESAQ date of 1 September 2013.

This year's results indicate that Central Dunedin and Palmerston were the only towns to meet their Air Plan goals. Dunedin's success comes after several years of industrial emission reductions; Palmerston's first partial winter of monitoring indicates that while air quality may be degraded during certain times of the day, the NESAQ may not be breached.

Multiple initiatives have been in place over the past several years in an effort to achieve compliance with both the NESAQ and the Air Plan. A re-cap of these initiatives and a discussion on their impact on air quality is included in Section 4.

Analysis of the monitoring results indicates that progress under the current strategy has been uneven across the region. Even though improvements have been made in many towns, air quality in several centres will not meet the NESAQ within required timeframes under the current air quality management strategy.

3. Winter 2013 Summary

3.1 PM_{10} statistics

Air quality monitors operated in Alexandra, Arrowtown, Clyde, Cromwell, Balclutha, Dunedin, Milton, Mosgiel and Palmerston this year. Alexandra, Dunedin and Mosgiel monitors operate continuously to fulfil MfE's monitoring requirements and the others run only during the colder months (May – September).

The summary statistics in Table 1 show that the number of exceedances ranged from none in Palmerston to 47 days in Alexandra. The table also lists the maximum one-day values along with the winter average for each site. The Air Plan's straight- and curved-line path targets are shown with each site's second highest value (the compliance criterion).

A spreadsheet with a wider range of various other descriptive statistics for each site is attached as Appendix 2.

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Table 1. Annual summary statistics for daily PM_{10} in 2013. The highest value in each category is marked in **bold**. (Unless noted, all units are $\mu g/m^3$).

Location	Number of exceedances (days)	Maximum PM_{10}	Winter average	Second highest PM_{10}	2013 Air Plan path targets
Alexandra	**47**	130	**47**	**110**	50
Arrowtown	17	77	30	76	50
Balclutha	4	88	28	55	50
Clyde	10	66	28	62	50
Cromwell	33	107	37	94	50
Dunedin	1*	56	17	46	50
Milton	42	**139**	44	**110**	50
Mosgiel	5	62	27	56	50
Palmerston	0	50	25	44	50

* granted an exemption by MfE due to an exceptional circumstance causing the exceedance

3.2 2013 air quality highlights

The 2013 results reveal the following highlights for each centre. (NB: Length of record is noted for each town.)

Alexandra (2005-2013)

* Summary statistics (number of exceedances, winter average and maximums) were about the same as their long-term averages.
* Overall, 2008 was the worst year for air quality in Alexandra and 2012 was the best; 2013 fell between these two.

Arrowtown (2006-2013)

* Had the lowest winter average ($30\mu g/m^3$) ever recorded.
* Recorded the lowest maximum ($77\mu g/m^3$) since monitoring began.

Balclutha (2009-2013)

* This year's July monthly average ($32\mu g/m^3$) was higher than in other years.
* With only three years of data, it is not yet possible to define trends.

Clyde (2008-2013)

* Maximum PM_{10} levels (highest 20 days) have decreased by 30% since 2008.
* Average PM_{10} during July was $31\mu g/m^3$.
* 74% of winter days recorded good air quality.

Cromwell (2008-2013)

* 58% of winter days had good air quality; 14% had moderate air quality, and more than a quarter (28%) of winter days had poor air quality.
* Cromwell's maximum PM_{10} value was $107\mu g/m^3$, 5% lower than most years and 20% lower than the highest maximum value of $133\mu g/m^3$, recorded in 2010.

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Dunedin (2006-2013)

* Lowest July PM_{10} average ($19\mu g/m^3$) and lowest average of the 10 highest PM_{10} days ($38\mu g/m^3$) since records began.
* Best overall result since monitoring began with 1 day over $50\mu g/m^3$ and just 2% of winter days between 35 and $50\mu g/m^3$.

Milton (2008-2013)

* Most statistics (number of exceedances, winter average, maximum daily) are similar to their long-term averages (2008-2012).
* The average of the top ten days was below $100\mu g/m^3$ this year for the first time.

Mosgiel (2005-2013)

* Average of the 10 highest days ($51\mu g/m^3$) was 15% lower than the long-term average.
* The winter average this year ($27\mu g/m^3$) was slightly higher than the long-term average ($25\mu g/m^3$).

Palmerston (2013)

* Monitor installed at the start of June; no exceedances were reported.
* The winter average this year was $25\mu g/m^3$ and the maximum daily PM_{10} was $50\mu g/m^3$, the highest allowable value.

4 Current air quality management programme and its impact

4.1 Programme elements

ORC has taken a multi-pronged approach to air quality management with the goal of meeting the NESAQ and Air Plan. Major themes have included:

- setting straight- and curved-line paths for compliance with the Air Plan,
- requiring stricter-than-required domestic heating appliance emissions rules in the Air Plan where needed,
- offering schemes for insulation and compliant domestic heating appliances,
- performing special studies to define PM_{10} issues in the region,
- negotiating 'best practicable option' boilers for consented industry,
- delivering education/awareness campaigns,
- performing enforcement activities.

Council adopted a strategy to implement these elements in the paper *Otago Regional Council Clean Air Strategy: 2007-2013* (Report Number 2007/451). Subsequent papers[1] re-iterated and refined areas of the strategy, its implementation and enforcement as needs arose.

4.2 Impact on air quality

Efforts to reduce domestic PM_{10} have relied on:

[1] *Air Quality Strategy and Long Term Planning* (Report No. 2011/1024); *Strategy for enforcement of the Air Plan rules* (Report No. 2012/0591).

- replacing high-emitting burners with low- or no-emission appliances, and
- encouraging behaviour change around the heating culture.

Measuring the effectiveness of these initiatives is complex and is further confounded by the role that weather plays in influencing particulate concentrations.

Two approaches are taken to analyse changes in PM_{10} concentrations over time:
- trend analysis of monitoring results while accounting for the weather, and
- analysis of emissions via inventory of burners.

4.2.1 Burner emissions inventory

Complete emissions inventories have not been updated since 2005; those estimates are used as pre-programme totals.

Table 2 gives the estimated reductions in PM_{10} emissions from installations due to the Clean Heat Clean Air (CHCA) programme. It's important to note that even though conservative assumptions about emission factors, fuel type and daily fuel usage were used, there can be large variations in these assumptions.

Table 2. Estimates of emission reductions due to the Clean Heat Clean Air programme.

	Total pre-programme emissions[2] (per day)	Total number of households in town	Number of compliant burners installed	PM_{10} reduction (kg)/day	Seasonal PM_{10} reduction (tonnes/winter)
Alexandra	380	2000	400	78	5.5
Clyde	n/a	400	100	19	1.3
Cromwell	180	1400	250	50	3.5
Arrowtown	160	900	250	44	3.1
Milton	340	750	100	22	1.5

4.2.2 Trend analysis

Relating emission reduction to concentration reduction requires accounting for the weather. A trend model accounting for weather effects was developed for Arrowtown and Alexandra; it was originally presented to Council in 2011 (Report Number 2011/1092). Model results incorporating 2013 data are discussed in this section.

In this model, days with weather conditions conducive to high PM_{10} concentrations are identified. These are days with little or no wind, cold overnight temperatures and clear skies. Temperature inversions, which serve to trap emissions near the Earth's surface, form during such conditions and exacerbate PM_{10} levels. These are referred to as High Pollution Potential (HPP) days.

Once the HPP days are identified for each winter, characteristics on those days are examined year-to-year for trends. In effect this removes the confounding factor of seasonality on PM_{10}.

[2] Calculated from *Warm Homes Technical Report: Home Heating Methods and Fuels in New Zealand,* MfE, 2005.

Because the Alexandra and Arrowtown PM_{10} datasets are robust and relatively long, this analysis has been applied to them. Previous reports[3] have noted progress in both towns; this section adds the 2013 data to that analysis.

Arrowtown

Applying the HPP model in Arrowtown shows that the weather was conducive to high levels of particulates 34 days this winter, yet only 17 days recorded PM_{10} at high levels (greater than 50µg/m^3). The graph in Figure 1 indicates the number of HPP days (when weather conditions were conducive to producing high-pollution days each year) versus the number of days that were monitored as high-pollution days. As emissions reduce, the gap between these two lines should widen.

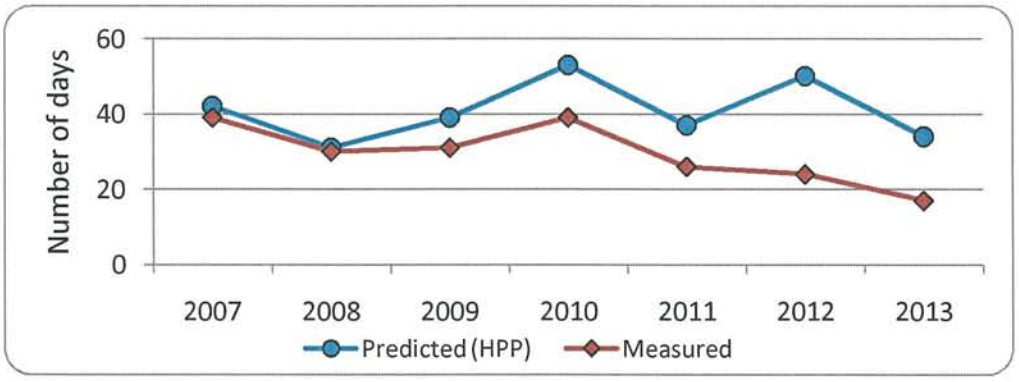


Figure 1. Predicted versus measured number of exceedances of the NESAQ in Arrowtown.

Looking just at the characteristics of the HPP days (Figure 2) indicates that winter averages have decreased, along with the average of the 10 highest PM_{10} days.

It is noted that 2007 was an extremely poor year for air quality in Arrowtown. The downward trend in averages is certainly skewed by the high values of 2007; however, even discounting 2007, there has been a 25% reduction in average winter PM_{10} concentrations – from about 60µg/m^3 to 45µg/m^3.

[3] *Winter 2011 Air Quality Results and Trends*, ORC Report Number 2011/1092
Winter 2012 Air Quality Results and Trends ,ORC Report Number 2012/1089

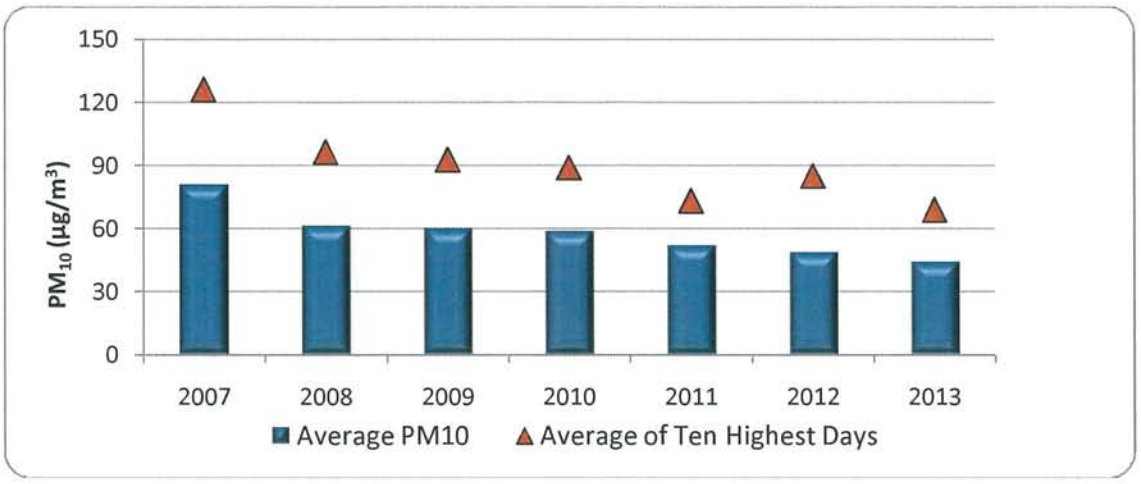


Figure 2. Averages of winter and ten highest days' PM_{10} on HPP days in Arrowtown.

4.3.2 Alexandra

Given the weather, 40 days were predicted to exceed the NESAQ standard; however, 47 days actually exceeded, as shown in Figure 3.

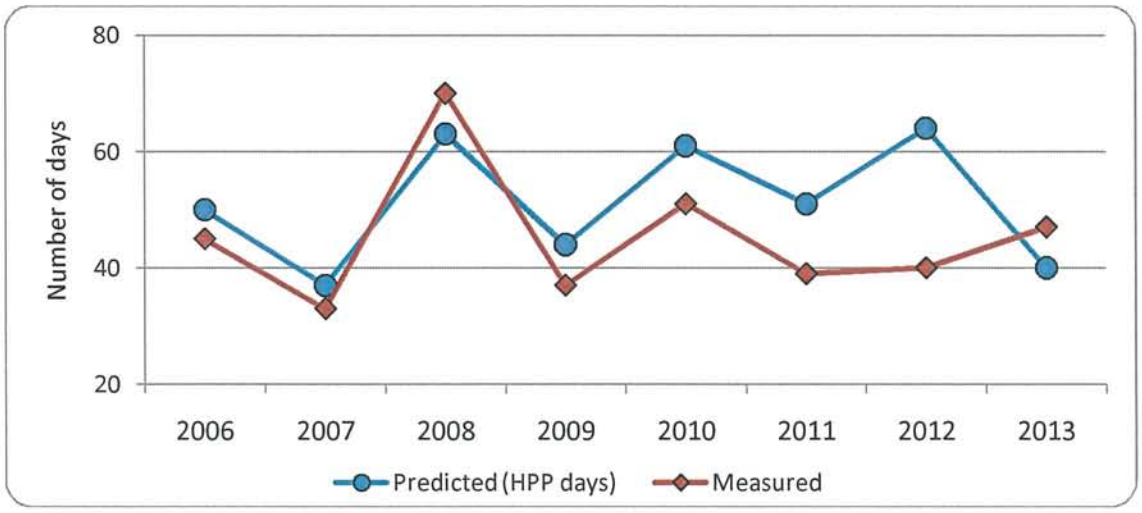


Figure 3. Predicted versus actual number of exceedances of the NESAQ in Alexandra.

The trend of improving air quality appears to have plateaued for this year. The reasons for this are unknown but might include:

1. changes in emissions near the monitor,
2. an increased use of high-emission fuels, i.e. wet wood, more coal, etc.
3. addition of an unknown quantity of PM_{10} from outdoor burning

In terms of winter averages on those HPP days when PM_{10} should be at its highest, there has been a significant reduction of concentrations, from 62µg/m^3 to 47µg/m^3 from 2006 to 2013, approximately 25%. Figure 4 shows the HPP-day averages along with the average of the 10 highest days.

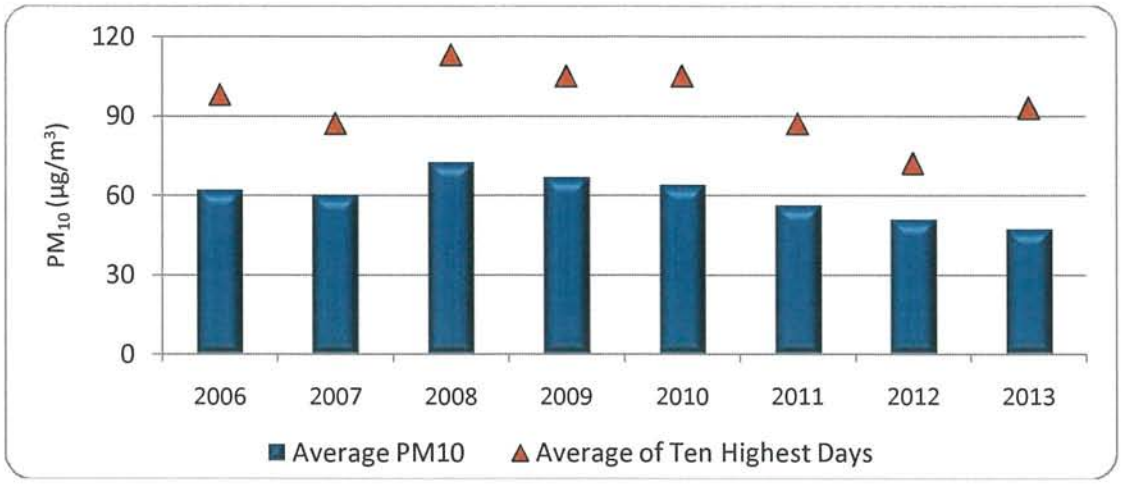


Figure 4. Averages of winter and ten highest days' PM_{10} on HPP days in Alexandra.

5.0 Forecasts for compliance with the NESAQ

To meet the requirements of the NESAQ, our MfE indicator sites - Alexandra, Arrowtown, Dunedin and Mosgiel - must not have more than three exceedances by 1 September 2016, and no more than one exceedance by 2020.

A large majority of people in Otago live in towns with relatively good air quality. Dunedin has experienced its best air quality this year since continuous monitoring began in 2006 and has met the NESAQ for two consecutive years. Mosgiel had just a handful of high-pollution days this year. ORC's air quality strategies have been working in these areas.

However, it is unlikely that Alexandra and Arrowtown (which represent all of Air Zone 1 plus Milton) will meet the NESAQ. There are approximately 5450 households in the Air Zone 1 towns (and Milton); this represents approximately 7% of Otago's total population of about 225,000 people[4].

Of these households, about 20% (1100) have participated in the CHCA compliant heating appliance scheme. This has resulted in an estimated 10-20% reduction of emissions in those towns. An additional, yet unquantifiable, amount of reduction may have taken place due to improved burning behaviour by residents. Original projections[5] for Alexandra estimated that in order to meet the NESAQ, approximately 70% of PM_{10} emissions needed to be removed during winter months.

Residents living in Air zone 1 towns and Milton experience some of the worst air quality in the country. These are also some of the country's most climatically-challenged areas in terms of air quality. Situated at the base of mountains, hills or dams in very cold and still winter environments, the physical volume of air available for

[4] 2013 Census

[5] *Predicted number of breaches of National Environmental Standard (NES) at Alexandra – Revised*, internal ORC report, 2007.

smoke dispersion can be very limited in these towns. This makes it extraordinarily challenging to lower PM_{10} concentrations.

Preliminary work on new projections indicates that even if the current rate of change was able to be sustained in Alexandra, achieving the air quality standards of the NESAQ is not possible by 2020. Sustaining the current rate of change is unlikely as well, given that the central government subsidy for domestic heating appliances has ended.

6.0 Discussion

Based on ORC monitoring data, MfE classifies all Air Zone 1 and 2 towns as "polluted" in terms of air quality. Once considered polluted, according to the regulations it takes five consecutive years of NESAQ compliance (one or less exceedance a year) to be re-classified as not polluted.

There are numerous challenges to meeting the NESAQ in Otago; these cut across social, economic, cultural, logistical, technological and the greatest climatological issues. A summary of these issues was expressed to the Ministry for the Environment in 2013, and is included as Appendix 3.

As stated in previous papers (2011/1024, *Air Quality Strategy and Long Term Planning),* Council has already programmed a review of its air quality management strategy in light of the 2013 monitoring results and the approach of the 2020 NESAQ deadline. The information in this report will inform the strategy review.

7.0 Recommendations

1. That this paper be received.

2. That the state of air quality in Otago be noted.

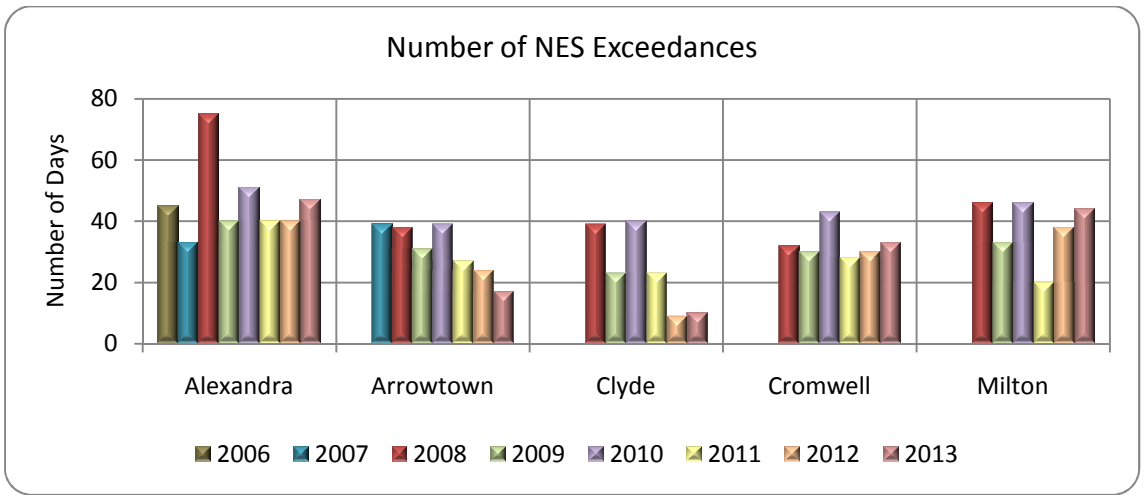
3. That the information in this paper be used to inform the planned review of the current air quality management strategy.

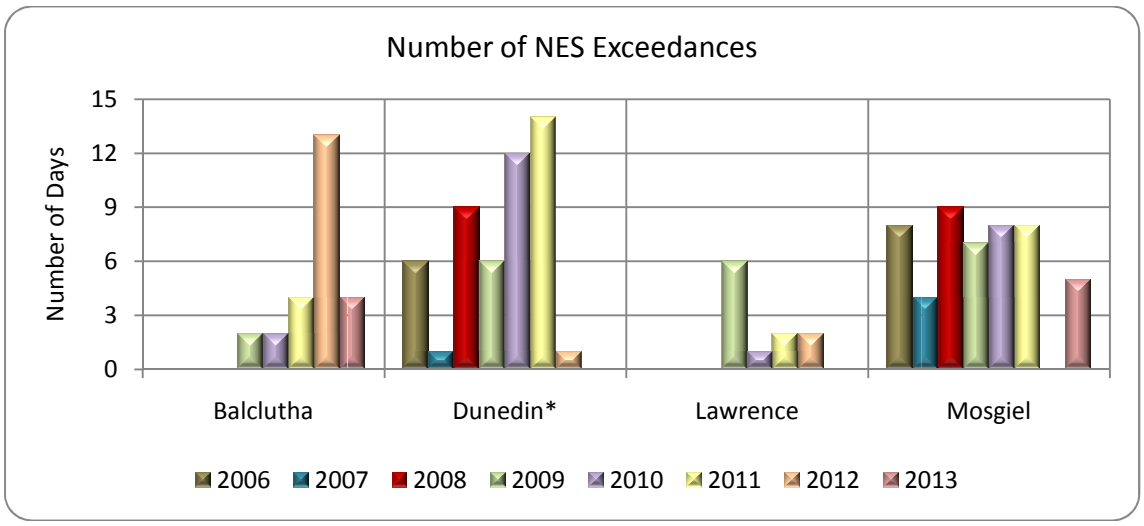
Gavin Palmer
Director Engineering, Hazards and Science

Appendix 1. Historical PM_{10} monitoring data for major Otago towns.

The two graphs below indicate the number of days that have exceeded the NESAQ in currently monitored Otago towns. Their lengths of record vary, depending on when a monitor was installed.

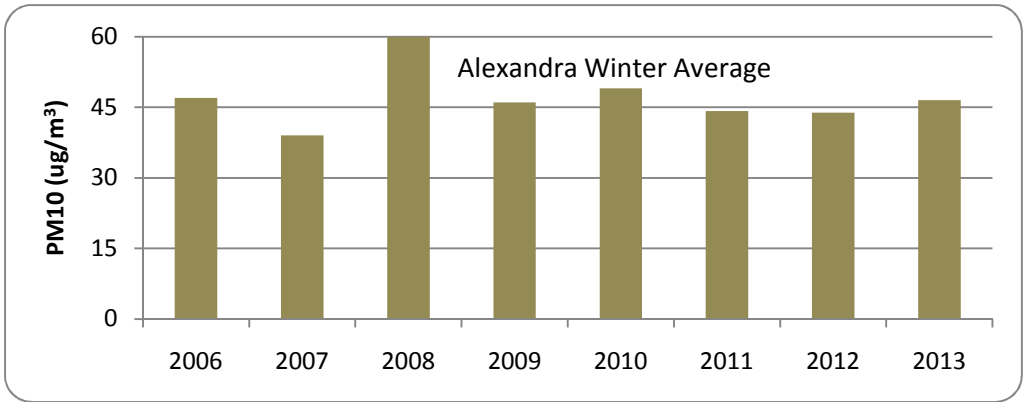
Note that data were not available for Mosgiel in 2012 and that the Balclutha monitor was moved within the town in 2011.

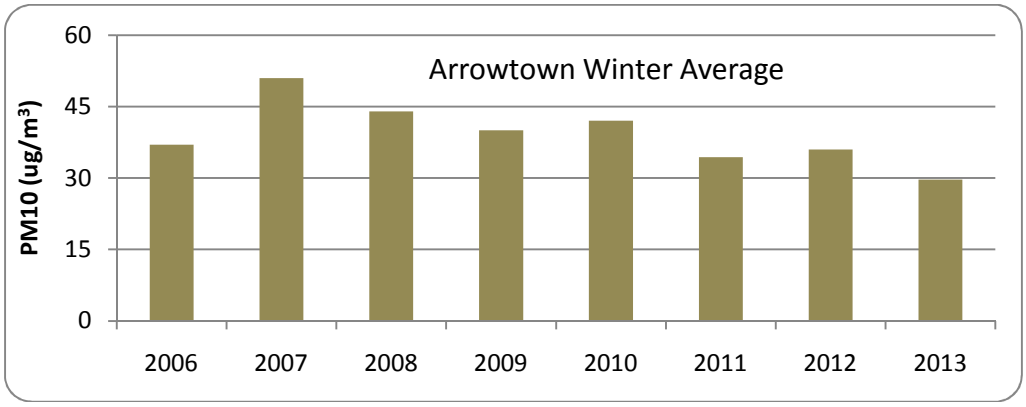


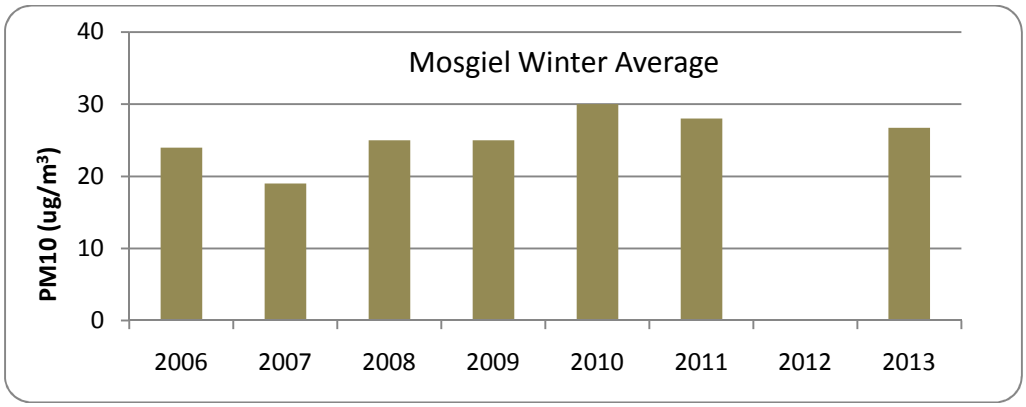


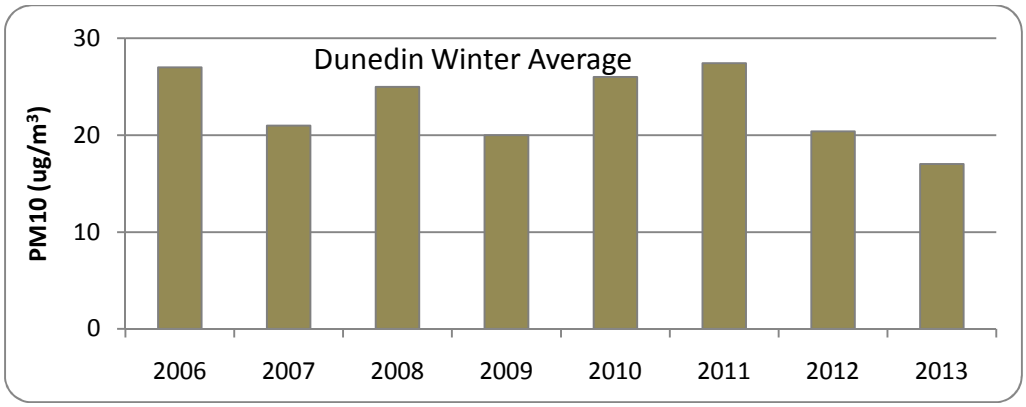
* During 2013, Dunedin recorded zero exceedances.

The following graphs show the winter PM_{10} averages at Alexandra, Arrowtown, Dunedin and Mosgiel since their continuous records began. These are the longest datasets and the sites with MfE-compliant monitors.


Alexandra Winter Average
PM10 (ug/m³)
60
45
30
15
0
2006
2007
2008
2009
2010
2011
2012
2013


Arrowtown Winter Average
PM10 (ug/m³)
60
45
30
15
0
2006
2007
2008
2009
2010
2011
2012
2013


Mosgiel Winter Average
PM10 (ug/m³)
40
30
20
10
0
2006
2007
2008
2009
2010
2011
2012
2013


Dunedin Winter Average
PM10 (ug/m³)
30
20
10
0
2006
2007
2008
2009
2010
2011
2012
2013

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Appendix 2. Descriptive statistics for 2013.

2013	Alexandra	Arrowtown	Balclutha	Clyde	Cromwell	Dunedin	Milton	Mosgiel	Palmerston
Summary									
Year Round average PM_{10}	32					18		22	n/a
Winter average PM_{10} (May-Aug)	47	30	28	28	37	17	44	27	25
Number Exceedances (in days)	47	17	4	10	33	1	42	5	0
Maximum PM_{10}	130	77	88	66	107	56	139	62	50
2nd highest PM_{10}	110	76	55	62	94	46	110	56	44
Number of Days > 100µg/m^3	2	0	0	0	1	0	3	0	0
Monthly exceedances (days)									
April Exceedances	0	0	0	0	0	0	0	0	0
May Exceedances	5	0	0	1	2	0	7	0	0
June Exceedances	13	12	2	2	10	0	12	4	0
July Exceedances	19	5	2	3	13	1	15	1	0
August Exceedances	10	0	0	4	8	0	8	0	0
September Exceedances	0	0	0	0	0	0	0	0	0
Winter day categories									
# of days under 35µg/m^3 LOW POLLUTION	45	80	94	89	68	118	52	90	64
# of days between 35-50 MED POLLUTION	31	26	25	22	16	2	29	17	18
# of days > 50 HIGH POLLUTION	47	17	4	10	33	1	42	5	0
% of days under 35 LOW	37	65	76	74	58	98	42	80	78
% of days between 35-50 MEDIUM	25	21	20	18	14	2	24	15	22
% of days > 50 HIGH	38	14	3	8	28	1	34	4	0
Monthly averages									
May Average	38	25	25	24	24	16	38	24	16
June Average	46	43	30	28	42	17	47	31	22
July Average	58	31	32	31	43	19	53	27	29
August Average	45	20	27	28	37	16	39	25	25

Appendix 3. Summary of air quality challenges in Otago (submitted to the MfE in 2013)

In airsheds that are failing the NES, emissions from solid-fuel domestic heating appliances have been found to be the overwhelming (>90%) source of PM_{10}. As such, the challenges and issues of meeting the NES lie within the very personal realm of people providing heat for their families, in their own homes.

There are significant cultural/social, economic, logistical, climatological, and technological challenges to meeting the NES.

Cultural/Social: Moving people from a traditional, familiar, and trusted heating source to something unfamiliar and, in many cases, more costly challenges people's cultural and social norms. Notions of self-sufficiency, including self-collection of fuel and relying on 'mates' for fuel, are still strongly held in much of regional Otago. A change to low- or no-emission burners such as pellet fires and heat pumps requires, to some degree, a leap of faith in not only the electricity and/or pellet supply but also in the quality and acceptability of heat. This is particularly true in Central Otago where stretches of up to three weeks of sub-zero overnight temperatures require a robust and dependable heat source.

Economic: Economic issues are also a challenge on many fronts. Fuel poverty is a well-documented phenomenon in some of Otago's airsheds. And whereas dry wood, diesel, LPG, and electricity prices have increased over the past 5 years, coal remains relatively cheap. In fact, in some Otago towns, free coal is regularly given to residents during winter. The incentive to willingly increase one's fuel bill is not strong, particularly when ambient air quality is often seen as secondary to keeping warm. Unfortunately, the argument for clean air has often been seen by residents as a choice between clean air and warm homes.

Logistical: The logistics of the wood supply chain is also an issue. Unseasoned wood will be the cheapest wood product, yet might take over a year to fully season. At the resident level, not everyone has the ability or space to properly store enough unseasoned wood for an adequate length of time. This may be particularly true on small sections in towns in Central Otago where perhaps up to 12 metres of wood may need to be stored.

In that case, there is a reliance on wood merchants, friends, or self-gathering in order to have a supply of wood through winter. That wood may not always be dependably dry as sales are unregulated.

Climatological: Since there are two factors in determining PM_{10} concentration – emissions and dispersion – the locale and climate of a town can provide additional challenges. A comparison of Alexandra and Balclutha provides an illustration of this particular issue. Population figures are roughly the same between the two towns; Alexandra has about 4800 people, Balclutha has about 4000. Coal use (according to the latest Census information) is higher in Balclutha than Alexandra, leading to Balclutha's higher estimated PM_{10} emissions during winter. In fact, Balclutha's town-wide daily winter PM_{10} emission is approximately 630kgs while Alexandra's is about 380kgs. Why then, does Alexandra experience over 40 exceedances of the NES per winter and Balclutha fewer than 10? Because these two towns experience very different climate regimes, with Alexandra's continental climate producing

very many cold, calm and clear nights. This leads to the formation of strong temperature inversions, causing air to stagnate and PM_{10} to intensify.

Technology: As shown through real-life testing of NES-compliant burners, laboratory results may not necessarily be indicative of actual emissions. Planning and policy made on 0.7 or 1.5g/kg emission rates may not yield the desired results if, in real life, emissions are much higher.

In addition, where there is significant human input into the home heating cycle, there will be unknown factors influencing emission rates. For example, burner tampering still occurs, allowing people to damp down their fires at night; people may be burning trash and other high-emission undesirable sources, etc.

A homeowner may have an NES-compliant burner but be using it in such a way as to create excessive emissions. That situation makes an already difficult compliance job that much harder. Plus, with no instrument to easily check emissions from a chimney, judging what is considered excessive smoke can become subjective. A long duration of slowly-emitted smoke may contribute more than what is normally thought of as an 'excessive' plume.

The slow development of the next generation of wood burning technology and testing is an issue. To eliminate the human element as much as possible, a truly technological solution needs to be found, whether it's a down-draught burner or domestically-sized boiler technology with built-in emission reduction gear.

Other:
The lack of a functional equivalent test for burners has possibly hampered the introduction of newer, cleaner technologies.

There may be a degree of clean heat 'message fatigue' in communities. That requires us all to keep the message sharp, fresh, and relevant.

Councils find themselves in the position of having to address and overcome the prevalence of poor housing stock, address concerns around fuel supply and reliability issues, and change traditional cultural norms, all in all a rather large task.

Future challenges: It is our view that while these challenges exist, it does not mean they can't be addressed. Regulation, education, introduction of new technologies and a sufficient length of time to adapt will likely see a change in majority attitudes and behaviours around what are acceptable levels of smoke in communities. We are already seeing that change and expect it to continue.

Otago Regional Council

REPORT

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1 Air, Surface-water and Groundwater

On 5 December, ORC received notice from MfE that the exceptional circumstance application for the air quality exceedance that occurred in Dunedin on 27 July 2013 had been successful. As previously advised to Committee, the application was made under Regulation 16A of the National Environmental Standards for Air Quality (NESAQ) which allows for exceedances due to "exceptional circumstances". As a result, Dunedin had its first year with zero exceedances (since continuous monitoring began in 2006) and the second consecutive year of complying with the NESAQ (one or fewer exceedances of the daily 50$\mu g/m^3$ standard per year). Air quality in Otago during Winter 2013 is the subject of a separate report to committee.

Staff undertook field trips with representatives from Ngai Tahu in the Lindis and Cardrona to discuss the minimum flow processes in these catchments. Key sites were visited, and specific instream, socio-economic, and cultural values were discussed. This is the first of several hui aimed at more closely involving Iwi in the minimum flow process.

Monitoring of the harvesting of farm forestry blocks on Berridale Farm near Milton has begun with pre-harvest surveys of in-stream and riparian habitat, sediment, macroinvertebrates and fish now complete. Turbidity probes have been installed, allowing continuous monitoring of turbidity upstream and downstream of the harvested blocks. Further surveys are planned to consider the effect of harvesting on in-stream values and the rate of recovery from any impacts. This information will be used to educate farm foresters on the likely impacts of harvesting practices and will be used to inform small forest owners of the likely mitigation required to comply with Plan Change 6A.

A trial to consider the effectiveness of the addition of alum (ammonium aluminium sulphate) to reduce phosphorus concentrations in two dairy effluent ponds in North Otago has started. This trial is aimed at providing farmers with a practical way of reducing phosphorus to comply with Plan Change 6A limits.

Weekly water samples have been collected from Lake Waihola following the detection of a cyanobacteria bloom in October, with warning signs erected warning the public of potential health risks associated with the bloom. Key community members and groups have been sent weekly updates advising them of the status of the bloom. The bloom declined rapidly in mid-November and the warning signs were taken down in late

Otago Regional Council

November. Weekly sampling continued until early January and counts of cyanobacteria have remained low. Sampling for cyanobacteria has been suspended following the prolonged low counts, although the accessible portion of Lake Waihola is visually inspected weekly for any signs of a return of the bloom. If the presence of cyanobacteria is noted in any of these inspections, weekly water sampling will be reinstated.

Planning and design for the Kakanui groundwater monitoring programme involving the installation of monitoring wells on private land at key areas throughout the aquifer has been completed. A meeting was held on 13 December with four farmers (private land owners) to brief them on the project and to discuss arrangements for land access. Drilling and installation of wells is expected to begin in late January.

Final easements for the upgrade of the State of Environment groundwater monitoring wells have been signed off and installation of the new wells in Queenstown-Lakes District and Central Otago are pencilled in to start in 5 weeks' time.

2. Natural Hazards, Civil Defence and Emergency Management

The joint ORC / DCC working group set up to incorporate natural hazards provisions into the Dunedin City District Plan has continued to make progress. The approach taken to characterise and map hazards, and the process of developing a planning response using this information has been confirmed. Work to date has focused on the flood hazard of the Taieri Plain, Kaikorai Valley and North East Valley; landslide hazard; and coastal hazards for the smaller communities along the Dunedin City coastline (excluding South Dunedin). A report summarising the technical hazard information is due for completion by the end of January, and a program of public consultation, involving both ORC hazards staff and DCC planning staff, is planned for March.

A joint presentation by ORC and Clutha District Council staff was made at the New Zealand Coastal Society Conference in November. This described the work undertaken by both councils to understand and describe the effects of tsunami and storm surge information, and how that information has been used by communities in Clutha District to create emergency response plans. The presentation was one of the few at the conference to describe the practical implementation of coastal hazard information at a local, community level. The joint work of the two councils was well received.

Staff attended the Tokomairiro A&P show on 14 December, as part of a program of work to assure the readiness and response capability of the Milton community for floods. A summary of the 'Flood Risk Management Strategy for Milton and the Tokomairiro Plain' was provided to the public, along with information about the Natural Hazards Database, Water Info, and other flood information sources. Approximately 20 members of the public visited the stall, and it provided a useful opportunity for locals to interact with ORC staff. The opportunity was taken to provide information about land management and water quality issues in the Tokomairiro catchment.

Information and support is continuing to be provided to the lifelines study being undertaken by the Otago Civil Defence and Emergency Management Group, utilising

Otago Regional Council

the Otago Natural Hazards Database. Staff are participating in briefings and workshops with lifeline utilities at which lifeline vulnerabilities and interdependencies are being identified. The work is one of the risk reduction initiatives of the Group.

3. Flood Protection, Land Drainage and River Management

The St David Street to Union Street works of the Leith Flood Protection Scheme are continuing, with enabling works (preliminary civil and utility works) mostly complete. The high voltage cable relocation work being undertaken by Delta is nearing completion, with the new cables progressively being made live and the redundant cables located in the excavation zone being disconnected. Modifications to the St David Street sewer have been completed, which will enable the sewer pipe to be removed from under the Water of Leith beneath the footbridge and in turn for the river bed to be regraded and the waterway area enlarged. Modifications to the Montgomery Avenue sewer have also been completed, taking this out of the excavation zone associated with the channel widening. Currently a section of sewer pipe along Castle Street is being relcoated out of the excavation zone. A contract has been awarded to Downer Construction Limited to carry out the main civil works, which are expected to be complete in May. The scale of landscaping works proposed for the left (east) bank has been reduced following further discussion with the university on design details.

Finishing and enhancement works are being undertaken to the Leith Street to Forth Street reach of the Water of Leith. This includes fencing and additional planting. Other refinements to the rock work downstream of Clyde Street will be made in summer.

4. Recommendation

That this report is noted.

Gavin Palmer
Director Engineering, Hazards and Science