

Report No. 00.210

1 May 2000

File: B/2/1/1

us-report 00.210-mdk1.doc

Report to the Utility Services Committee
from Murray Kennedy, Strategy and Asset Manager and
Karin Bradshaw, Laboratory Manager

Public Perception of Water Quality

1. Purpose

To provide information on water quality and maintaining public confidence in the Wellington water supply.

2. Introduction

This report results from a Councillor's request that officers advise the means by which the Wellington Regional Council (WRC) can maintain public confidence in the Wellington water supply. This is in the context of advertisements for water purifiers and distillers, which could undermine public confidence in the water supplied. Bottled water has been included in the investigation.

3. Bottled Water, Water Filters and Distillation Units

In recent years several products have been promoted as an alternative to reticulated water for drinking purposes or as additional treatment at the point of use. These products fall broadly into three categories;

- Bottled water
- Water filters
- Water distillation units

3.1 **Bottled Water and a Comparison with our Public Water Supply**

This is a growth industry, it is understood sales in New Zealand now exceed \$7M a year. It is seen as a convenience product. Many of the plastic containers are designed for re-use and it is not unusual to see them being refilled with tap water.

A selection of bottled water was purchased from two Wellington supermarkets. Choice of products was largely related to the amount of shelf space given to the product. These were in containers up to two litres. The cost per litre of the six products ranged from \$1.06 to \$1.39. One of the products was distilled water, however this was not the most expensive.

It is interesting to note that the unit price is comparable, or greater than, some well known brands of soft drink.

Various claims are made on the labels on the containers such as “[name of brand] is one of the purest waters in New Zealand” this refers to the source spring. Much of the language used is in marketing-speak. Some of the claims though are difficult to reconcile with the fact that three of the six products were ozonated before bottling. Ozonation is one of the most powerful oxidation processes for treating water. If the water is as good as it is claimed to be before bottling, why does it need ozonation? Four of the six bottled water samples had a recognisable bottling code number or a best by date.

Water samples were tested for turbidity and particle counts by staff from the Water Group’s IANZ registered laboratory.

The results are included in Attachment 1.

The rhetorical question was asked above as to why some bottled water may need ozone treatment if the source is as pure as is claimed. Perhaps the answer lies in the Heterotrophic plate count results, which can indicate the presence of bacteria. Product 5 does not claim to be treated, it has a high Heterotrophic plate count in excess of 5,700 colony forming units per millilitre. Colony forming units (CFU) from this test do not indicate the water is undrinkable, rather they indicate the presence of bacteria, and therefore further testing is warranted. None of the bottled water products had coliforms present.

Product 2 though is of concern to us. The water is claimed to have gone through a number of processes. It is claimed to be sterile but has bacteria in it. A second bottle of the same product was tested and gave even higher Heterotrophic plate results. Because of our level of concern the product has been referred to the Public Health Service for further investigation.

Attachment 2 shows the microbiological test results from the wholesale reticulated water supply system. No coliforms were detected from the Total Coliform tests in the 1998/99 year. For the Heterotrophic plate count, the median values do not exceed 2, all but one site gave a test result which exceeded 5700 CFU/mL. The total number of instances, where the count exceeded ten, was small.

The next stage of the bottled water testing was turbidity and particle counting. This was carried out at the Te Marua water treatment plant by laboratory and water treatment plant staff. The laboratory's terms of accreditation do not include tests using these particular instruments. Nevertheless, the testing was carried out to a high standard.

Turbidity and Particle Count Testing of Bottled Water

Bottled Water Product	Turbidity N.T.U	Particle Count Total >2µm/mL
1	0.024	4
2	0.026	11
3	0.048	35
4	0.034	6
5	0.033	31
6	0.186	37

Results of bottled water testing carried out at the Te Marua Water Treatment Plant on 27 and 28 March 2000.

The particle counter counts the number of particles greater than 2µm in size (1µm = ¹/₁₀₀₀th of a millimetre). Giardia and cryptosporidium particles are normally considered to be above 2µm in size. Bacteria are below this size.

The results from a recent university survey of 57 types of bottled water in America also found a wide range of colony forming units, see Attachment 3.

As a comparison the particle count of water leaving the Te Marua WTP is as follows:

Month	Average particle count per mL (readings every 2 minutes) Particles greater than 2µm
August 1999	54
September 1999	97
October 1999	56
November 1999	92
December 1999	Counter at another treatment plant during the month
January 2000	49
February 2000	55

The best steady state performance from the Te Marua WTP for a particle count >2µm is in the 8-10 range. This is when the raw river is of low colour and low turbidity. Backwashes at the plant filters and lower quality raw water lead to the higher monthly average particle count figures. Generally turbidity averages from 0.03 – 0.04 NTU.

Water leaving the Te Marua WTP is, on average, of a similar level of turbidity to

bottled water, but slightly higher for the particle count. Water from the Wainuiomata WTP is not quite of the same quality as the Te Marua WTP water. The average turbidity though is still less than 0.1 NTU. Water from the Waterloo WTP is of the highest quality as it is from a secure groundwater source.

3.2 Water Filters

There are a large number of water filters on the market designed for a variety of functions, for example, the removal of chlorine. Others may be designed specifically for removing giardia and cryptosporidium size particles. Prices vary but \$200-\$300 is not uncommon and plumbing costs are additional. Cartridges have to be replaced periodically at a cost of about \$100-\$150. The cartridge life depends on household usage but a year or more is not unexpected. Filtered water costs considerably less than bottled water. A \$120 cartridge treating 10,000 litres equates to 1.2 cents per litre. Unfortunately, some of the means of filtering or removing chemicals involves the use of very fine material; granular activated carbon is an example. The large surface area of the carbon creates a surface on which bacteria can grow. This does not imply that such bacteria are harmful, but they can be.

The United States Environmental Protection Agency, in its publication “What can I do if there is a problem with my Drinking Water” cautions as follows;

All Point-of-use and Point-of-entry treatment units need maintenance to operate effectively. If they are not maintained properly, contaminants may accumulate in the units and actually make your water worse. In addition, some vendors may make claims about their effectiveness that have no merit. Units should be tested for conformance with standards of the National Sanitation Foundation (NSF) or the Water Quality Association.

Some of the filters available in New Zealand have been tested by the NSF. While the NSF is regarded as a reputable organisation, it is difficult to ascertain whether their testing methodologies are entirely relevant to the NZ Drinking Water Standards.

There is an Australian/New Zealand Standard for drinking water treatment units – plumbing requirements, AS/NZ 4348 : 1995. As at mid March 2000, no point of use water filters sold in New Zealand had been registered as complying with this standard.

The Water Group’s laboratory had a serviced water supply dispenser, primarily for chilling water. A recent test of water from the unit showed that the water contained bacteria. Attachment 4 provides further details. Consequently, the supply contract has been cancelled. The water entering the filter/chiller, supplied by Hutt City, did not contain any colony forming units.

Some filters are purchased to remove the slight chlorine taste from water. Another solution is to leave a covered jug of water in the fridge for a few hours.

There is no doubt that water filters are useful for certain medical conditions. Also, where there may not be a reliable water supply, for example rain water or a private well. In metropolitan Wellington though, the public needs to be cautious when installing a filter, as it can be a means to degrade the water quality.

We have already taken issue about the claims made by one filter seller. This resulted in action by the Fair Trading Division of the Commerce Commission.

3.3 **Distillation Units**

These units boil water, turn the water into steam and then condense the steam, usually using the cooler room air. The domestic units are relatively slow, producing about one litre an hour and are usually more expensive to operate than domestic water filters. Boiling one litre from room temperature and then converting it to steam takes about 0.9 kWh. With an electricity cost of 10 cents/kWh, the production cost of a litre of distilled water is nine cents.

Some of the distillation units have been extensively advertised on television. Units cost about \$500 each. This seems expensive, as the units are essentially a low wattage kettle with a condenser unit.

Distillation largely removes dissolved minerals. The reason for removing the minerals though is uncertain. Humans have evolved over a long period and there have always been various minerals in the water we have drunk. In fact our bodies need a supply of minerals. Some of these minerals come from the water we drink, others from the food we eat.

4. **Reticulated Water Supply and Gradings**

The Water Group reports regularly to its four city customers on water quality. Results are also published annually in the Group's Business Activity Report. Details of the microbiological monitoring from the 1998/99 Report are shown in Attachment 2. Some of the results are from water tests carried out at the point of supply to our customers.

Water treatment plants are assigned one of six gradings by the Public Health Service.

Assessment is based upon source and treatment factors, grades are:

- A1 Completely satisfactory, negligible level of risk, demonstrably high quality
- A Completely satisfactory, very low level of risk
- B Satisfactory, low level of risk
- C Marginal, moderate level of risk, may be acceptable in some small communities
- D Unsatisfactory, high level of risk
- E Completely unsatisfactory, very high level of risk

Current gradings of The Water Group's plants are:

Te Marua	A	(surface water source)
Wainuiomata	C	(surface water source)
Waterloo	B	(secure aquifer source)

Wainuiomata WTP normally produces water of a very high quality, but has in the past produced turbidity spikes of short duration, leading to a C grading. This problem has been rectified although 12 months of supporting data is required when seeking re-grading. Later this year an application will be made to have Te Marua and Wainuiomata plants re-graded to A1. Waterloo WTP cannot be graded above B without chlorination. This is of some concern but Hutt City has expressed a preference for unchlorinated water.

While there is some minor deterioration in the water quality between the water treatment plants and whole sale points of supply to our customers, it usually is still of excellent quality. Once the water passes into our customers' networks, the Water Group is no longer responsible for water quality, however, from an end user's point of view, they are only interested in the quality of the water delivered to them.

The various zones within our customers' networks are graded by the Public Health Services from a to e.

This assessment is based upon reticulation condition, management, and actual water quality:

- a Completely satisfactory, negligible level of risk, demonstrably high quality
- b Satisfactory, low level of risk
- c Marginal, moderate level of risk, may be acceptable in some small communities
- d Unsatisfactory, high level of risk
- e Completely unsatisfactory, very high level of risk

The 1999 edition of the "Register of Community Drinking Water Supplied in New Zealand" divides our four city customers into 24 zones, gradings are as follows:

a	=	13
b	=	10
d	=	1
		24

The "d" grading is the eastern area distribution system of Wellington City and could be easily rectified by the City. Overall the consumers within the four cities can have a high degree of confidence in their water supply.

Technically, zones have a two alpha character grading. The first, in upper case, is for the water as it leaves the water treatment plant, and a second lower case letter for the

distribution system. For example an Ab grading.

5. Communicating the Quality of the Public Water Supply

A number of initiatives are undertaken to promote the activities of the Water Group and ensure the public are aware of quality of the water supply. Some initiatives are carried out in conjunction with our customers.

5.1 Water Treatment Plant Grading

The Council's policy is to target an A or A1 grading for the water treatment plants, where practical to do so. All plants incorporate features to automatically shutdown if the water quality does not comply with the Drinking Water Standards.

5.2 Catchment Management

Water catchments are managed to ensure the raw water is of a high quality. This includes rangers working in the catchments, monitoring of forest health, animal culling and where appropriate, restricting public access.

5.3 System Backup

There is a level of redundancy in the water supply system so that any one water treatment plant (Te Marua, Wainuiomata or Waterloo) could be shut down and base water demand still be met. Base demand is the year round daily demand excluding garden watering. Redundancy in the system removes the pressure to keep a plant operating when it should be taken offline.

5.4 International Standards

One of the Water Group's objectives is maintain accreditation under the ISO 9002 quality standard for water treatment.

Accreditation to ISO 14001, Environmental Management System is expected by 30 June 2000.

5.5 Water Availability

There are sufficient developed raw water sources to ensure demand can be met unless a 1 in 50 year or less frequent drought situation arises. Even then, the impact should only be on garden watering.

5.6 **Business Efficiency**

Efficiency gains together with lower interest costs over the last four years have allowed the wholesale cost of water to decrease by 4 percent in 1998/99. This followed a few years of constant prices. It is proposed to reduce the price a further 4 percent in 2000/01. These efficiency gains have been at a time when water quality has improved.

5.7 **Regional Council Annual Report**

This provides an overview of the strategic direction for metropolitan Wellington's wholesale water supply, long and short-term performance indicators and achievement against those indicators for the previous year. Generally available to the public through Council offices and public libraries.

5.8 **Water Group Annual Report**

This is complementary to the Regional Council's Annual Report. It provides a high-quality introduction to the Council's role in Wellington's water supply, the significant political and operational issues of the previous business year and a statistical record of supply quality, quantity, and financial performance including benchmark comparisons. It is distributed to customers, the media, business and political leaders, and other interested parties. Fulfils our reporting obligations to our customers. Six hundred copies of the most recent report were published. More than 500 of these have been distributed to date. (First published 1998).

5.9 **Video – Wellington Regional Water Supply, A brief history**

A 12-minute video about the development of metropolitan Wellington's water supply system, the Regional Council's role in water supply, a description of the present integrated system and the benefits that accrue to the public from this system. The video is shown to all groups that visit our treatment plants and is made available on loan to schools and other interested groups. (Created 1998)

5.10 **WRC Internet Site – Water Supply**

Website www.wrc.govt.nz/ws provides details of all aspects of the Regional Council's role in water supply. The site includes '*Wonderful Water*' a resource for schools that was developed by the WRC in conjunction with a teaching professional, specifically to meet the needs of teachers. The site address is given to people/groups requesting plant visits or information about Wellington's water supply. The site contains a generic WRC Water Supply E-mail address for making contact with us. (Site completed 1998. Content currently being reviewed.)

5.11 **Plant Visits**

Operations staff regularly host visits to our treatment plants. Visits include a video presentation, an explanation of the treatment process and a demonstration of the sophisticated treatment process and control systems at work. Questions are welcomed and visits can be tailored to the interests of specific groups. These groups range from water treatment trainees to politicians, school parties to Probus and Rotary clubs. More than 1,000 people visited one of our water treatment plants in the last operating year.

5.12 **Brochures/Map**

The Water Group has a collection of colour brochures that explain the Regional Council's role in water supply to Wellington, and give operating details of its main water treatment and distribution assets. Brochures are available at the Utility Services reception on the 4th floor and at the water treatment plants. Copies are sent to groups and individuals requesting information.

5.13 **Press Releases**

Our intention is to demonstrate the variety and complexity of work the Water Group undertakes, and the value to the public of that work. Officers of the Water Group have initiated 11 releases in the last 12 months. This is in addition to releases initiated by Communications and/or Regional Councillors. The introduction of the WRC's *Elements* has provided a further opportunity to promote 'good news' stories. This newspaper is delivered to all Regional households.

5.14 **Upper Hutt Science Fair**

Utility Services will participate in the Upper Hutt City Science Festival 2000 (20 to 23 July). The aim of the fair is to bring science and its daily applications in Upper Hutt to the notice of the local community, and to encourage young people into science-based careers. Operations will provide treatment plant tours to the public while Laboratory staff will demonstrate aspects of water quality testing.

5.15 **Speaking Invitations to Clubs, Professional Associations and Public Meetings**

Officers make themselves available to speak to a variety of groups. These have included Wellington City ward meetings, Rotary groups, the Master Plumbers' association and the Wellington Water Garden Society.

Generally these activities are low key, apart from the water conservation programme. Additional promotional activities could be undertaken, but at some cost. Ideally though a brand should be promoted. Apart from the WRC name there is no brand at present. It is probably best to leave this issue until after the current water integration initiative has run its course.

6. **Public Perception of the Water Supply**

As a water wholesaler we do not usually deal directly with end users, though our customers survey water users to measure their degree of satisfaction. Information from the customers' 1998/99 Annual Reports is as follows;

6.1 **Hutt City Council**

The 1998/99 Annual report states that 96 percent of residents surveyed are satisfied with the water supply service. In the year before it was 94 percent.

6.2 **Porirua City Council**

Porirua City does not specifically report on overall consumer satisfaction with the water supply. They report on quantity, quality and timeliness for repairs, all indicate a high degree of public satisfaction.

6.3 **Upper Hutt City Council**

For 1998/99 the city reported 95 percent of persons surveyed rated the water supply as satisfactory or better.

Upper Hutt City has indicated an objective in its Proposed 2000/01 Annual Plan of maintaining an Aa grading for the reticulated water supply.

6.4 **Wellington City Council**

In 1999, 81 percent of residents surveyed rated the continuity of the water supply as very good or good. In 2000 a new question about taste is to be added to the survey.

Three cities report on public satisfaction with the water supply and other measures. One city only reports on separate measures, not overall satisfaction. The results indicate that a high percentage of the public are satisfied with their water supply systems. This would include a basket of measures such as quality, pressure, taste, reliability and responsiveness to repairs.

7. **Communications**

The quality of the reticulated water supply is of public interest. It would seem appropriate to issue a media release after the Committee has considered this report.

8. **Environmental Issues**

There are no specific environmental issues relating to the report.

9. **Summary**

Given the cost per litre of the bottled water sold at supermarkets it was disappointing to note that two of the six samples were not of a high standard. One in particular was of concern, it claimed to be sterile but contained bacteria.

Our four city customers charge just over \$1 for a cubic meter of water (1000 litres) delivered to the consumers' premises for use at their convenience. An equivalent quantity of bottled water costs over \$1000 at a local supermarket, "transport home not included". For this sort of money the public should be able to expect a quality bottled water product. This is not always the case.

There has been much hype about water filters. The medium used in some, activated carbon, is loved by bacteria as a surface to grow on. The public should be cautious of using filters with activated carbon.

Point-of-use filters produce water that is cheaper than bottled water. Perhaps the question the public should ask the purveyors of filters is; why filters are needed at all in the metropolitan Wellington area in situations where there is a reticulated water supply?

It is interesting to note that none of the filters on sale have, as at March 2000, been certified as complying with the Australian/New Zealand Standard (AS/NZS 3497:1998).

Distillation units are expensive to purchase and they produce water that costs about 9 cents a litre. Unless there is a medical need for distilled water it is difficult to see the point in distilling it if a reticulated water supply is available in the Wellington area.

Water produced at The Water Group's water treatment plants is of a high standard. It complies with the Drinking Water Standards for New Zealand (1995). Water leaving the water treatment plants then travels through a water reticulation system to end users. While there will always be isolated problems the water that arrives at consumers taps at nearly the same quality as when it left the water treatment plants.

Generally the public is well satisfied with the product they receive from our four city customers.

10. **Recommendation**

That the report be received and the information noted.

Report prepared by:

Approved by:

MURRAY KENNEDY
Strategy and Asset Manager

DAVID BENHAM
Divisional Manager, Utility Services

KARIN BRADSHAW
Laboratory Manager

Attachments (4)