

## WATER, WATER EVERYWHERE...

*In our final article on “wicked” issues, writer SHELLY BISWELL asks how safe is New Zealand’s drinking-water?*

On 3 September Havelock North residents received the “all clear” that they could drink their water straight from the tap. It had been a long August for the town, with more than one-third of the town’s population of 14,000 reportedly becoming sick due to contaminated drinking-water. Test results suggest that campylobacter was the primary infectious agent, although the source of the contamination has not been confirmed.

### Asking questions

In mid-September the Government announced it would begin an independent inquiry into the Havelock North water supply contamination incident. Appointed inquiry members are Hon Lyn Stevens QC who will chair the inquiry, Dr Karen Poutasi CNZM, and Anthony Wilson ED.

The inquiry members will look at how the Havelock North water supply system became contaminated. It will also look at how that was addressed and how both local and central government agencies responded. They will present their findings at the end of March.

The Hawke’s Bay Regional Council is conducting its own investigation into the issue, with a focus on whether the water bores that supply the town’s drinking-water were sealed correctly.

The Health Act 1956, which was amended by the Health (Drinking-water) Amendment Act in October 2007, is the main tool for regulating our drinking-water supplies.

The Act applies to water suppliers that serve 25 or more people for 60 or more days per year or, if there are fewer than 25 people, where there are 6000 or more person/days. For example, if all 25 people using a water supply depend on that

water supply 365 days of the year that would be 9125 person/days (25 x 365) and the Act would apply.

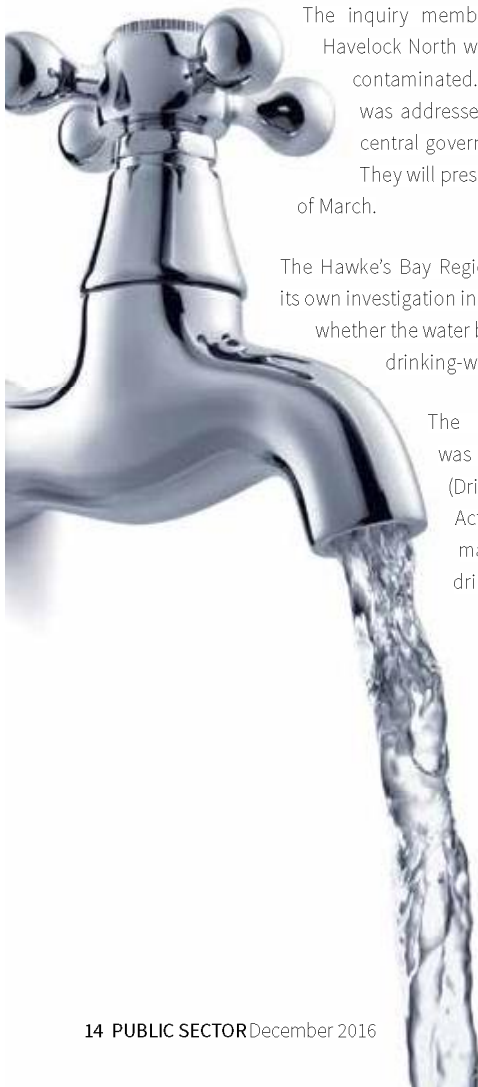
The Act went into force on 1 July 2008, but to give water suppliers time to prepare it was phased in. The Ministry of Health provides a table on its website that shows when types of water suppliers needed to comply with the Act, both under the original legislation and the extended dates that were announced by the government in 2009 to give water suppliers additional time to meet the requirements of the Act. The last two water suppliers that needed to comply under the legislation were neighbourhood drinking-water suppliers (serving 25 to 100 people) and rural agricultural drinking-water suppliers. These two types of suppliers were given until 1 July 2016 to be compliant. (Rural agricultural drinking-water suppliers can show that at least 75 per cent of their water supply is used for agricultural purposes and have a different set of compliance criteria.)

In terms of complying with the Act, according to the Ministry of Health’s 2014/15 annual report on drinking-water, which is prepared by the Institute of Environmental Science and Research, about 3,008,000 (79.4 percent) New Zealanders received drinking-water supplies which met all the requirements of the Drinking-Water Standards of New Zealand that year. Rates of compliance for bacterial (such as E. coli) standards, which the Ministry of Health calls the most important criteria, are much higher at 96.8 percent. But only 80 percent of drinking-water supplies met the protozoal (such as Giardia and Cryptosporidium) standards.

The report covers registered networked drinking-water supplies that serve more than 100 people.

Beyond the annual report, communicating the state of New Zealand’s water supplies is also done through the Drinking Water for New Zealand website ([www.drinkingwater.esr.cri.nz](http://www.drinkingwater.esr.cri.nz)). Developed in 1998 by ESR for the Ministry of Health, the database is used by district health boards and local bodies to schedule and monitor water samples and evaluate compliance with New Zealand’s drinking water standards. For the public, the website provides a snapshot of the state of water supplies around the country.

On the website you can type in the name of a town or region and find out the status of its water supply based on the latest published compliance with the drinking-water standards.



## Managing risk

Chris Nokes, a Science Leader from ESR's Risk and Response Group, says, "New Zealand uses a risk-based approach in managing drinking-water quality.

"Water suppliers use water safety plans, which are risk management plans, to protect drinking-water quality. Testing for every type of pathogen (disease-causing microorganism), for example, would be prohibitive cost wise, and more importantly by the time test results become available you may have had a contaminated supply for some time. Water safety plans identify things that may go wrong in a water supply so they can be addressed before they become a problem."

***"We say no one owns the water, but that position makes our water sources vulnerable."***

In preparing their water safety plans, water suppliers need to look across the full water supply chain – from "raw" water, through treatment, to the pipe network that carries the water, for factors that may create a health risk.

In developing water safety plans, water suppliers need to be aware of issues that may affect the quality of their source water. For example, geothermal activity can influence arsenic concentrations in a water supply. Based on this knowledge, water suppliers in areas with known geothermal activity may build regular arsenic testing and mitigation measures into their water supply plans. They should also plan how they will reduce the health risk if they find arsenic present at unsafe concentrations.

Perhaps unsurprisingly, because of the resourcing associated with preparing water safety plans, large water providers (serving over 10,000 people) have had relatively high compliance rates in terms of developing water safety plans.

As the Ministry of Health's 2014/15 annual report notes, however, "In general, the larger supplies have a greater level of compliance with their current requirements than smaller suppliers. However, for medium and minor supplies, more progress is needed to meet the progressively introduced requirements for water safety plans."

In the 10 years to 2005 the government offered \$10 million a year through a drinking-water subsidy scheme, to assist water suppliers, but that money ran out and the scheme was not renewed. Water New Zealand is now advocating for the scheme to be reintroduced and suggests \$20 million annually is required each for drinking-water and wastewater subsidy schemes.

As Water New Zealand Chief Executive John Pfahlert explains, "We've reached good levels of compliance with the drinking-water standards, but to continue to improve we're going to need to invest money and build capability, particularly in lower socioeconomic and smaller communities."

ESR's Chris Nokes says in the early 2000s New Zealand and Australia pioneered the risk-based approach to water supply

management. The World Health Organization, which wanted to encourage the approach, took notice of the advances New Zealand and Australia were making.

"We'd had a monitoring-based approach to managing drinking-water quality prior to the 2000s. Implementing risk management principles was a real game-changer," he says.

Still, the Ministry of Health says on its website that New Zealand has relatively high rates of preventable gastrointestinal diseases. "For example, the campylobacteriosis rate in New Zealand is twice that of England and three times that of Australia and Canada. This is at least partly attributable to contamination of drinking-water."

ESR reported 42 waterborne outbreaks with 131 associated cases in 2014, all of which were linked to a specific pathogen. The three most commonly reported waterborne pathogens were *Giardia* spp. (54.8 percent of waterborne outbreaks), *Cryptosporidium* spp. (23.8 percent), and *Campylobacter* spp. (9.5 percent).

Nokes says one way to reduce waterborne outbreaks is to make sure water safety plans are living documents. "They help guide water suppliers through a risk assessment and management process, but risk factors – such as land use – can change over time and water safety plans need to reflect these changes."

Drinking-water responsibilities of district health boards are undertaken by drinking-water assessors. Their powers range from reviewing records and asking for more information from water suppliers. They also conduct and ask water suppliers to take water samples for testing. To provide a check and balance, they approve water safety plans.



## At the source

Where drinking-water falls into the "wicked" problems category is that while drinking-water supplies are managed by local bodies, such as city councils, drinking-water sources are managed by regional councils under the Resource Management Act 1991 and National Environmental Standards for sources of drinking-water.

Going back to water safety plans, there can be a tension between the resource consents given by a regional council and the level of

risk a water supplier believes is acceptable.

That tension was illustrated at the end of August when Hastings Mayor Lawrence Yule told Radio New Zealand's Checkpoint that Hawke's Bay Regional Council shouldn't conduct its own investigation into the Havelock North outbreak, stating, "They are responsible for the aquifer and the quality of the groundwater and the issuing of all consents. So how can they objectively test our bores when they have a vested interest in proving that it's either us, or not them?"

Water New Zealand Chief Executive John Pfahlert says there are a number of challenges that New Zealand will need to address in the near future on drinking-water. When we interviewed Pfahlert he had just returned from Water New Zealand's well-attended annual conference.

"Some of the issues that received the most attention included iwi rights and the need to grapple with the idea of ownership and responsibility. We say no one owns the water, but that position makes our water sources vulnerable," he says.

Associated with ownership is water pricing. "Clearly at some point water suppliers are going to want to move to the highest value use.

"Another issue is in areas where catchment water is fully allocated, especially in areas that are facing growth pressures. There needs to be a consistent approach to help drinking-water suppliers find ways to assess water allocations. Are there ways to reallocate water that isn't being used? What happens when they say no?"

There's also a need for building capabilities in water management. Interestingly, this year during the Water New Zealand annual conference a management/thought leadership presentation stream was introduced and was extremely popular with attendees.

"Water professionals recognise the importance of building a more strategic approach to water management. Central government is currently considering changes to the Local Government Act to make it easier for Local Government to establish Council Controlled Organisations to manage water assets."

Pfahlert says at the core of all of these issues is moving to a better understanding that drinking-water is finite and has costs.

***"Not chlorinating water from shallow bores such as those in Christchurch is like driving without a safety belt."***

"As a country we've been resistant to measuring use. There is a general resistance to water meters, for example, but as our population grows and as other pressures such as climate change and land use affect our water supplies and sources we need to make changes."

A stark example of how water supplies are under increasing pressure occurred earlier this year when Ashburton District Council entered negotiations to sell commercial land to the foreign-controlled company NZ Pure Blue which planned to bottle South Island water for export.

The highly publicised deal was terminated by the council in the end, but had it gone through it would have included a 30-year resource consent that had not been publicly notified to extract about 1.4 billion litres of bore water annually.

***"The outbreak in Havelock North is a symptom of the environmental issues New Zealand is facing."***

### **The elephant in the water – chemical treatment**

During the Havelock North outbreak, Hastings District Council began chlorinating the water and announced it would continue to chlorinate for at least several more weeks.

As Hastings District Council Chief Executive Ross McLeod said during a press conference on 20 August, chlorinating drinking-water over the longer term is "a conversation for the community to have".



It's a conversation being had around the country in the wake of the outbreak, although for many communities it seems that chlorination remains an unpalatable solution.

For example, Christchurch City Council went against its own staff advice and unanimously decided not to consider temporarily chlorinating the water from eight shallow bores that serve about 20,000 residents in northwest Christchurch. Shallow bores are often more prone to contamination from surface sources.

In what appears to be an acknowledgement of the risks associated with shallow bores, the council is accelerating a programme to replace 22 shallow bores (including the eight in question). The

work was originally due to be finished by 30 June 2018, but that work is being brought forward so that most of the wells will no longer be used as a drinking-water supply by March 2017.

As Water New Zealand Chief Executive John Pfahlert said at the time of the council's decision, "Not chlorinating water from shallow bores such as those in Christchurch is like driving without a safety belt.

"We know that councillors are under pressure, often from very vocal groups of people who oppose adding chemicals to public water supplies, but they also need to remember that, as Havelock North has shown us, there can be very severe consequences when the risk doesn't pay off."

Even proponents agree that chlorine isn't perfect, water treated with chlorine can have an aftertaste and smell that many people don't like, and many people have an issue with adding any chemicals to their water supply. Just consider the ongoing battle with fluoridation in some New Zealand water supplies, in spite of the scientific evidence that shows its proven dental benefits. There's also additional costs associated with chlorinating the water supply.

### Thinking big on water quality

University of Auckland Professor Alistair Woodward and his colleague Research Associate Professor Simon Hales, Department of Public Health, University of Otago, published a blog in September suggesting that the Havelock North Inquiry needs to "think big".

As Woodward says, "Our point is that the inquiry should look at operations and procedures around drinking-water supplies, but there are stresses on our fresh water resources that need to be considered.

"These stresses range from population growth to changing land use and are reflected in deteriorating measures of fresh water quality, including a rise in nitrate levels and a fall in biodiversity, across the country, and are most marked in areas where dairy farming is on the rise."

Woodward says climate is another important driver of disease risk. The outbreak in Havelock North was preceded by the heaviest daily rainfall recorded in at least 10 years by the Hastings automatic weather station: 82mm in the 24 hours to 9am on 6 August. The rainfall may have caused the first substantial runoff in the area for nearly a year.

***"We need to look at whether we have the right settings for alerting the public to potential outbreaks."***

"We put forward in our blog the possibility that this weather event could have played a part in contamination of the water supply.

Local authorities need to build the effects of climate change into their water safety plans.

"The outbreak in Havelock North is a symptom of the environmental issues New Zealand is facing."

As Woodward and Hale summed up in their blog, "Of course it is important to detect and deal effectively with the threats in our drinking-water supply. But it would be a great mistake to be trapped by the hazard paradigm; this issue is bigger than organisms and disinfectants.

"We have to also tackle threats to our water supply. This requires up-stream thinking, on the scale of water catchments, agricultural economies and climate systems. It would be a great waste if the independent inquiry focused only on the proximate causes of the outbreak. The bigger question is what we need to do to protect the quality and sustainability of the New Zealand habitat."

### Weighing up the costs

While there are costs associated with treating drinking-water, the costs associated with infectious outbreak are high.

The Ministry of Health's 2015 (updated October 2016) Guidelines for Drinking-water Quality note that in 2004, OMS Consultants estimated savings of \$13 million to \$37 million a year by controlling waterborne disease. OMS used 1999 numbers (the most recent at the time) which were based on 18,000 cases of notified waterborne enteric disease data. A review by ESR in 2006 put the number of cases closer to 34,000 in 1999, which the Ministry of Health notes "would give a much higher benefit than that calculated by OMS".

The guidelines provide several examples, including an outbreak of campylobacteriosis in the Canterbury town of Darfield (population 1790) in August 2012 where 413 people became ill due to faulty chlorination of the water supply. The economic impact of the incident may have cost the town between \$300,000 and \$500,000, not including the time off school and





work for individuals affected.

In early September, the Hastings District Council put early estimates for their infectious disease outbreak at \$700,000.

Of course, there are also the costs to human health. Age Concern New Zealand Chief Executive Stephanie Clare says while older people and the very young are often most susceptible to infectious outbreaks, it's a concern for everyone.

"These type of outbreaks can be the 'last straw' for someone who has a compromised immune system. The results can be loss of independence, slow recovery and in extreme cases even death," she says.

"The goal is to make sure systems are in place so that this type of thing doesn't happen, but equally important is making sure good, solid communications exist so that credible and accurate information can reach people through a range of channels."

Clare says there have been many takeaway lessons from Havelock North. "There were things that could have been done better when it came to communicating information to people. We need to evaluate what went right and what went wrong and make sure other communities can learn from Havelock North's experience.

"One of the lessons is, who is responsible for communicating that information? Is it the local council or water supplier? Is it the regional council? Is it the district health board? Is it Civil Defence and Emergency Management? There needs to be a clear understanding – not just within organisations but by the wider public – about who is responsible for providing information and where people can find that information."

Tied to that, Clare says, is the question of when situations become emergencies and when the public is notified of potential drinking-water contamination. "We need to look at whether we have the right settings for alerting the public to potential outbreaks. People were getting sick weeks before there was a public health advisory in place, so we need to ask whether the public could have been informed earlier.

"It's better to err on the safe side and have people boiling their water than to end up with an outbreak of this magnitude."

Water New Zealand Chief Executive John Pfahlert doesn't mince words when he says we "dodged a bullet" with Havelock North. "As serious as it has been, the reality is it could have been far worse. One of the things that needs to come out of the inquiry is whether the systems we have in place are robust enough to address the increasing pressures on our drinking-water supplies."



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