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SEPTEMBER / OCTOBER 2020 ISSUE 216

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water

Issue 216 SEPTEMBER / OCTOBER 2020

INSIDE

- | | |
|--|--|
| 4 President's comment – two very eventful years
6 Association news and activities
8 2020 Conference keynote speakers
10 Jochen "Rainer" Hoffmann remembered
12 Te Wiki o te Reo Maori 2020 (Maori language week)
14 Profiling out-going President Kelvin Hill and in-coming President Helen Aitken
17 Three waters te Reo Maori poster
18 Stormwater 2020 online conference coverage
22 Michael Taylor obituary by Jim Graham
24 Political party policy on water
29 Industry training update
34 An industry leader moves on | 56 GIS Dynamic Catchment Risk Assessment Tool
58 Flood detention dam investment
60 Strengthening a seawall for a climatic future
64 Restoring Lake Hayes
68 Water management – Aussie lessons
70 Technology – Tunneling for tomorrow's wastewater |
|--|--|

REGULARS

- | |
|--|
| 36 Profile – Jason Colton
40 Veteran profile – Arthur Haughey
66 International – Drinking water lessons from Germany
72 International – Electrochemical process
74 Environment – Protecting marine environments
76 Legal
78 Water New Zealand wipes campaign
80 Comment – Philip McFarlane, WSP
82 Pacific – Oxfam
84 Comment – Gareth McCabe
86 Advertisers' index |
|--|

FEATURES

- | | |
|---|--|
| 30 Climate change and Three Waters
44 Domestic hot water research
46 Water reform – a Scottish perspective
50 Action for healthy waterways decoded
52 Emission calculation tool for water sector
54 Study into local microplastics | 74 Environment – Protecting marine environments
76 Legal
78 Water New Zealand wipes campaign
80 Comment – Philip McFarlane, WSP
82 Pacific – Oxfam
84 Comment – Gareth McCabe
86 Advertisers' index |
|---|--|

Cover Photo: The Hope River, Richard Sutton, ESR.
Fresh, clear water flowing from the mountains to the thirsty plains of Canterbury.

'Ka ora te wai, ka ora te whenua, ka ora nga tangata'
'If the water is healthy, the land is healthy, the people are healthy'



P34

P60

P70

The official journal of Water New Zealand – New Zealand's only water environment periodical. Established in 1958, Water New Zealand is a non-profit organisation.

Two very eventful and busy years



Kelvin Hill,
President, Water New Zealand

Those of us that have worked in the water sector for a number of years will be very sad at the loss of one of our most respected members of the drinking water sector. Dr Michael Taylor passed away recently at his home in Waikanae.

Michael dedicated his career to water safety – developing national drinking water standards as well as procedures for monitoring and surveillance of the quality of water supplies and methodologies for water supply. You can read more about his contribution on page 22.

We also sadly fare-welled another respected member of our community recently. You can read more about the contribution Rainer Hoffman made to the three waters sector on page 10.

On a brighter note, I hope those of you who joined our online Stormwater conference enjoyed the sessions as much as I did. While it was disappointing that Covid-19 meant we could not all be together in the one place, technology has certainly allowed us to continue to meet, discuss and connect with each other.

As I write this column we are optimistic that the decision to “go hard and go early” will mean that we will be able to get together for our Annual Conference and Expo in Hamilton later this month. But if not, our event organisers have plans in place to ensure that whatever the outcome, we will continue to ensure that our conferences bring a lot of value to the sector.

The conference will be my last official engagement as Water New Zealand President, just as this is my last column in that role in this publication. As I write this, I am preparing to pass the baton to our incoming President Helen Atkins (see more on page 14) at the conference.

These were certainly two very eventful and busy years to be President of Water New Zealand.

The legislation to establish the new drinking water regulator, Taumata Arowai, has passed through Parliament

and the complementary enabling legislation has been introduced. These provide the basis for major and much-needed changes.

Four years after the Havelock North contamination, the need to address the delivery and regulations around the three waters remains critical and we now have a defined pathway to help prevent another similar crisis occurring again.

The new regulatory environment will have a big impact on the way we operate. I’m looking forward to meeting members of Taumata Arowai at the full day workshop in Hamilton ahead of our annual conference. I am certain this will be a worthwhile event so for those of you who are working in this space, I would urge you try to get there if you can.

Of course, as we know, drinking water isn’t the only big issue facing us. While the recent National Climate Change Risk Assessment published by the Ministry for the Environment listed potable water as urgent and high risk, climate change will throw up all sorts of challenges for our infrastructure and the way we manage waste and stormwater.

Water New Zealand’s recently established Climate Change Group has been working on a pathway forward for our sector to mitigate capital and operational carbon emissions so that we can do our part to achieve national carbon reduction targets. See our article on page p28.

The new environment will also provide challenges and opportunities for Water New Zealand itself and we’ll continue to evolve to meet the needs of our membership.

Before I finish, I’d like to also take this opportunity to wish Raveen Jaduram all the best for his new ventures after six years and a very valuable contribution to both Auckland and the national water sector during his time as chief executive of Watercare. Another tribute to his fine work is on page 32.

For me, while I hand over the presidency, I’m looking forward to opportunities for new roles and continuing to be part of this dynamic sector as we adjust to the challenges ahead.

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Flood-prone septic tanks health risk

Water New Zealand says effluent leakages from flooding and poorly maintained septic tanks pose a significant health risk to the community.

Back in July, flooding in Northland led to raw sewage from septic tanks spilling into parks and a local school playground.

Water New Zealand Chief Executive Gillian Blythe says this is a major health risk and shows the need for better septic tank monitoring and risk assessment.

"There are around 270,000 private on-site wastewater management systems and septic tanks throughout the country servicing about 20 percent of the population."

She says owners need to be more aware of the potential risk for contamination of local waterways as well as private drinking water wells.

"In many cases, there is no ongoing monitoring of septic tanks, so it is left

to owners to ensure their units are well maintained and functioning properly.

"The risks dramatically increase when there is flooding. Water can flow into the tank and spill raw sewage into the environment.

"After a flood, there is a need not only to clean up the immediate spillage but also ensure that any damage to the surrounding soak area has been repaired."

She says councils need to identify septic tanks, especially those prone to flood risk and to work with owners to raise their awareness to help reduce risk of environmental contamination.

Water New Zealand recently produced a domestic users' guide for homeowners of septic tanks and on-site wastewater management systems.

The guide is available on the Water New Zealand website: www.waternz.org.nz/OWMScompletenguide

New legislation to transform drinking water safety and delivery

Water New Zealand says new legislation aimed at improving the safety of drinking water will transform the way water is delivered and give the new regulator a solid framework to help ensure the safety of all publicly supplied drinking water.

Association Chief Executive Gillian Blythe says the new Water Services Bill, giving Taumata Arowai the legislative tools to regulate the sector, will have a significant impact on water suppliers around the country.

"The bill requires that all drinking water suppliers meet drinking water standards and that they have a safety plan that contains a multi-barrier approach to drinking water safety.

"Currently, close to 40 percent of people receive water that does not comply with current drinking water standards or has unknown water quality.

"Far-reaching changes are needed to ensure we have the regulations and operational practices in place to reduce the risks of another Havelock North contamination event from occurring.

"The new legislation also sets out competency requirements and process to ensure that staff meet professional skills or qualification requirements."

Gillian says Water New Zealand has already been working with the sector to develop a competency framework and ongoing professional development to ensure a fit-for-purpose workforce.

"There is a skills shortage in the water sector, and

the new environment will mean increased opportunities for water professionals."

She says Water New Zealand, on behalf of its members, will be looking at the legislation in detail over the coming weeks and will be making submissions and representations to the government.

"We will ensure our members have the opportunity to take part in discussions and we will be listening closely to their feedback.

"Already we have a full day Taumata Arowai workshop planned to coincide with our annual conference in Hamilton in September. This will provide an opportunity for members to talk directly to the new regulator."



New Water New Zealand president Gillian Blythe (centre) dropped in to meet some of the association's Young Water Professionals in Auckland recently. At the get-together, Watercare staff shared their learnings from the Australia/New Zealand Young Water Professionals (YWP) conference. YWP member, Olivia Philpott says there were some great take-away messages and the conference had left participants feeling inspired and motivated to help shape the future of the water industry.

ALTA

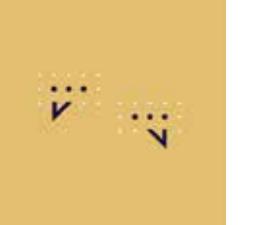
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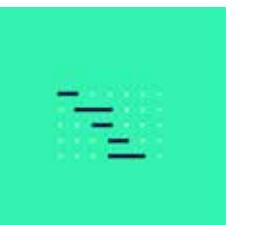
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Conference keynote speakers

The Water New Zealand Annual Conference & Expo in Hamilton, scheduled for September 16–18, features a great line-up of speakers.

Henk Ovink, special envoy for international water affairs, Kingdom of The Netherlands

Henk Ovink was appointed in 2015 by the Dutch Cabinet as the first special envoy for international water affairs. As such, he is responsible for advocating water awareness around the world, building institutional capacity and coalitions amongst governments, multilateral organisations, private sector and NGOs, and initiating innovative approaches to address the world's stressing needs on water.

"Worldwide, water is the number one global risk, the connecting challenge across the 2030 Agenda for Sustainable Development and our best opportunity for inclusive and comprehensive action!"

Henk Ovink served on President Obama's Hurricane Sandy Rebuilding Task Force where he led the long term innovation, resilience and rebuilding efforts. He developed and led the 'Rebuild by Design' competition and initiated the National Disaster Resilience Competition. Before joining the task force, Ovink was both acting director-general of spatial planning and water affairs and director of national spatial planning for the Netherlands.

Henk teaches at Harvard GSD, the London School of Economics and the University of Groningen.

His book, written together with Jelte Boeijenga, "Too big. Rebuild by design: A transformative approach to climate change" explores his climate and water work for the Obama administration.

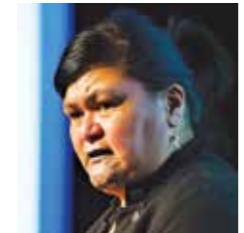
In January 2018 Henk Ovink was awarded an honorary membership from the Royal Institute of Engineers of the Netherlands for his 'transformative global water work'.



Henk Ovink

Hon Nanaia Mahuta, Minister for Local Government, Minister for Maori Development and Associate Minister for the Environment

As a mother, and a constituent MP with 20 plus years' experience who has come from 'flax-root' politics, Nanaia Mahuta remains connected to the aspirations of people from all walks of life. Those who work hard for a living so that their children can do better, kaumatau, tradespeople, those who aspire to own their home, those who own small businesses



Hon Nanaia Mahuta

and those who lead a range of services and organisations and huge iwi entities.

During her time in Parliament, Nanaia supported policies and initiatives that built the capacity of communities, especially social service organisations; greater investment in education, employment and training opportunities particularly for young people; supported the continuation of the Treaty Settlement process; and supported specific initiatives that lift the well-being and opportunities for young mums and those who are vulnerable and victims of abuse.

She is a tribal member of Waikato-Tainui, Ngati Maniapoto and Ngati Manu and her parliamentary experience has enabled her to contribute to the collective aspirations of Maori and all New Zealanders.

Bill Bayfield, chief executive, Taumata Arowai

Bill Bayfield joined Taumata Arowai in May 2020, following his time as chief executive at Environment Canterbury Regional Council (ECan).

He has an in-depth knowledge of drinking water and environmental regulation and is a highly experienced chief executive in both central and local government. Prior to ECan, Bill was CEO at the Bay of Plenty Regional Council for five years, before that, he was general manager, sustainable industry and climate change group at the Ministry for the Environment, and has also held senior roles at Taranaki Regional Council.

His appointment as establishment chief executive of Taumata Arowai is on a fixed-term basis to December 2021. He will lead the establishment of Taumata Arowai and its first six months of 'going live' in 2021 as the new drinking water regulator. The Taumata Arowai Board will consider a permanent appointment for 2022 and beyond.

Bill's appointment is a significant step in establishing this new Crown entity, so all communities have access to safe drinking water.

Colin Crampton, chief executive, Wellington Water

Colin Crampton is the chief executive of Wellington Water. Council-owned Wellington Water is responsible for delivering excellence in water services to the residents and communities of the metropolitan area of Wellington.



Bill Bayfield



Colin Crampton

Colin is passionate about leadership and collaborating with other entities. And if there's any free time, he'll be enjoying swimming or kayaking.

Raveen Jaduram, chief executive, Watercare

Raveen Jaduram was chief executive of Watercare Services for six years, resigning in August this year and will depart his role at the end of October. Previously, he has been the managing director and chief executive of Australian private water company Murrumbidgee Irrigation and has held numerous senior executive roles within the water industry in New Zealand.

Raveen is regarded as a global water leader.

In other service, Raveen is on the board of the New Zealand Infrastructure Commission – Te Waihanga. He has been an independent director of Wellington Water, president and chairman of the Water and Wastes Association (now Water New Zealand), chairman of the Water Sector Senior Executives Forum, on the board of the Committee for Auckland, on the Steering Group of the



Raveen Jaduram

Business Leaders' Health & Safety Forum and chair of the Centre for Infrastructure Research, University of Auckland.

Raveen did post graduate studies in business at Stanford, Macquarie and Auckland Universities and has also attended INSEAD.

Guest Speaker: Nigel Latta

Born and raised in Oamaru, Nigel first attended Otago University, where he completed an MSc in Marine Science. He then moved to Auckland where he trained as a clinical psychologist and graduated with a Master of philosophy with 1st class honours in psychology and a postgraduate diploma in clinical psychology.



Nigel Latta

Nigel has worked for the past two decades in a number of agencies including drug and alcohol rehabilitation, sex offender treatment programmes, family therapy agencies, Child Youth and Family, probation services, and extensively in private practice.

He continues to work as a clinical psychologist in private practice consulting with organisations and agencies from throughout the country, and has lectured on a number of senior courses at the New Zealand Police College.

Taumata Arowai Full Day Workshop

Important pre-Conference event

Come and find out what you need to know

The new drinking water regulator, Taumata Arowai, will be established next year. Taumata Arowai will be responsible for drinking water regulation plus have oversight of wastewater and stormwater.

This full day workshop is an opportunity to find out more about Taumata Arowai – the approach it will take, how it will operate, the changes that are happening and what you need to know about working in the new regulatory environment.

Come and meet key staff, listen to presentations and get answers to your questions.

Time: 9:30am – 4:30pm **Date:** 15 September 2020

Go to waternzconference.org.nz for more information and to register



Thank you to our Premier Partners



'Game of Thrones' quiz night winners

Water New Zealand's seventh annual 'Game of Thrones' quiz was held in Wellington recently. This year, the trophy changed hands! Congratulations to Wave Runners from Tonkin + Taylor who took the 'throne' home this year. Excellent work Melissa Fortune (right), Hannah Jagvik (left), Emily Wright (centre), Reuben Ferguson and Tung Hoang! Thank you to all the teams who attended, it was a great turn out and we trust everyone had fun.



Jochen "Rainer" Hoffmann 24 September 1951 – 20 June 2020

There are very few regions of New Zealand where Rainer did not have a significant influence on the planning and development of the wastewater treatment processes.

These include his extensive involvement in both the Chapel Street and Te Maunga Wastewater Treatment Plant upgrades for Tauranga City Council, conducting optimisation studies leading to a 13-year capital works programme and the development of the Selwyn District's Rolleston wastewater scheme, supporting the rapid growth within the Canterbury region.

Rainer came to New Zealand from South Africa where he was a director in a specialist wastewater consultancy and worked alongside Dr James Barnard who developed the Bardenpho wastewater treatment process. Rainer joined Stantec (then MWH) in 1999 when he and his wife Jenny and children arrived in New Zealand.

His legacy is borne out in the impact he has had on the people and organisations he has been involved with, striving



for innovation and excellence, providing a practical, everyday explanation to complex issues for everyone to understand. Rainer was a great mentor and supporter of young professionals. He was a team player and gentleman in so many ways.

During 2016 and 2017 Rainer and Jenny temporarily relocated to the UK to provide specialist review input to Stantec's process design teams.

Rainer was an active member of Water New Zealand and was the coordinator at the Canterbury region for a period.

Rainer published his thesis on "Phosphorus Removal in the modified Activated Sludge" and was the author of over 20 published papers on wastewater related topics, several of which were award-winning. In 2015 Rainer was the recipient of the Ronald Hicks Award for his paper on New Zealand's First Full Scale Biosolids Solar Drying Facility at Rolleston.

Rainer's influence will not be forgotten. Our water sector's sincere condolences to Rainer's wife Jenny and family. By Jim Bradley.



Water challenges are escalating around the globe, placing people and communities, our environment, and our very future at risk. By 2025, 1.8 billion people will be living in countries or regions with absolute water scarcity. We are a Fortune 1000 global water technology provider with one mission: to help our customers solve water through the power of technology and expertise. Together, we can make water more accessible and affordable, and communities more resilient. Let's create a world that is more water-secure and sustainable for all. We have the opportunity of a lifetime to solve water. Let's work together and lead the way.

#LetsSolveWater



Te Wiki o te Reo Maori 2020

Water New Zealand/Waiora Aotearoa is proud to once again tautoko (support) Te Wiki o te Reo Maori (Maori Language Week) on 14-20 Mahuru (September). By Troy Brockbank, WSP, and Emily Afoa, Tektus Consultants.

For the third year running, Waiora Aotearoa has produced a bilingual water-focused poster to celebrate te Wiki o te Reo Maori. This year's theme is 'te Mana o te Wai' (see page 17).

The National Policy Statement for Freshwater Management says: te Mana o te Wai is a concept that refers to the fundamental importance of water and recognises that protecting the health of freshwater protects the health and well-being of the wider environment. It protects the mauri (health) of the wai (water). te Mana o te Wai is about restoring and preserving the balance between the water, the wider environment, and the community."

te Mana o te Wai encompasses six principles that inform the implementation of the NPS-FM 2020, and relate the roles of tangata whenua (indigenous people) and other New Zealanders in the management of freshwater.

The first principle is mana whakahaere. This is the power, authority, and obligations of tangata whenua to make decisions that maintain, protect, and sustain the health and well-being of, and their relationship with, freshwater.

Second is kaitiakitanga, the obligation of tangata whenua to preserve, restore, enhance, and sustainably use freshwater for the benefit of present and future generations.

Third, manaakitanga, the process by which tangata whenua show respect, generosity, and care for freshwater and for others.

Fourth, governance. The responsibility of those with authority for making decisions about freshwater to do so in a way that prioritises the health and well-being of freshwater now and into the future.

Fifth, stewardship, which is the obligation to manage freshwater in a way that ensures it sustains present and future generations.

The sixth principle is care and respect. It is the responsibility of everyone to care for freshwater in providing for the health of the nation.

te Mana o te Wai provides a clearly defined hierarchy of obligations, prioritising the health and well-being of water bodies and freshwater ecosystems; the health needs of people (such as drinking water); and the ability of people and communities to provide for their social, economic, and cultural well-being, now and in the future.

This year's poster puts the health and well-being of wai in the centre.

It incorporates concepts introduced in previous posters

including te Hurihangā Wai (The Water Cycle, 2019) and Nga Momo Wai (Types of Water, 2018). It is intended to expand on these concepts to illustrate the different stages of water, and corresponding mauri (lifeforce) and hauora (health).

The holistic nature of 'te Mana o te Wai' is further demonstrated through the interconnectedness of water.

The poster also includes Nga Wai-o-rangi (Waters of Ranginui/sky) and Nga Wai-o-nuku (Waters of Papatuanuku/earth), connecting the physical realm to the spiritual, and demonstrating the requirement that waters, especially those whose mauri has been diminished, are returned to and connected to the earth and sky for cleansing and for their mauri to be enhanced.

Although te Mana o te Wai has been developed for freshwater management, it has relevance for all interconnected water: drinking water is typically sourced from freshwater sources; wastewater effluent is typically treated to a high-water quality standard and discharged to land and waterbodies. This can affect receiving waters, including groundwater and freshwater sources; and stormwater runoff is often directly connected to freshwater.

Te Wiki o te Reo Maori

Maori Language Week has been celebrated in Aotearoa since 1975. This year's theme is Kia Kaha te Reo Maori. 'Kia Kaha' is well-known and used in New Zealand in its correct meaning of 'be strong'.

We often talk about languages as if they are people – talking about language health, strength, and revitalisation. When we say 'Kia Kaha te Reo Maori' we're saying, 'Let's make the Maori language strong'.

As Te Taura Whiri i te Reo Maori (the Maori Language Commission) says; '*Strength for an endangered language comes from its status, people being aware of how to support revitalisation, people acquiring and using it and from the language having the right words and terms to be used well for any purpose.*'

Te Wiki o te Reo Maori is not just for Maori or te reo Maori speakers. It is an official language for everyone. But, more importantly, it is to encourage non-speakers to take part and give it a go.

Ten ways to add te Reo Maori into your everyday work

Give it a go and korero (speak) Maori. Don't worry about what others think, feel the fear and korero anyway!

1. Practice pronunciation in te Reo Maori – greetings and place names are a good start.
2. Greet your colleagues, family, and friends with kia ora (hi/hello), ata marie (good morning) or mauri ora (cheers, good health).
3. Learn and practise your pepha (introducing yourself in Maori). Encourage your colleagues to do the same and share with each other.
4. Enrol in a te Reo Maori and/or Tikanga course near your home/work.
5. Change your PC's keyboard to te Reo Maori mode, i.e. setup macrons.
6. Have a conversation about what you think when you hear the kupu (word) "wai" (water).
7. Go to waternz.org.nz to download the bilingual wai poster and pin it up in your office, or by your desk. Try to use the Maori terms on the poster in place of English ones.
8. Start up a waiata (singing) group.
9. Download and use a te Reo app on your phone (see below).
10. Purchase "Maori at Work" by Scotty Morrison and incorporate into your workplace.

Urban stormwater can pick up contaminants and requires treatment prior to discharge.

The NPS-FM 2020 requires all regional councils and local authorities to 'give effect to te Mana o te Wai'.

Further, Taumata Arowai, the new water services regulator (in process of establishment), is also required to give effect to te Mana o te Wai as part of its objectives.

This has relevance for all water practitioners involved in the planning, design, construction, and operation of three waters infrastructure. It ensures that a holistic catchment framework

is applied, and the rights of water are put first.

Nga Wai Manga (the Urban Water Principles) are 10 principles developed by the Urban Water Working Group and recommended to protect and restore te Mana o te Wai in urban contexts. They are another resource to help guide decision-making at all levels and promote the creation of water sensitive urban spaces by drawing on matauranga (Maori knowledge), the lessons of the past and international best practice, the needs of our present communities, and a vision of a sustainable, resilient future.



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Changing of the guard

A new president is taking the helm of the Water New Zealand board. **Mary Searle Bell** spoke with out-going president Kelvin Hill about his time leading the association and to his replacement, Helen Atkins, about her plans to tackle the big challenges the industry is facing.

Building industry capacity and capability

This year, Water New Zealand has stepped away from choosing the usual engineer or scientist as its president and has instead elected a lawyer to the role. **By Mary Searle Bell.**

Helen Atkins has been working as an environmental and public lawyer for about 25 years. She has her own firm, Atkins Holm Majurey, and over the past 15 years or so, has been a member of Water New Zealand and served on the board for the past six years. She has also provided regular legal comment and advice in this journal for many years.

"I can't remember how I came to write in the journal. I spoke at a few conferences back in the day and it may have risen from that."

She also did some work from time-to-time for the board and provided advice of various reviews to the Resource Management Act. During the tenure of Steve Couper as president she was shoulder-tapped to be a co-opted member. After two terms, she was elected onto the board.

"I find it fascinating," she says of the industry and the

challenges the association tackles. "I'm not an engineer, but in my day job, I do interact with the water sector particularly in the freshwater policy space."

"Things like, who should get freshwater and who should have access to it."

"What has been curious up until recently though, is that the discussion often centred around dairy and horticulture, while water services didn't get a mention."

"It's only been since the Havelock North outbreak that the public are aware that they get water that might be contaminated, and we are only now looking at the bigger picture."

Helen says, unfortunate as it was, one silver lining from the Havelock North incident is it provided the impetus for change that the industry desperately needed.

For many years water services was often the poor relation, she adds, falling behind libraries, museums and events centres when

it came to council spend. However, that is no longer the case.

"It is clear that freshwater quality is one of the most important environment issues. Now that the link to drinking water and freshwater is better understood by the public, water services are clearly on the radar."

"We are entering a time of immense challenge for the sector. It has been underfunded for a very long time and there is a lot of catching up to do. And the cost is eye watering!"

Even with all the changes and difficulties, Helen says that this is a very exciting time for the sector.

"The government has listened. It has proposed a change in the rules governing the sector and has put its money where its mouth is. While the money is not likely to be enough – it is a great step in the right direction."

"Obviously local government will have to step up to and, from my observations, they are up for the challenge."

What is currently underway is a fundamental shift in the way water is managed. With the Water Services Bill likely to be enacted early next year and taking the next two years to be implemented, Helen says it will be a dominant presence throughout her presidency.

"It is my job to support the industry and to work with the new regulator, Taumata Arowai, to ensure the safe drinking water



value proposition is achieved.

"It is vital that the association remains relevant to its members during this time."

Building industry capacity and capability will remain a big priority for the association under Helen's leadership.

"The board reviewed the strategy in November last year and made a few tweaks to ensure it is future-proofed. I think it is right for the next two years."

As someone working outside the industry, this distance enables Helen to appreciate the whole water picture.

"I can step back as I'm not involved in it on a day-to-day basis and see things from a different perspective."

"Having our new CEO Gillian [Blythe] on board at this time is great. Gillian and I have a similar approach to solving problems and we will work incredibly well together to assist the strategy at all levels."

"While we are in unchartered waters to some extent, the association is in a really good space."

"Kelvin has done a fantastic job as president, keeping the 'wheels on the bus' and more through some rough times. Kelvin, with the board, has been instrumental in directing our strategy and I consider myself very lucky to be following in his sound footsteps."

"Now is a real opportunity for our sector to shine."

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Implementing new opportunities

For the past two years, Kelvin Hill has led the Water New Zealand board and, during his time, significant changes have impacted the sector and the association. **By Mary Searle Bell.**

When I took over the presidency from Dukessa Blackburn-Huettner, the water regulator proposal had just been announced,” says Kelvin.

“This prompted us to sit down as a board and do a strategic review of the whole organisation.

“From that, a couple of key things popped up. First, the role of being an advocacy type organisation needed looking at – we had no representative from our younger membership on the board, and with an aging workforce it is important to have the voice of the next generation.

“We also had no one to give us insight into Maori views on water. To address that, Troy Brockbank was co-opted to the board.

“We reviewed our purpose for existing and came up with a mission statement that encapsulates what we’re about: ‘If the water is healthy, the land is healthy, the people are healthy’.”

Under Kelvin’s leadership, there was a big focus put on training in the sector, as well as workforce capacity.

“We still have a way to go, but we have made good progress. Certainly, employing Jim Graeme to progress this important piece of work was pivotal to the association’s success.

“Although Jim moved into the newly established Taumata Arowai, we are fortunate that Mumtaz Parker decided to accept the training manager’s role and has carried on in progressing this work.”

It’s a cause pretty close to his heart. In his regular job as utilities manager for Western Bay District Council, Kelvin works closely with neighbouring Tauranga City Council and they are currently out in the market with a joint three waters maintenance contract that has a requirement in it that stipulates a certain number of trainees need to be employed each year and enter a qualification pathway within the water sector.

“This is around building resilience in the industry and building technological knowledge in the district – passing that local knowledge from one generation to the next.

“Councils need to recruit more youth. Often people plead that they train the young ones up and then they promptly leave. But they have to realise that if every organisation trained young people, they would continue to shift around but stay within the water industry.

“Also, by moving around from organisation to organisation, people gain a wider experience, which is good for everyone.”

There is a chronic shortage of people in every part of the water sector, Kelvin adds.

“With the baby boomers retiring, there is simply not enough people to replace them.

“Often, young people have fallen into the industry. We don’t do enough to promote ourselves and the careers we offer.



“We need to push this, from operators to engineers to admin staff – it’s a real growth area in the country at the moment.”

This is an area of focus for Water New Zealand going forward to promote the water sector as a great place for a career path.

Internally, within the association itself, there is also going to be a need for more staff.

“As part of our strategic review in the water space, we undertook an exercise around what we could look like at full capacity based on marketplace and discovered we could need around 12 to 14 staff instead of the current nine,” says Kelvin.

“We rely on membership levies and the conference for funding, so this is tricky, but our Technical Manager, Noel Roberts and Principal Data Scientist, Lesley Smith, need an additional support person to provide assistance with technical matters as well as around servicing our growing membership.”

One of Kelvin’s big challenges was the recent change in CEO within Water New Zealand.

“With John Pfalhert deciding to retire, it was imperative to find a replacement CEO with the right skillset to steer the ship in these turbulent times.

“The current direction central government is taking with the three water reforms has changed our organisation’s approach in terms of its operational focus, with less emphasis on advocacy and a greater emphasis on a collaborative and factual gathering of information to help formulate opinions and provide sector feedback.

“Gillian [Blythe] was chosen because of her background in the power industry at a time when it was going through change, much like the water industry is now.

“I think she will be great in the role.”

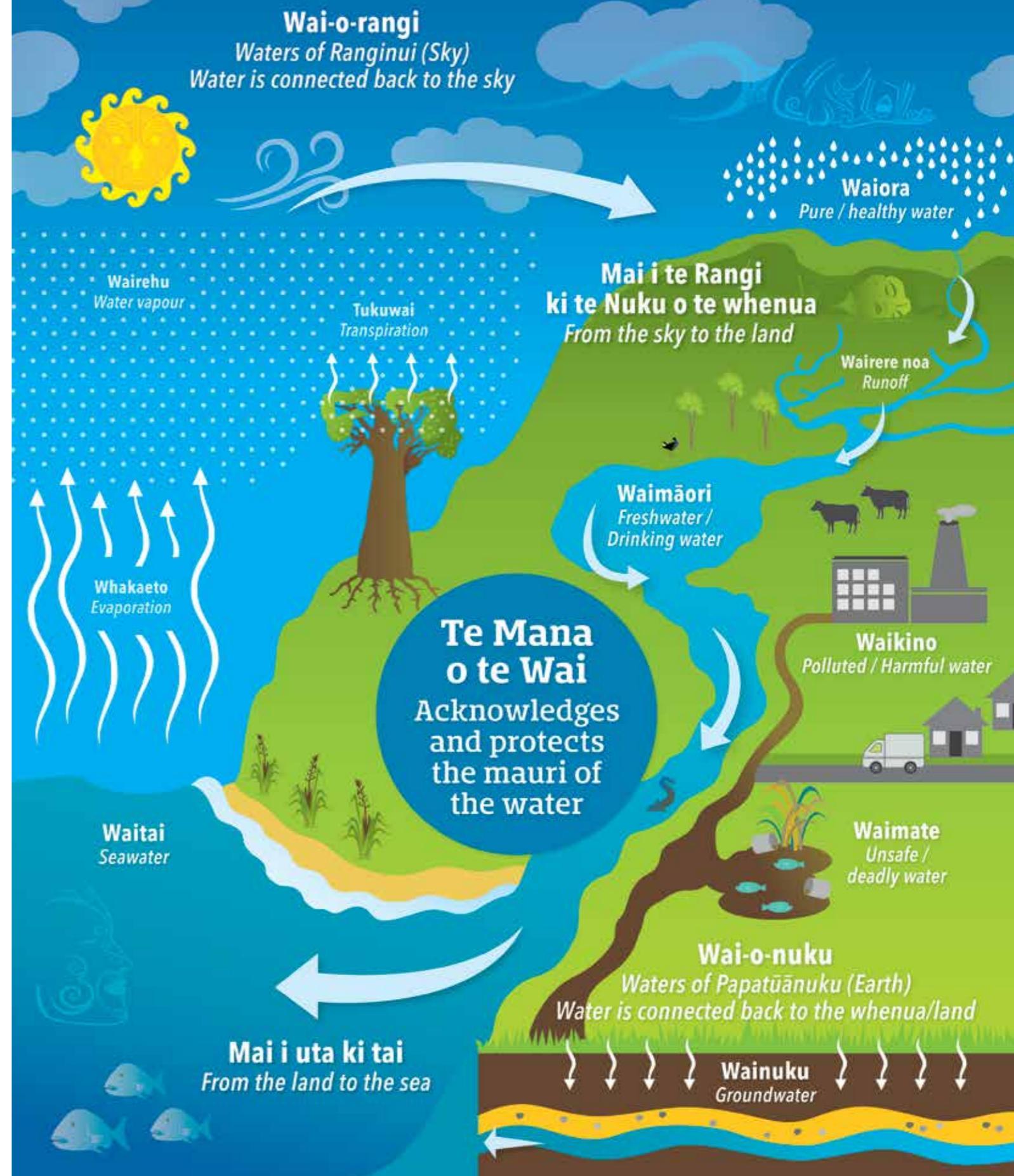
With his presidency done, Kelvin is still keen to serve the association. Although, currently, there is no role as immediate-past-president, he will continue to chair the water utilities group and will possibly continue to serve as a co-opted member of the board if opportunity arises.

“I don’t intend to disappear,” he says.

“There’s a healthy list of candidates with some great skill sets and experience for this year’s board elections with two vacancies on the board, which is great. They are going to face a range of challenges going forward in the next three years.

“Certainly, with the new regulator coming into play next year and the potential water reforms that follow, there is going to be some big challenges and implementation opportunities going forward. I would like to be part of the team going forward.

“I want to see a good outcome for the industry and the public, with safe, clean drinking water being available for everyone, now and for future generations.”



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Stormwater online conference a huge success

With Auckland in Alert Level 3 and the rest of the country in Level 2 the Stormwater 2020 conference went fully online for the first time in its history. Many of the sessions will be on the Water New Zealand website.

Access to Stormwater 2020 was through a clever and simple portal and individual links offering water professionals a two-day binge-watch of stormwater presentations that had been pre-recorded and three, live keynote speakers including an opening address from the Minister of Local Government, Hon Nanaia Mahuta.

The two other keynotes were Annette Lees and Tom Schuler, and delegates had the option of viewing and participating in four streams offering a total of 58 speakers, sponsors and exhibitors with cutting-edge stormwater information, innovation and technical knowledge.



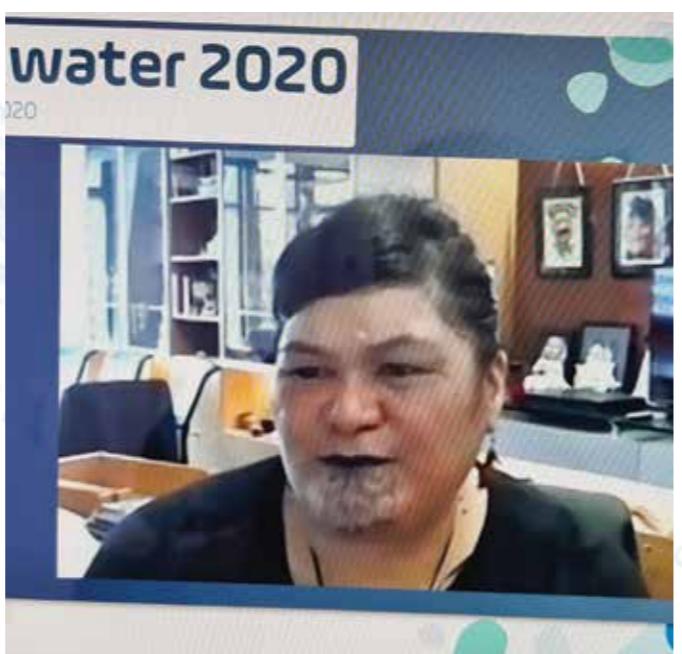
MC'd from a garage in West Auckland

As MC Te Radar opened the conference from his garage in West Auckland with a light-handed trivia review of our country's most humorous prison escapes, and rain and floods while watchers were encouraged to vote in a flood damage survey. As the regular conference MC his house-keeping and safety message in the event of an emergency was unique to say the least.

Explaining Taumata Arowai

In her keynote speech Hon Nanaia Mahuta thanked Water New Zealand for organising the conference and continuing an important discussion in what has been an intense and challenging year with the biggest water sector reforms in decades.

The minister discussed in detail the Government's approach to all three water aspects as lead minister behind the reforms and the new regulator – Taumata Arowai, which will work closely with regional councils and water professionals. "I am pleased to say good progress has been made," she said while encouraging conference delegate participation in the new regulatory regime and thanking the association for its "openness" and contribution in the overall discussion. During question time, the new Water New Zealand Chief Executive Gillian Blythe asked the minister for the meaning of Taumata Arowai. The minister explained it was her own recommendation to the regulator and, as conceptional title (as opposed to a literal one), it encompasses a holistic view of all water as 'life-giving'.



Expert advice on urban watersheds

Tom Schueler from the Chesapeake Stormwater Network zoomed in from Baltimore in the US to speak on his 35 years of experience in practical aspects of stormwater and restoration practices to protect and restore urban watersheds.

Tom directs the Chesapeake Stormwater Network, a non-profit devoted to training and engaging the public and private sectors to build more sustainable practices.

"Our mission is to help restore the Chesapeake Bay and the thousands of miles of streams that drain our nation's watershed," he said.

Tom also serves as the stormwater coordinator for the EPA Chesapeake Bay Program, and has guided a dozen expert panels to consensus on the best practices to reduce runoff and pollutants from the urban sector. Some notable expert panels

included stormwater retrofits, stream restoration, low impact development practices, urban nutrient management, street cleaning and floating treatment wetlands.

He is also familiar with our own watersheds, having first visited here in 1992 to work on a shallow wetland project for the Auckland Regional Council.

He pointed out the island watersheds are different (they are younger, for instance) from continental ones, although urban landscapes are similar.

He told us the trend in North America is to go beyond the normal stormwater models and take a holistic approach to watersheds with "an eco-system approach" involving "healing" streams and stream restoration, network repairs, sediment entrapment and restoring wetlands and shorelines.



Water and swimming, a touching presentation

A much anticipated keynote presentation that opened the second day of the conference was made by Annette Lees, the author of *Swim: A Year of Swimming Outdoors In New Zealand* (Potton and Burton).

Annette delighted viewers with her personal story of her life-long relationship with water and our unique affinity with swimmable water. She even apologised for her damp hair as Annette had already been for an early morning dip down at her local beach.

This presentation was based on her book *Swim*, which is a social history and personal story of Kiwi love of swimming in creeks, rivers, estuaries, lakes and the sea, and was long-listed for the 2019 Ockham New Zealand book prize's Royal Society award for non-fiction.

Annette Lees also directs Alternative Endings, a consulting business with a special focus on strategy, complex problem resolution, capability and sustainability of organisations along with design and evaluation of public good projects, programmes and issues.



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2020 Stormwater Professional of the Year Award

This award is to recognise an individual within the industry that has had a significant contribution to stormwater management and development within the wider spectrum of engineering, research or industry.

This year the award was presented to **Clare Feeny of Environmental Communications**.

This is the fifth year of the award for Stormwater Professional of the Year and the award criteria set a very high standard of professionalism so, once again, the judges had a difficult time deciding on the winner.

"Clare has been a member of Water New Zealand since the 1990s. In 1990, she presented an award-winning paper, which was the first non-technical paper Water New Zealand recognised in its then 45-year history," say the judges.

"Clare has presented several stormwater papers and is a long-standing member and has actively contributed to Friends of the Stormwater Committee. Clare has judged the Innovation Awards since its inception in 2018, has chaired conference sessions, been actively involved in AGMs and regularly supports local events.

"Clare's style is to fly under the radar, however, she is a great role model in how you can use your membership to multiple organisations to drive collaboration and improvement."



2020 Stormwater Conference – Paper of the Year

Does your Retention meet your Intention, written collaboratively by **Mark Groves (WSP), Bodo Hellberg (Tauranga City Council), Brendon Schicker (WSP), Warren Bird (WSP)**.

The judges say this paper addresses assumptions used in industry to estimate detention requirements. Greenfield pre-development flow rates, design methods and the underlying assumptions can cumulatively have a large impact on estimates for detention requirements as well as orifice discharge rates.

"This paper demonstrated the importance of such considerations by looking at different design events, different durations and different model assumptions and found that short duration storm design methods were more likely to lead to underestimation of flows, with the design potential to increase discharges and increase flooding risk.

"Validation with real rainfall data also showed the need to understand individual catchments and their complexities. Based on their assessment the authors recommended modelling a range of durations, storm sizes and rainfall profiles to best assess the needs of the catchment. This has implications for any design engineer looking at detaining stormwater and releasing appropriately in larger catchments while mitigating flooding risk."

2020 Young Stormwater Professional of the Year Matthew Lillis of Engineering Leadership Services.

This award is to recognise a Young Stormwater Professional within the industry that has made a significant contribution to the stormwater industry and the general community and has demonstrated exceptional achievement in the early stages of his or her career. The award is open to individual members who are under 35 years of age.

The judges say the quality of the applicants was high, making it a difficult decision.

"Matthew's management of the complex Mangakootukutuku ICMP demonstrates his outstanding technical knowledge and communication skills. His commitment to volunteer activities is evident through his ongoing involvement in Engineers Without Borders and his contribution to the stormwater industry has been demonstrated through the presentation of his work at conferences.

"He demonstrates a breadth and scale of experience to date, while still early in his career, that strengthened our decision to present the award to him."

2020 Stormwater Innovation Award – FenceTank

The judges said all innovations judged offered fantastic solutions that had a value proposition to significant stormwater challenges.

"Congratulations to Andrew Olsen from Stormwater Systems on creating a stylish solution to water tanks that are unsightly and take up valuable space on properties.

"The scoring was very close. However, the uniqueness and freshness of the complete concept was the major factor in the judges' decision.

"FenceTank is the winner as a lot of thought has gone into the design. It is being made in New Zealand creating jobs, which although not a criteria, the judges believe was important in the current situation we find ourselves in."

The judges also highly commended Bodo Hellberg and Whare Joseph Thompson for 'The Four Winds' Stormwater Manhole Cover.

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A life of sharing, understanding and protecting health and environment

Former Water New Zealand Principal Drinking Water Adviser, Jim Graham, reflects on the life, achievements and contribution of one of New Zealand's most eminent water scientists.

Dr Michael Taylor's contribution to the drinking water sector is well known by those of us who have been around for a while.

He died aged 91 on August 3. I first encountered Dr Michael Taylor in the early 1990s when he joined the Ministry of Health and I was a Health Protection Officer in Auckland. At that time, he seemed to me to be very knowledgeable and expert but kind of aloof and difficult to talk to.

Michael emigrated to New Zealand from England when he was 34 and worked initially as a research fellow at the Cawthron Institute in Nelson. He had completed a PhD in organic chemistry and had been a senior scientific officer in charge of chemical oceanography in the Arctic team of the UK Ministry of Agriculture, Fisheries and Food.

Michael had a passion for diving and the marine environment and continued to indulge his underwater passion with a role with the Norwegian Fishery Directorate's Institute of Marine Sciences. He proudly claimed to be one of the few people in the World who had dived in both the Arctic and Antarctic.

Michael set up the water analysis laboratory at the Cawthron Institute in Nelson. He advocated for inter-laboratory calibration programmes, which led to the Department of Scientific and Industrial Research (DSIR) DSIR setting up the ChemAqua programme for collaborative tests of water analyses.

In 1971 he became the chief chemist with the Auckland Regional Authority and in 1976 he took the role of Manager, Water Quality with the Water and Soil Directorate, Research and Survey group, which was set up by the Ministry of Works and Development. He also began working with the World Health Organisation, undertaking short-term consultancies,



running training courses throughout Asia on water quality monitoring and hazardous waste management.

In 1980, Michael was made Research and Survey Director of the Water and Soil Division, overseeing around 200 scientists and technicians throughout the country who provided scientific services to the National Water and Soil Conservation Authority.

His next role was Chief Director of the resources group with the DSIR where he controlled a budget of \$60 million and a staff of 700, overseeing the science output for the botany, ecology, geophysics, geological survey, soil and land science, and, of course, water sciences divisions.

In 1990 he turned 60 and was required to retire but, finding himself bored, applied for and took a position responsible for drinking water quality regulation with the Ministry of Health.

At that time, very little monitoring of water supplies was undertaken and the sector had limited understanding of water quality science, risk and the importance of safe water supplies.

Michael's achievements between his appointment and final retirement in 2008 were exceptional.

They include the preparation of drinking water standards in 1995, 2000, 2005 and 2008, a water supply grading system, legislation in 2007 and the \$150 million Drinking Water Assistance Programme.

But, probably his greatest achievement over this time was his ability to change the thinking of people in our industry. The regulatory tools that he developed, his drive to improve capability and competence in the industry and his insistence that water suppliers provide safe drinking water shifted the mindset of many in the drinking water industry.

Michael was very disappointed when the Havelock North

outbreak occurred as it was the very thing he had been working to prevent. He took a great interest in the inquiry and was keen to see effect given to its findings.

Throughout his career, Michael perfected the art of dealing with politicians and bureaucrats. He was expert at getting both to do the things that he thought needed to be done. This was particularly evident when he shepherded the Health (Drinking Water) Amendment Bill through the House against considerable opposition from local government.

He was a great fan of the *Yes, Minister* and *Yes, Prime Minister* books and insisted that I read them as text books for how government worked and how to get things done, in spite of government.

For his work with water and his contribution to the industry, Michael has received many accolades. In 2000 he received the New Zealand Water & Wastes Association (NZWWA) medal, its premier award, which was renamed the Michael Taylor Award, and in 2007 he was invested as a Companion of the Queen's Service Order.

I had a quite a bit to do with Michael from 2001 until 2005 when I was a drinking water assessor in Wellington, but got to know him better when I worked with him at the Ministry of Health for the three years before he finally retired.

He remained aloof but often spoke of the many interesting things he had done. He had an interest in wine and impressed on me the importance of only drinking good quality wine. Any wine enthusiast in New Zealand should thank Michael who in his time at the Water and Soil Division, championed work on identifying soils suitable for grape growing.

What people often didn't see about Michael was his desire to assist others to do well. He would check reports or advice I had written and then sit down to explain changes I need to make and why. While I initially found this annoying, when I realised that his intention was only to improve the quality of my work, I welcomed his advice. He was always keen to

assist me to do well, but he had very high expectations and if you met them the most praise he would give would be a simple 'well done'.

Keen to improve the capability and experience of drinking water assessors, Michael facilitated a programme with the WHO that sent assessors to many countries across the Pacific to explain the usefulness of water safety planning. That programme has been described to me by a senior WHO official as one of the most effective water programmes that they have done in the Pacific.

But the thing I really admired about Michael was his compassion. It was never overt or something he ever made much of, but he had a real desire to improve things for those whose circumstances were most difficult. He was determined for example that funding from the assistance programme would be available to the smallest water suppliers even though the cost per person was the greatest. His view was that they had the greatest need of assistance.

He also insisted that funding should be provided specifically to marae and papakainga.

Michael's contribution to the water industry was huge, no question, but it was the person that Michael was that stood behind that contribution. It was his values, protecting peoples' health, protecting the environment, his love of science, knowledge, information and understanding of what stood behind the things we could see, that meant he was able to achieve the things he did.

I visited Michael from time to time after he retired, most recently at the aged care home in Waikanae where he was living. Even though the years were catching up with him, he retained those values, an interest in science, drinking water quality and other people.

His contribution in many places and many ways made a considerable difference to what we do and how we do it, but it is the person who I will remember.

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Party policies on water

We asked political parties running in the upcoming election for their policies on the water sector and these are responses we received.



The Labour party wants to make sure that all our communities have safe, affordable and resilient water services. The Three Waters Review, led by Local Government Minister Nanaia Mahuta, has found that there are huge looming costs to be able to replace ageing infrastructure, meet safety and environmental regulations, and protect against the impacts of climate change, and that the current system is not fit for purpose.

Ratepayers in small rural and provincial areas can't bear all these costs, so we have to look at new ways of delivery and funding our water services. Central government is working with local government on possible approaches and solutions to these challenges.

In 2016, 5000 people were made sick, and up to four people died from drinking contaminated water in Havelock North. The subsequent inquiry found that there were systemic failures in drinking water safety by numerous parties. It recommended that dedicated drinking water regulator be formed, and the Government

has created Taumata Arowai, the new water services regulator, to make sure we don't have such outbreaks in future.

Taumata Arowai will be responsible for drinking water safety from about the middle of next year when it takes over that role from the Ministry of Health.

In July 2020 the Prime Minister announced \$761 million to help address these issues through the three waters stimulus and reform programme. This includes \$30 million specifically to help rural drinking water suppliers comply with the new regulatory regime.

But we want to ensure that we end up with a system that works for our communities over the long-term, so councils are being asked to join a korero on reform.

We've also delivered on our commitment to clean up waterways. We've introduced a new National Policy Statement for Freshwater Management and required that rivers and lakes be clean enough for people to swim without getting sick, while achieving aquatic ecosystem health.

We're setting stricter controls on pollution, putting controls on high-risk farm practices, and requiring mandatory and enforceable farm environment plans. We've invested heavily in large-scale planting, and our Sustainable Land Use Package has helped the primary sector to protect at-risk waterways and wetlands.



Water is a key cultural, economic and environmental resource and New Zealand is blessed with an abundance of it by international comparisons, and our water quality is better than many developed nations. However we can do more to improve water quality, availability and efficiency of use.

The current review of the Three Waters is a significant opportunity for communities, councils, iwi and industry to review this precious resource.

National supports the introduction of a drinking water regulator, but has significant concerns about further non detailed reform of the Three Waters. These concerns relate to the lack of any specifics around form or structure of new entities to manage water. Minister Mahuta has given no final details on the number of independent water bodies, how they will be funded and what contribution the tax payer will make to these reforms.

It is clear there is a funding deficit surrounding water infrastructure. However offering \$761 million to councils if they reform themselves is not a holistic solution. Some councils may take this up, but many will not and New Zealand will end up with an ad hoc system of water management.

Three Water assets are not networked outside of the community in the same way electricity, gas and roads are. Equally there are only three forms of funding for such infrastructure – user charges, rates and general taxation.

While many councils ask for central government support, they also resist the need for the Crown to have more say in how local infrastructure is run. The NZTA is the most obvious shared funding model for large infrastructure, but the Crown has a significant say in priorities, funding envelopes and final signoff for local projects.

As such the overall structure of managing the Three Waters needs to be carefully considered before changes are made. In this balance, infrastructure needs to be built and managed in a way that is cost effective for the consumer, ratepayer and tax payer.

Water is a key strategic asset resource for New Zealand. Its importance for renewable energy, recreation, potable supplies, environmental enhancement and production should not be underestimated.

National strongly supports water storage as a key part of any climate change mitigation strategy.

HeartLandNZ

Clean water is a necessity for life, vital to our continued prosperity and an absolute basic requirement for agricultural production.

New Zealand's freshwater resources belong equally to all New Zealand citizens and our freshwater resource needs to be protected, and that can only happen if all water users and the Government work together.

Many of our native freshwater species are threatened with, or at risk of, extinction. This includes 72 percent of fish species; including four of our five whitebait species, the ancient lamprey, and tuna (longfin eel), together with 34 percent of invertebrates and 31 percent of plants.

Heartland will set national freshwater quality standards (NPS), including for pathogens, dissolved oxygen, nutrients, periphyton, and macroinvertebrate health. The National Policy Statement will be designed to stop water quality getting worse and to set timeframes for improving water quality to make all of our rivers and lakes swimmable when weather conditions permit.

- Heartland will: require all intensively stocked land near waterways to be fenced with setbacks (for riparian planting where required) to assist with filtering and absorbing silt and nutrients before they can flow into the water.
- Require all regulatory authorities to produce test results that identify the levels of pollution, in all sub-catchment waterways under their control, and then to put in place strategies and plans to target improvement of the worst areas first, within the two years post the election.
- Promote best practical options for land use appropriate to soil types, and the innovation that goes with them.
- Support regulatory authorities in implementing the new standards and bottom lines, in setting minimum flow regimes on named waterways, and in overseeing the separation of stormwater and sewage systems in urban areas.

• Require regulatory authorities to report annually on whether, and how, regulatory authority rules within the region are adequate to protect waterways.

• Work with urban territorial authorities, particularly in the main centres, to improve stormwater management, to separate stormwater from sewage, and to maintain or enhance the health of receiving waterways.

• Investigate the adequacy of urban sewage treatment plants across New Zealand with a view to identifying towns that may need assistance with planning or implementing cost-effective upgrades.

• Work to prevent any further loss of New Zealand's wetlands and will promote wetland restoration.

• Support the development of water storage systems that allow for adequate supply for both urban and rural usage even during times of low rainfall or drought.

• Support the addition of hydro-electric generation capabilities in any new water storage system to benefit from the renewable energy source available.

maori Party Freshwater policy (from the party's website)

The Maori Party will prioritise addressing the protection and restoration of freshwater and ensuring that the rangatira and kaitiaki rights and interests of tangata whenua are honoured and implemented across freshwater management and allocation.

The Maori Party will: Overturn the Crown's position that "everyone owns water" and instead adopt a position that acknowledges Maori proprietary, customary, and decision-making rights and interests to freshwater.

• Acknowledge the intrinsic whakapapa of freshwater, and support hapu and iwi to negotiate for those whakapapa rights to be acknowledged in law.

• Restart negotiations between the Government and hapu and iwi to develop a policy framework on how Maori rights and interests

are implemented in freshwater management and allocation.

- Substantially increase funding to the Te Mana o te Wai fund to support the efforts of whanau, hapu and iwi to protect and restore catchments and aquifers.
- Put a moratorium on new consents for water bottling plants, until a new allocation system has been developed.
- Develop a commercial user pays policy to help ensure fair allocation and support with tangata whenua-led catchment restoration
- Develop an allocation system and undertake significant reform of the RMA to ensure that Maori rights and interests in water are addressed in RMA processes, including decisions on water takes and discharges.



The Government recently announced a new set of water quality rules including what it calls “environmental bottom lines”. These rules will impose additional costs on farmers, but do little to improve water quality in rural or urban areas.

Improving water quality in rural communities is a vital step to restoring the biodiversity that makes New Zealand unique. Biodiversity in fresh water, plants and insects is the life support that underpins our rural economy, and our health and wellbeing as a nation.

The RMA and new freshwater rules are being used as a blunt tool to force farmers and landowners to abandon their farm environmental plans. These plans are agreed with regional councils and are based on local rivers and soil science. Farmers are instead being forced to submit to government a plan which side-lines the wishes of local communities and the businesses which produce our food and our wealth.

Rather than imposing a one-size-fits-all approach from Wellington, ACT will put farm environmental plans back into the hands of farmers and regional councils.

ACT believes that a partnership approach between farmers, regional councils with their science capability, and the large

primary sector businesses which rely on a clean, green reputation, are best placed to solve water quality issues.

ACT will reform the RMA to establish a framework for primary sector partnerships between farmers, regional councils, and primary sector businesses, to deliver the environmental outcomes which meet the expectations of communities and consumers.

The major issue in urban areas such as Auckland and Wellington is that councils have let existing networks run down to the point that sewage regularly spills into harbours and streams, and only 25 percent of waste water treatment plants are fully compliant with their consent conditions.

ACT will require councils to commit to short and long-term water quality objectives, and to plan and budget to renew and upgrade aging and failing water and wastewater infrastructure.

Local councils have resource consents which mean they don't even have to report these spills to the public, and regional councils rarely prosecute territorial authorities for thousands of overflows – only twice in the year to June 2019 according to Water New Zealand's annual surveillance report.

In addition to the new National Policy Statement for Freshwater Management, the Government proposes a new drinking water regulator, Taumata Arowai, to have a national oversight role for sewerage and stormwater networks, but that role will not include enforcement, which despite the failures over the past 25 years, will remain with regional councils.

ACT will stop councils from obtaining consents to spill raw sewage into streams and rivers, and apply to councils the same set of rules that businesses and farmers must follow.

Green

From the maunga to moana, water is a taonga which must be protected. We all deserve access to clean, safe drinking water, and the precious biodiversity in our waterways should be protected.

Change is happening. With the Green Party's support, the Government has introduced the strongest ever water reforms. For the first time, rules for water will prioritise ecosystem baselines and Maori cultural values. These changes mean water quality will improve over time, restoring our lakes, rivers and wetlands so people can swim safely, and freshwater species can thrive.

The Green Party has supported the Government to invest \$761 million to rebuild ageing three waters infrastructure and ensure it stays in public ownership. This addresses immediate pressures so that everyone in Aotearoa has access to clean drinking water and ensures land and water use and management prevents polluted water from entering our rivers, lakes, aquifers and oceans.

But we know there is much more we can do to safeguard and futureproof the water sector. We will prioritise sustainable solutions for the use and storage of water, recognising that a changing climate requires us to adapt to drier summers and more frequent flooding.

The Green Party will invest in local infrastructure to capture

and store rainwater and encourage household water conservation and storage. We will require new buildings to include greywater recycling as part of a comprehensive change to a climate-friendly Building Code. And we will support farmers to plan for climate resilient farming and ensure Farm Environment Plans address on-farm water conservation, irrigation efficiency, and rainwater capture and storage.

We will also ensure that regional councils are properly resourced to implement Freshwater Farm Plans and the National Environmental Standard on Freshwater.

To support a transition to green water infrastructure, we will invest in natural resource engineering and design that uses natural features like swales to filter stormwater, increasing permeable surface areas in our cities, and restoring natural wetlands nationwide.

While we're making progress towards restoring rivers and streams, we also need to fix the approach to water allocation and conservation. This means using water fairly and efficiently within natural limits. We will create a fair system for water allocation, with commercial users like water bottling companies paying a resource rental fee, and allocation phased down to sustainable levels. Iwi and hapu will be involved in designing a framework that recognises Maori interests, prioritises ecological integrity, and protects food production.

The Green Party will also oppose large-scale irrigation projects that encourage intensive farming and ensure that nitrogen limits are based on the best science.

Outdoors NZ Outdoors Party

We will reform all three waters to recreate a pure, clean New Zealand with drinking and swimming water that we can all be proud of.

Our priority is health for all communities and ecosystems and clean water is foremost in our Outdoors Party vision, philosophy and policy. We acknowledge and respect the values placed on water by Maori, its Wairua and spirit, its life force. Water is a living entity.

Clean water, fresh air, thriving soils and nutritious foods are at the core of community and environmental well-being. We must eradicate or at least minimise additives, contaminants and poisons in our water. There is ample research in every aspect of land management, water supply, stormwater systems and wastewater technologies to achieve this.

The Outdoors Party will return the focus to the people and local communities under our overarching ‘localism’ policy. The party will promote full transparency and innovation to identify, replicate and adapt the best solutions from around the world so we can lead the world.

Water supply, stormwater and wastewater management are dependent on, and in turn affect the quality of our natural waters in catchments, our rivers and the ocean.

Well-managed sewage systems can be 17,000 percent more efficient, with much-improved discharge quality. Our health thrives when our gut has a healthy microbiome. Similarly, our environment thrives when our waste contains healthy organisms. Well-managed stormwater systems can add value to all environments.

We will do much better by recognising that water, life and nature are interconnected. We will take a broader approach to the management of all our natural resources: connecting water, soil, regenerative agriculture ‘farming with nature’ and ‘fit for purpose’ development.

Our Healthy Waterways programme is a start towards improving the health of our catchments. We support new legislation to create a quality drinking water regulatory framework. Taumata Arowai, the new Water Services Regulator, will oversee enforcement. A steering committee will provide oversight for reform and wastewater and stormwater networks. We will find a water champion to drive the vision.

Central Government must support local authorities to ensure best practice is available to evolve localised systems. Major centralised plants tend to benefit vested interests. Small is beautiful. We need to support science and technology that gives local communities control over their resources for community-good purposes. We support the return of ‘public good’ science and the re-creation of organisations like DSIR to promote and ensure best practice right across the board.

We will build on community expertise, science and technology so we can lead the world in water quality.

The Outdoors Party will invite communities to local summits to share and develop the expertise to create the healthiest, most ecologically sound water systems in the world.

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It is The Opportunities Party's (TOP) goal that we will be able to leave our natural and built environment for the next generation in a better state than we've inherited it, so our children will be able to enjoy healthy cities and the same lakes and rivers that we once did.

This means cleaning up our freshwater by; taking an integrated catchment-based approach; tackling land use impacts; and improving our three waters infrastructure.

Taking an integrated catchment management approach and addressing land use will help ensure that our drinking water sources remain safe, as well as making our rivers and lakes swimmable and healthy.

To help improve water quality TOP will ensure freshwater quality standards are hard-wired into planning legislation nationwide. This will include a limit of one milligram per litre for nitrogen as recommended by the majority of scientists. Implement nationwide measurement and monitoring standards for water.

Ensure nationwide oversight by an independent Freshwater/Te Mana o te Wai Commission. This was recommended to the Government in 2010 and 2019 and carries the support of the Waitangi Tribunal, Freshwater Leaders Group, Kahui Wai Maori,

Fish & Game, Environmental Defence Society and the Climate Change Commission.

We will legislate that all water takes must occur alongside a reciprocal improvement to that water body, and ensure the right farm type in the right place and operate within the environment's capacity. We will upgrade water treatment systems and infrastructure to best practice.

To fund stormwater, wastewater and drinking water infrastructure upgrades TOP will redirect revenue from GST on housing and growth to local government to maintain public assets and infrastructure.

Central government owns 45 percent of the country's infrastructure and receives 70 percent of the revenue generated to manage it. Local government owns 38 percent of infrastructure but only receives seven percent of the revenue. TOP thinks this is wrong and will favour the development of natural water infrastructure that provides better public spaces, mitigates and adapts to climate change.

Through the redirection of tax on new developments, TOP will ensure local governments get the operating revenue for the infrastructure they need to play their part. TOP will completely reform the urban development planning process. This will include a clear 30-year plan to create healthy, resilient towns and cities. TOP's plan will create regional urban design panels responsible for reviewing major developments.

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Training Development initiatives

Water New Zealand's training development manager, Mumtaz Parker, outlines recent developments and opportunities in the water training sector.

The three waters sector will benefit from a number of new opportunities available following the Government's decision to fund up to \$380.6 million to help keep apprentices in work.

The post-Covid-19 Apprenticeship Boost will support up to 36,000 apprentices per year (including new apprentices), by providing a subsidy to around 18,000 employers.

The opportunities include:

- **The Targeted Training and Apprenticeships Fund:** (TTAF, also known as free trades training). This fund will support learners to undertake vocational education and training without having to pay fees. All water treatment and reticulation programmes are covered by the fund, and it covers fees from July 1, 2020 until December 31, 2022.
- **Apprenticeship Support Programme:** a broad-based support for employers to keep existing apprentices and employ new ones.
- **Manā in Mahi (pride in work):** an expansion of the existing programme that supports at-risk people through an industry training pathway into long term sustainable work.
- **Regional Apprenticeships Initiative:** particularly support for displaced regional apprentices who have lost their jobs.
- **Group Training Scheme:** this funding is to ensure the existing seven schemes remain viable by enabling them to continue to employ apprentices and trainees and provide related services to host businesses.

Employers will be able to access support from either Apprenticeship Boost, Manā in Mahi, or the Regional Apprenticeships Initiative (depending on the type of apprentice or pre-apprentice trainee they employ).

All employers that have an eligible apprentice will be able to receive a base subsidy rate up to \$12,000 per annum (\$1000 per month) for first year apprentices, and up to \$6000 per annum (\$500 per month) for second year apprentices through the Apprenticeship Boost.

To be eligible, the apprentice has to be enrolled in a TEC-approved apprenticeship or Managed Apprenticeship programme. To have a look at eligible courses visit: www.connexis.org.nz/news/

Competency Framework

The following competency frameworks are now available:

- **Wastewater Treatment Operators:** for those who operate wastewater treatment processes such as preliminary and biological treatment, collect and analyse data on the processes, and carry out first line maintenance tasks.
- **Drinking Water Distribution Operators:** for those who carry out planned, preventative maintenance on the drinking water system, as well as respond to incidents such as burst pipes and major leaks.

Water Industry Professionals Association

The WIPA enrolment gives you access to WIPA approved courses across drinking water, wastewater, stormwater and essential skills.

Once completed, each course gains WIPA CPD credits which takes trainees one step closer to achieving the requirements needed to become a Registered Water Industry Professional.

CPD credits can also be gained by presenting a paper at a conference, and/or attending a WIPA approved webinar.

Further information is available at wipa.co.nz for enrolling onto the WIPA CPD programme or if you are interested in listing a course.

Reform of Vocational Education Update

Stephen Town, the new chief executive for NZIST (New Zealand Institute of Skills and Technology), has commenced in his new role.

Additionally, the construction and infrastructure Workforce Development Council (WDC), Interim Establishment Board (IEB) held its first meeting in Auckland. The main focus for the IEB is to establish the WDC as a legal entity.

If you have any training related questions or feedback, please drop me an email at training@waternz.org.nz



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Addressing challenges of climate change on the water sector

Climate change is the greatest environmental challenge of our time and will have significant and ongoing implications. The water sector is closely bound to climate change impacts – both in terms of climate shocks and stressors, and in terms of the three waters infrastructure that we rely on. James Hughes of Tonkin + Taylor, and Jon Reed and Emily Sopers of Beca, outline some climate change challenges and how climate risk, adaptation and mitigation might apply to the water sector.

Climate change context

The most recent IPCC special report SR15 (2018) gives a target 1.5 degrees Celsius with ‘no or limited overshoot’ and underscores the need for urgent and transformative action as climate impacts increase in scale, frequency and intensity.

It says emissions of carbon dioxide would have to be cut by 45 percent by 2030 to keep the rise in global temperature below 1.5 degrees. Emissions must decline immediately, and that the next 10 years are critical for climate change mitigation, as well as planning for adaptation.

As defined by IPCC, mitigation is the human intervention to reduce the sources or enhance the sinks of greenhouse gases. Adaptation is the process of adjustment to actual or expected climate change and its effects.

The Climate Change Response (Zero Carbon) Act 2019 was recently adopted in New Zealand. The purpose of this Act is to provide a framework to develop and implement clear and stable climate change policies that limit the global average temperature increase to 1.5 degrees.

The Climate Change Commission (CCC) has been established and should provide the government with independent advice from experts on achieving targets set in the Zero Carbon Act, as well as monitoring them.

The CCC will recommend the first three, five-yearly carbon budgets, out to 2035, by one February 1, 2021.

The Zero Carbon Act also includes a ‘reporting power’ which will enable the responsible minister to require central and local government organisations and ‘lifeline utility providers’ to report on adaptation.

Several other relevant initiatives that have signalled a potential increased focus on climate risk and adaptation are worth noting.

The first is the Government’s proposal for mandatory climate-related financial disclosures. This is currently being considered, and while proposals are only for listed issuers, banks, general insurers and institutional investors, there is potential for it to be expanded to other entities. Submissions supported the inclusion of large non-listed entities as well as companies in sectors highly at risk from the impacts of climate change.

The second is the Draft Annual Plan released by the Office of the Auditor-General. The OAG is seeking feedback on this plan, which proposes an increased focus on climate change and resilience – through which they seek “to provide assurance to the New Zealand

public about the effectiveness of the Government’s risk and resilience planning, with a particular focus on preparedness for, and response to, emergencies and addressing the impacts of a changing climate.”

Finally, the National Climate Change Risk Assessment has been published.

The First National Climate Change Risk Assessment

MfE has recently published the first National Climate Change Risk Assessment (NCCRA), a national overview of how New Zealand may be affected by climate change-related hazards.

It identifies the principal risks and opportunities, highlights information gaps, and helps identify where the Government needs to focus its action. It also provides a useful resource for councils and asset owners on notable risks.

The risk assessment will be used to develop a National Adaptation Plan over the next two years, which will outline what is required to prepare for the risks.

The risks are grouped according to five value domains: human, natural environment, economy, built environment and governance.

While many of the risks are interlinked, these groupings are useful, as they help identify risk ‘owners’ – i.e. those who have a role in managing the risk over time.

The built environment risks are of particular relevance to the water sector.

The NCCRA reports that extreme flood events will increase around New Zealand, with estimates of up to an 11 percent increase in the one-hour duration storm by 2040, and up to 34 percent increase by 2090. Ongoing sea-level rise also contributes



Figure 1

significantly to both coastal and inland flooding, exacerbating coastal storm tides, which in turn leads to more frequent and severe inundation of coastal areas.

Between 2020-2040 ‘extreme’ sea levels are expected to be reached only once every 100 years on average. By 2050-70 this is predicted to occur at least annually. A key risk is that of drought, which will impact on potable water supplies throughout the country.

Recent droughts have had significant impacts on water supplies around the country, particularly in Auckland and Northland. Water New Zealand’s annual National Performance Review indicates that since 2014, around 50 percent of our councils report that they have implemented some form of water restriction. This is a significant proportion and underlines the seriousness of this risk to councils and communities.

These flood and drought related risks currently pose major challenges for communities, councils, and infrastructure utilities – and these challenges will grow over time if not addressed soon. Similar challenges also include the ability to obtain insurance and how the relevant water providers are governed.

One of the key governance risks identified within the NCCRA was that climate change impacts are exacerbated because current institutional arrangements are not fit for adaptation – this includes legislative and decision-making frameworks, coordination within and across levels of government, and funding mechanisms.

The second risk is to wastewater and stormwater systems. More extreme events will lead to more frequent exceedances of current levels of service, resulting in sewer overflows and increased nuisance flooding.

Internationally, droughts and extreme temperatures have been shown to result in minimum flushing flows not being met within sewers, which in turn can lead to blockages, increased wastewater toxicity and issues within wastewater treatment plants.

So, what does this mean for the water sector, and how should we respond?

First, councils and water authorities should take some comfort that these climate risks are now well and truly on the radar. The release of the NCCRA provides a very useful starting point to enable them to understand their own risks regionally and develop plans to adapt and respond to these.

It is important that councils and water authorities take a strategic approach to planning for climate risk and embed climate change considerations into the way they do business. This is summarised in Figure one – and includes planning (assessing and understanding risks and vulnerabilities), acting and observing/adjusting as required.

For those looking for more detailed assistance in terms of process, there are many local and international resources available to assist with understanding climate risks and vulnerabilities and developing adaptation plans.

Zero Carbon Framework

With adaptation considered, the second piece of the climate change response is mitigation to move to a zero-carbon industry. The Zero Carbon Framework (being developed by the Water New Zealand Climate

Change Group sets out a ‘pathway’ which can be used by water sector organisations to mitigate capital and operational carbon emissions, thereby playing their part in the achievement of national carbon reduction targets.

This is in development and is expected to be finalised over 12 months, with opportunities for the water sector to provide input and feedback.

If the water sector is to work collectively in mitigating against catastrophic climate change, we need a shared vision, principles, and framework for collaboration. The current working draft is set out below.

Shared vision

The proposed shared vision for the water sector is that the three waters infrastructure is low carbon dioxide, safe and healthy.

Principles

The framework has been developed in accordance with the following principles:

Mitigation actions need to be locally appropriate. There is, however, a wealth of international experience. We will build on international knowledge to tailor solutions that are appropriate for our communities.

Different organisations have different priorities and drivers. The sector’s low carbon framework needs to remain adaptable to different situations; however, providing principles and a framework to help achieve a level of standardisation across the industry to harness our collective wisdom.

Mitigation pathways should consider all forms of carbon emissions in



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water sector activities, including capital carbon and the whole of life and supply chain impacts.

A clear understanding of relative carbon impacts in sector operations is needed to target mitigation activities to the areas that will have the most impact.

To work in a way that upholds our Treaty of Waitangi partnership responsibilities by engaging with and understanding of the perspectives of mana whenua and integrating perspectives and pathways from the Maori world view (Te Ao Maori).

Climate mitigation activities should be prioritised using the emissions management hierarchy of avoidance followed by minimisation, reduction and offsetting as a last resort.

The Low Carbon Framework should be freely available and understandable to all.

Framework

The framework prepared to date recommends four main workstreams to help water sector organisations to develop Low Carbon Pathways, as follows:

1. Set carbon reductions targets for all forms of carbon emissions (biogenic and non-biogenic, capital and operational).

The Zero Carbon Act sets out a domestic greenhouse gas emissions reduction target, including reducing net emissions of all greenhouse gases (except biogenic methane) to zero by 2050; reducing gross biogenic methane emissions by 10 percent by January 1, 2030 (in comparison to 2017 emission levels), and to 24-47 percent by January 1, 2050 (in comparison to 2017 emission levels).

Thus, the targets specified by the Zero Carbon Act (ZCA) provide a minimum biogenic and non-biogenic emission reduction target for the water industry to achieve.

The most immediate target for the water industry and New Zealand at large is the interim 2030 target to reduce gross biogenic methane emissions by 10 percent in comparison to 2017 emission levels.

Individual organisations may elect to develop more ambitious targets that contribute to the IPCC's goal of a 45 percent reduction in carbon emissions by 2030.

2. Quantify baseline annual operational and capital carbon emissions.

This will allow the water sector to understand relative carbon impacts of three waters infrastructure, and forecast these emissions out to 2050, including capital works projects where possible, allowing estimation of effort required to meet the 2050 carbon reduction targets.

3. Plan operational and capital carbon reduction initiatives.

The planning phase will enable all water sector organisations to establish projects and initiatives for biogenic and non-biogenic emissions reductions using these guidelines. This should focus on reduction in the hotspots determined by their baseline.

It is likely that, given the urgency of the timescale, work will be required simultaneously across a number of different initiatives.

Figure 2 shows an example of a plan, with the purple bars the baseline forecast of emissions and the teal coloured bars the result of the plan, following the implementation of reduction initiatives. This suggests that offsetting is required for a proportion of the emissions to reach the targets set in the Zero Carbon Act.

Within the Framework we expect to be able to provide both local and international examples about approaches that could be used to reduce both capital and operational carbon.

4. Review emissions annually.

Water sector organisations should review their carbon emissions regularly, creating their own carbon inventories. This will allow tracking of annual emissions in relation to the baseline, determining whether they are on track to meet targets, and the proportion of emissions that require offsetting.

It is an exciting time to work in the water sector and the Climate Change Group looks forward to providing relevant information and advice to the sector over the next few years.

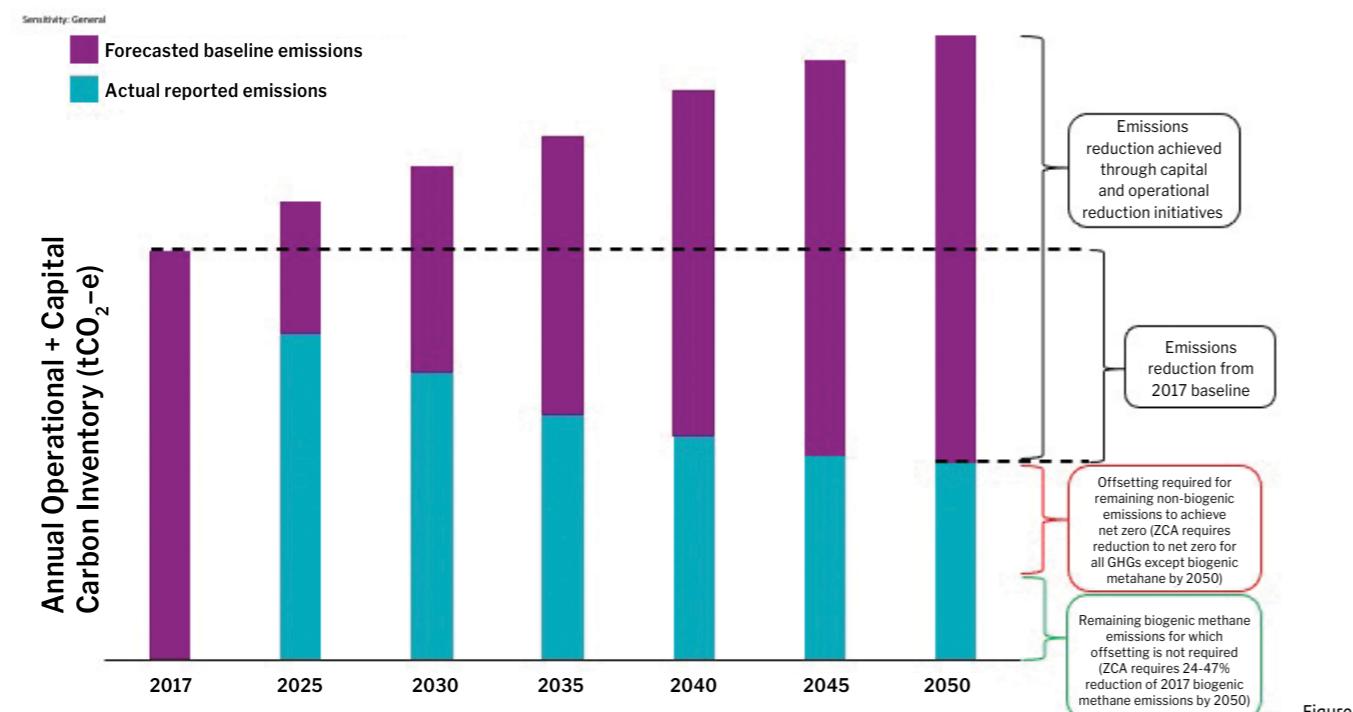


Figure 2



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Industry leader moves on

Raveen Jaduram's connections with Auckland city's water infrastructure go back over three decades and last month he resigned from his CEO role at Watercare. **By Alan Titchall.**

As a journalist I tend to judge industry leaders by their willingness to engage with the media and Raveen Jaduram has been never shy of fronting up to korerorero when he can, and was always open as a Water New Zealand board member.

His was one of the first industry profiles we published in the new-look Water New Zealand journal back in 2016, when he talked with the then editor Vicki Jane.

During the first lockdown in Auckland I had a very open phone chat with Raveen about the city's escalating water shortage. I won't expand on that conversation, other than to say if anyone can reliably predict this country's viable weather with any certainty from one year to the next – step forward and be blessed (especially by our vinicultural and horticultural sectors). Auckland suffers droughts around every 10-20 years and the latest was almost as bad as the infamous one between 1913-15. Not that the city didn't get its customary winter dousing – it just didn't fall where we keep the biggest bucket, up in the Hunua hills. Exasperating this shortage is two decades of intense city development and increased water use.

Raveen's resignation at the end of October 2020, the day before the 10th anniversary of the formation of the amalgamated Auckland Council, was announced by Watercare's chair, Margaret Devlin. It was unfortunate that it followed well-publicised criticism of Watercare's handling of the water shortage.

"I have not resigned because of the drought, or the sentiments expressed in some quarters," he tells me.

"I would never leave Watercare, its staff and the people of Auckland in a lurch. That is just not me. I always take these challenges head on, rather than walk away."

A decision like this is never about a single issue, he adds.

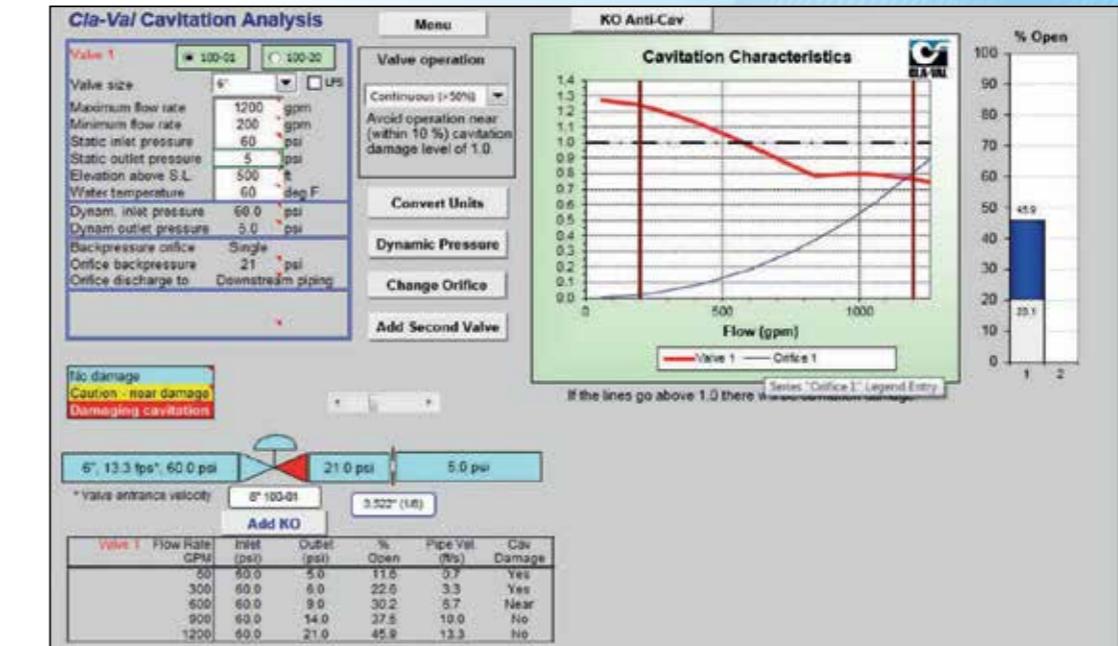
"It was made after taking several factors into account; my completing six years in the role and earlier advice to the board about opportunities with three waters reform and broader infrastructure opportunities; recommendations for Watercare from the recent CCO Review and whether I would want to be CE with that setup; and the distraction that my salary was causing to both me and Watercare."

I note that Raveen actually took over Watercare in 2014 on much less than the previous chief and it would also be unfair to not



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Working smarter not harder

Clever technology for wastewater and water operations is the way of the future, however, it is also coming into its own in these challenging times of social distancing. **By Mary Searle Bell.**



Jason Colton heads up Lutra, a company that provides the latest in software and process engineering services, and he says that while the Covid-19 outbreak has been a scary time, it has also been a really interesting exercise for his company.

"I was involved with the Covid-19 Local Government Response Unit. We're very aware that the age of many workers in water and wastewater operations put them in the high-risk group for Covid so our response needed to take that into account.

"We had such a short amount of time to come up with a solution for training additional backup staff, safely and remotely."

But finding solutions has been something Jason has been doing since he was a boy.

"My dad was an engineer and he was always tinkering with things.

"It's a habit I've inherited.

"And one of the central tenets of my career is to work smarter, not harder. To do more with less."

When English-born Jason did his science degree, a paper on water engineering piqued his interest, leading him to do a Master's in water and wastewater process engineering at Cranfield University.

"I then stayed on and did a Ph.D. It was industry-based – I worked with United Utilities, optimising media filtration to facilitate the removal of cryptosporidium oocysts."

He spent four years with the company, writing design and operation guides for filtration and doing R&D work in addition to completing his Ph.D. before the urge for a more front-line role saw him move to Welsh Water.

"I like to get my hands mucky.

"The role had a lot of variability – from R&D to troubleshooting to process audits, and we had pilot plants and new technologies to work with – and there's no substitute for getting out there and amongst it.

"It was exciting, and it was fun."

After three years, Jason got the opportunity for a secondment to Wellington, so in 1999 he spent 10 months with Greater Wellington Regional Council, optimising its water treatment plants.

"I returned to the UK and went back to Welsh Water as a principal engineer, but I found myself feeling unsettled. So, I decided to go contracting."

He joined Purac, and for two years designed and built water treatment plants for the likes of South Staffordshire Water and Thames Water.

"We built a lot of plants very quickly – both greenfield and brownfield upgrades, installing both new and conventional technologies."

But he was still feeling unsettled.

"It slowly dawned on me that I wanted to move to New Zealand. So, in late 2002, my partner and I did just that."

He joined the water process team at Beca in Auckland, spending four years designing and commissioning a number of water treatment plants.

"Then my itchy feet returned.

"I had product ideas I wanted to explore so I went out on my own, setting up a water process engineering firm called H₂ope."

Incidentally, H₂ope, pronounced 'hope', proved to be a bit too clever a name – it looked good on paper but people were unsure how they should say it and staff email addresses always had to be spelled out over the phone, which was tiresome – so the company was rebranded as Lutra in 2015.

Jason's first piece of patented technology was Compass, an

advanced coagulant dose controller that he had developed on the Wellington water treatment plants.

Compass is now being used on 81 plants around the world.

Since 2006, the company has grown to 29 staff, although five of those have been recruited in the past couple of months to help with the increased workload thanks to the pandemic.

The team is a 50:50 mix of process engineers, who provide consulting services, and technical staff, supporting Infrastructure Data, Lutra's operations management software product.

"All our products are about making plants and people more efficient," Jason explains.

He says Lutra is across quite a lot of councils, from Watercare in Auckland to the Invercargill City Council. Their products report on Drinking Water Standards compliance for 58 percent of New Zealand and 13 percent of Australia's connected population.

In addition, Lutra has developed all the water and wastewater operator training content for Connexis' Level 4 qualifications.

"We did this at cost for the industry. It was the worst business decision I've ever made, but a great ethical one."

"We produced the material for industry and see Connexis as the stewards of it."

As a part of this, Lutra also developed a Scada operators'

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training tool (also at cost). It's a fully interactive, online training and competency assessment tool for Scada, the software that is used to control water and wastewater treatment plants.

"It's a world-class tool.

"We're very proud of it."

This year has been a landmark one for Lutra for a number of reasons. In February, Watercare acquired a 67 percent shareholding, something that Jason says is a validation of its worth as a company.

Then, of course, the global pandemic hit and Jason and Lutra went straight into disaster management mode.

"Fortunately, we were able to quickly and easily transition to working from home.

"Within three days, we repurposed the Connexis training material for water and wastewater operators to provide free training for backup operators, should they need to be brought in as a part of the fallout from Covid-19.

"We set up a 24/7 national helpline for operational staff, which was manned all the way through the lockdown at levels three and four.

"We also put Sim-Plant, the Scada training tool, online for free too."

It's this ability to adapt and work smarter that has ensured Jason's success.

It's not just him though. He believes in creating and working in a culture of excellence.

"Excellence is a habit.

"I like to set tough targets to achieve.

"Also, I like to develop talent. I was fortunate with good mentors in my career and I like to create a working environment where people can shine.

"Sustainability is another passion of mine and doing more with less fits into this – less power, less chemicals, less waste – all while improving water quality, both in the natural environment and of drinking water."

To this end, Jason says he has been impressed with the work done on the water reforms so far.

"People in the industry have been working hard for safe water for years but progress has been slow. The water reforms will accelerate this.

"It's a once-in-a-generation opportunity for a step change in quality. We've got six years to do this, according to the timeline, and it's a massive challenge, but doable.

"I'm very excited. Now, more than ever, it is important to work smarter."

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TSS removal up to 90% is theoretically possible if the device is operating at a fraction of its maximum treatment flow rate, or targeting larger particle sizes, but this will be outside the certified performance of a device.

The New Jersey Department of Environmental Protection (NJDEP) certification process is arguably the most rigorous globally, of which an NJCAT verified test is part of the requirements. All GPTs are certified for 50% TSS removal with a particle size distribution with a D50 of 75µ, the treatment flow rate is the distinguishing factor as they are predominantly used for pre-treatment or retrofits.

Most regional councils are yet to require a GPT within their network. The exception to this is Auckland Council, who have included GPTs in their recent network discharge consent. So why should a GPT be installed elsewhere?

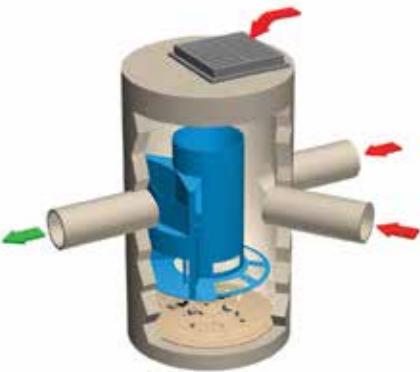
GPTs are used across New Zealand as the economic best practicable option for sites where the device will be retrofitted into existing stormwater infrastructure. Whether an existing brownfield

development, or for an entire catchment, the outcome is a reduction of pollutants in the receiving water environment. Alternatively GPTs can provide pre-treatment upstream of a StormFilter or green infrastructure. As sediment is pre-treated, there can be improved treatment and an extended maintenance frequency.

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The Cascade Separator design allows for multiple pipe and grated inlets, removing costly upstream junction manholes. A patented slanted skirt provides superior scour protection during normal and peak flows, allowing the device to be shallower than other manhole GPTs. Installing fewer smaller and shallower manholes is a more efficient solution for your project.



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A botany flavoured career

Arthur Haughey doesn't boast of a glittering career in the water industry, but he has just one stellar achievement, of which he is very proud, that changed history. **By Mary Searle Bell.**



"Thank goodness for dissolved oxygen meters and, later, for submergeable probes."

Arthur Haughey

Arthur grew up in the country around Kaipara Harbour, before houses there had electricity. It was a tiny community, with just 12 children at the local school.

"Back then, people only came here to holiday for the week over Christmas, otherwise we were left alone," Arthur reminisces.

At the end of the 1940s, the Haughey family moved to Glen Eden in Auckland and young Arthur started at the local primary school. Here, a teacher told his parents that he was 'far too bright to leave school and raise chickens', and so Arthur continued his education at Avondale College.

While at university he worked nights on the wharves to save money to attend university.

"I was very fortunate. A member of the Auckland Harbour Board lived up the road and he got me jobs over the holidays – it virtually paid all my expenses."

After completing a degree in botany, Arthur wondered if there were "any jobs for people like me?"

One option was working with apricots in Central Otago, but that was a bit chilly for Arthur's liking. However, Ron Hicks needed a biologist at the Mangere Wastewater Treatment Plant.

"On my first day he said to me, 'you're going to learn to do a dissolved oxygen measurement, and you're going to do them until you can do them in your sleep'.

"Thank goodness for dissolved oxygen meters and, later, for submergeable probes."

At that time, the plant had only been open for four months and was suffering from a major midge problem. Arthur was put on the case.

"I was assigned to Dr Don Spiller. When I told him, I didn't know anything about insects, he said, 'You're a biologist. You do now!'

"There was another biologist, a fish specialist, experimenting with controlling the midges with fish in the ponds – unsuccessfully, I might add.

"We walked a fine line to get a balance between lots of midges or lots of smell!"

Arthur explains that the ponds were quite versatile in

some respects, but quite demanding, "and challenging if you were a neighbour!"

During his time with the Auckland Metropolitan Drainage Board, Arthur also worked to tackle problems with the outfall at Okahu Bay – problems aggravated by the release of untreated effluent when stormwater made the system overflow, and problems that Auckland is still battling.

He continued his studies too, completing his Masters' degree, which involved a study of planktonic algae in Auckland's sewage ponds, although, to his disappointment, he found no new species in five years' work.

Then, in 1967, sweeping changes to local government led to working conditions becoming "unsavoury" and when Arthur and five of his colleagues were told to like it or lump it, they all immediately pulled resignation letters from their pockets and handed them over.

Arthur then got a job with the Engineering and Water Supply Department in South Australia, where they too had a midge problem.

His wife Robin packed up their household and family of four daughters (the youngest of whom was just six months old) and they all moved to Adelaide.

When Arthur got to work, instead of dealing with insects, he was asked to look after the catchments in the lower Murray Basin and the Adelaide Hills. His role was one of supervision and advice.

While his job was straightforward, it was during his time in Australia that Arthur made his biggest contribution to the world, quite serendipitously, but it is something of which he is justly proud.

"We had taken a rainfall sample following some heavy rain – something like 1500mm had fallen over South Australia and Queensland in one weekend. Interestingly, the sample was very, very radioactive. And the timing coincided with a bomb test in the north of the Northern Hemisphere.

"I mentioned this sample at various water meetings in Sydney and Canberra but heard nothing more, despite my colleague Peter asking if anyone was interested in the sample 10 times in the following 18 months – in hindsight, I can see we weren't asking the right people."

"Then at one meeting of the Water Resources Council, I told my story to a man who was most interested. He asked if we still had the sample and left the meeting to ring Lucas Heights nuclear facility.

"He returned and asked if they could have the sample. I said yes, but I wouldn't be back in Adelaide until Tuesday."

"First thing Tuesday morning three of the fabled 'men in black' marched into the labs demanding the sample. Because of their attitude I took great pleasure in making them wait while I rang the director to get his permission."

Arthur's sample proved that it didn't take 30 months for radiation to get to the Southern Hemisphere

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"I have never seen a government department move so fast!"

Arthur Haughey

from the atmosphere as they thought but took as little as 30 hours.

These results were sent off to the UN security council and at the next meeting of the General Assembly, atmospheric tests were banned.

"I have never seen a government department move so fast!"

In 1977, he returned to New Zealand, taking the position of chief scientist with what is now the Auckland Council.

In this role, along with managing the lab and scientific services, he provided services and advice to sewerage, bulk water, refuse and park departments and the Regional Water Board.

Arthur also served on the IWA committee and was president of Water New Zealand (or as it was known at that time, the Water Supply and Disposal Association) from 1981-83.

The restructure of the council in 1991 and subsequent formation of Watercare left Arthur without a job.

"They couldn't afford me and didn't have a job for me, but they didn't tell me."

"That was memorable!"

So, he took some time and finished building a modest beach house in Onemana in the Coromandel, then got stuck into tackling the weeds and vermin in the area.

"I believe that qualifies as continuing one's biological career."

He then set up his own business, Environmental Evaluations, which provided ecological consulting services, and later, in 1996, also took a position as a senior tutor at Unitec, lecturing on freshwater biology, waste management and coastal management.

"I organised two or three field trips each year to give students an idea of what they would be expected to do as a technician in the field – putting them on the end of a spade in a stream."

After he retired, Arthur and Robin moved to Onemana – they've been there 12 years now.

And while Arthur's short-term memory is becoming problematic, that doesn't stop him tackling the pests in the neighbouring bush reserve and keeping an expert eye on the three ornamental ponds in their village.

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Our hot water efficiency technologies put to the test

Research into household hot water use to help improve energy efficiency in New Zealand households is being carried out by the NSW Department of Planning, Industry and Environment.

Glenn Seymour, from the department's Strategic Energy division explains.

The NSW Department of Planning, Industry and Environment has begun a research programme monitoring the volume, time of use and length of draw of hot water in a sample of 200 homes throughout Australia and New Zealand.

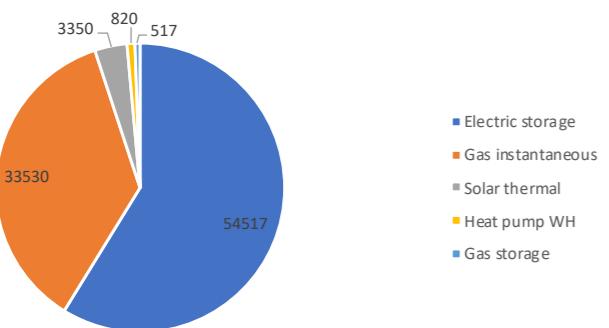
This includes 30 homes each in Dunedin and Auckland.

It is intended that the data collected will inform jurisdiction and government projects, including the trans-Tasman Equipment Energy Efficiency (E3) hot water project.

Hot water systems are a priority group of products for E3 as, in New Zealand they contribute 29 percent of residential energy costs and 33 percent of residential greenhouse gas emissions.

There is a broad range of water heating technologies available in the trans-Tasman market. Sales here, however, are dominated by electric storage water heaters and gas instantaneous systems at 59 percent and 36 percent respectively of sales in 2016, as can be seen in the graph below.

NZ annual water heater sales (2016)



Sales of heat pump water heaters and solar water heaters, while currently low, are expected to increase in future.

There are numerous barriers to householders making objective decisions on the best water heating technology for their household.

Some systems, including electric storage water heaters and gas water heaters, have base performance levels specified in standards that must be met. Other systems, such as heat pump water heaters and solar water heaters, have no mandatory base performance levels.

Not all types of hot water systems are tested to evaluate their performance and efficiency. This includes solar photovoltaic based systems and electric instantaneous water heaters.

Hot water system types that are tested use different bases for evaluating their performance. The efficiency of electric storage water heaters is based on a measurement of standing heat losses from a tank full of hot water, while the efficiency of gas water heaters is calculated based on delivering 200 litres of water heated 45 degrees C above the coldwater temperature.

Neither of these bases represents a realistic pattern of use in a typical household. Different usage patterns will impact the efficiency of different technologies to a greater or lesser degree.

In 2019, the Department contracted energy consultancy firm Sustainable Energy Transformation to carry out research into information available on household hot water draw-off quantities and profiles in Australia and NZ, as well as investigating a range of international studies.

This work identified that there is no single source of hot water draw-off profile data that could be used as a basis for testing or modelling.

The research identified that the number of household occupants is the main factor, and that the relationship between the number of occupants and water used is almost linear.

Other factors that impact hot water use include: Climate; seasonality; water heater type; and householder attitudes to water and energy use.

The lack of information on draw-off profiles and the importance of this information to the overall project led the department to embark on the current project to install hot water monitoring equipment in a sample of 200 homes across climate zones in Australia and New Zealand.

The project aims to capture data that is as representative as possible of various climate zones, water heater types and household sizes within the constraints of the project budget.

Seasonality is a factor in hot water use, so the monitoring project was originally planned to run for at least 12 months and will begin generating data from September 2020.

As a result of changing householder habits due to Covid-19, the metering is likely to be left in place until the end of 2021.

A sample of 200 homes has been recruited representing, as far as practicable, the distribution of homes in the various climate zones across both countries, the range of household occupant numbers, and the distribution of hot water system types.

The department has awarded the monitoring contract to NSW based Intelligent Metering, trading as UtilityCap, which is working with Laser Plumbing here to recruit and engage with households.

UtilityCap will be using Ultraheat T550 ultrasonic thermal energy and flow monitoring units. These are a 'plug and play' design and will be very simple to install on site and to decommission as and when required. The sensors will measure water temperature, the volume of hot water, start and stop times of hot water draws and therefore the length of the draw.

Data will be held in a secure cloud-based environment.

All participating householders will complete a survey to gather demographic and other information relevant to their hot water use, such as the number and nature of hot water using appliances. This

will form the basis of the end of project analysis.

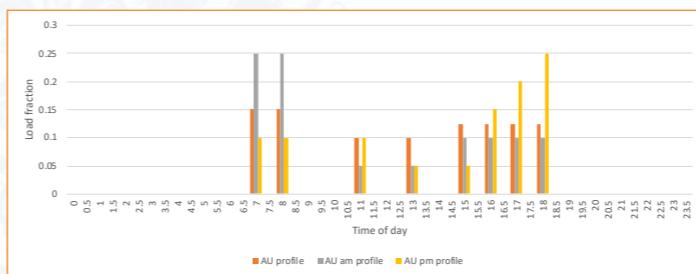
Householders will also complete a questionnaire that aims to establish their attitudes generally to energy, water and the environment as this is believed to be a significant factor in determining hot water consumption.

An online diary for householders will also be included to note unusual or exceptional activity that may impact on households' hot water use, such as having guests to stay or going on holiday.

Data from this monitoring work will lead to the development of a number of typical household draw-off profiles. It is expected that several distinct profiles will be identified, including morning biased, evening biased, and a blend.

This is illustrated in the graph below, that shows the Australian profile used in AS/NZS 4234:2008 – Heated Water Systems Calculations of Energy Consumption and examples of morning and evening biased loads.

Australian hot water load profiles



Of particular interest for understanding the energy consumption of gas instantaneous water heaters will be the typical number of hot water draws, as each hot water draw requires the appliance's heat exchanger to be heated before hot water is delivered.

The study will also provide statistical information on mean daily household water use that can be analysed to determine the impact of a range of factors such as household size, climate zone, water heater type, etc, on the volume of hot water used by a household.

The draw-off profile data can then be used as the basis of hot water system test methods and modelling to reflect actual household hot water use more accurately.

The E3 hot water project includes the development of a proposed online consumer tool. Users will be able to enter details of their household in order to see the energy costs and greenhouse gas emissions associated with a range of water heating options for their particular situation. This will be based on their own data as well as information derived from the draw-off profiles compiled from the monitoring study.

This domestic hot water draw-off research will help to inform regulators, industry and consumers about how hot water is produced and used in domestic dwellings.

Understanding hot water draw-off patterns in households is key to providing useful and tailored information to assist consumers in making more informed and more energy-efficient choices for their situation.

This will ultimately lead to reduced energy consumption for water heaters. Although not part of the research, an additional benefit may be a better understanding of the requirements for pipe sizing in different types of residences.

This may lead to possible review of these materials in each country's building code.

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Water reform a Scottish perspective



By Alan Sutherland, chief executive, Water Industry Commission for Scotland; Simon Parsons, director of strategic customer services planning, Scottish Water; and Peter Martin, technical director, Black & Veatch.

The water reform agenda provides an opportunity for the New Zealand water industry to take stock and re-focus on legacy and emerging challenges.

Although operating in a different political/regulatory environment, the UK water industry (and particularly Scotland) can provide some useful insights and pointers as to how asset and operational management of a regulated water industry has evolved and developed over time.

In terms of population size and distribution, New Zealand and Scotland are more similar than might be first thought; with a small number of populous conurbations and the remainder in widely scattered smaller rural communities.

The public-owned Scottish Water was created 12 years after the water companies in England and Wales, and initially compared unfavourably with them in general performance. However, it proactively benchmarked itself against them and, from 2010 onwards, has consistently ranked in the upper quartile of most performance metrics.

So, it is noteworthy for New Zealand that, as a fast-follower, Scottish Water only took eight years to reach the point where England and Wales took 20 years.

But this also illustrates the importance of recognising that in areas of critical national infrastructure – such as water – radical changes take time, space and sustained commitment to

implement and deliver the desired transformation in performance and service delivery.

Once a utility starts to seriously consider its assets in the round (for upgrading, renewals or compliance), the level of investment is often found to be more significant than initially anticipated; particularly in the formative years before detailed asset performance knowledge is acquired. This is something of which new water entities, funding bodies, customers and central Governments need to be aware.

Although, at first sight, the list appears daunting, much is already happening or developing to address these multiple inter-related challenges. Some examples and learning from Scotland, and the UK generally, follow.

Regulatory learning

Initially, a regulatory environment was created where the focus of the regulated businesses was principally about pleasing the regulator; not the customers.

Unfortunately, this also tended to lead to an attitude of ‘we can’t do something because the regulator won’t let us’, rather than letting companies, and more importantly their individual employees, be creative and innovative in delivering services.

However, the latest business plans have been prepared on lighter touch, risk-based regulation, where the companies have taken direct responsibility and obtained a clearer understanding

of what customers want, the benefits they want and what they are prepared to pay; with the regulators monitoring performance in meeting these outcomes.

Companies are re-invigorating their ‘purpose’. The fundamental public service purpose had rarely been lost but had not necessarily been communicated externally.

In Scotland, Ethical Business Practice and Regulation (after Hodges & Steinholtz) is being used by Scottish Water and its principal stakeholders (the Scottish Government, the Water Industry Commission for Scotland (WICS), the Scottish Environmental Protection Agency (SEPA), the Drinking Water Quality Regulator (DWQR), the Customer Forum, and Citizens Advice Scotland (CAS)) to use a transparent and collaborative approach in transforming the Scottish water industry to meet local net zero emissions regulations and improve its customer-centricity.

In England and Wales, ‘social contracts’ are being developed to meet this end.

Putting the customer at the heart of the business

Scottish Water is striving to make future investment decisions with a metaphorical ‘customer in the room’.

That environment is encapsulated in this recent draft guidance from the UK Government, which says:

“Your Water Resources Management Plan should efficiently deliver resilient, sustainable water resources for your customers and the environment, both now and the long term. This objective should be at the centre of all planning methods and decisions.

“You should be transparent through your methods, data, assumptions and decisions to achieve customer, stakeholder, regulator and government support for your plan. This is essential so that all interested parties can debate and influence your plans.”

Investment choices

At the outset, the investment focus of UK water companies was on significant capital spending to build new water, wastewater and biosolids treatment assets to meet various quality objectives.

As those obligations were met, the focus shifted to balancing capital maintenance and operating expenditure to maintain compliance, asset serviceability and customer service.

Investment planning and prioritisation for both new and replacement assets is a perennial challenge for all asset intensive organisations.

In Scotland, WICS is working closely with Scottish Water and the other stakeholders (mentioned above) to develop and establish approaches in two main areas.

In response to the asset replacement challenge, Scottish Water is promoting a common understanding amongst its stakeholders of the resources that it will require for an appropriate transition to where a sustainable level of annual investment can be put in place. The transition aims to be fair to both current and future generations.

In a rigorous investment planning and prioritisation

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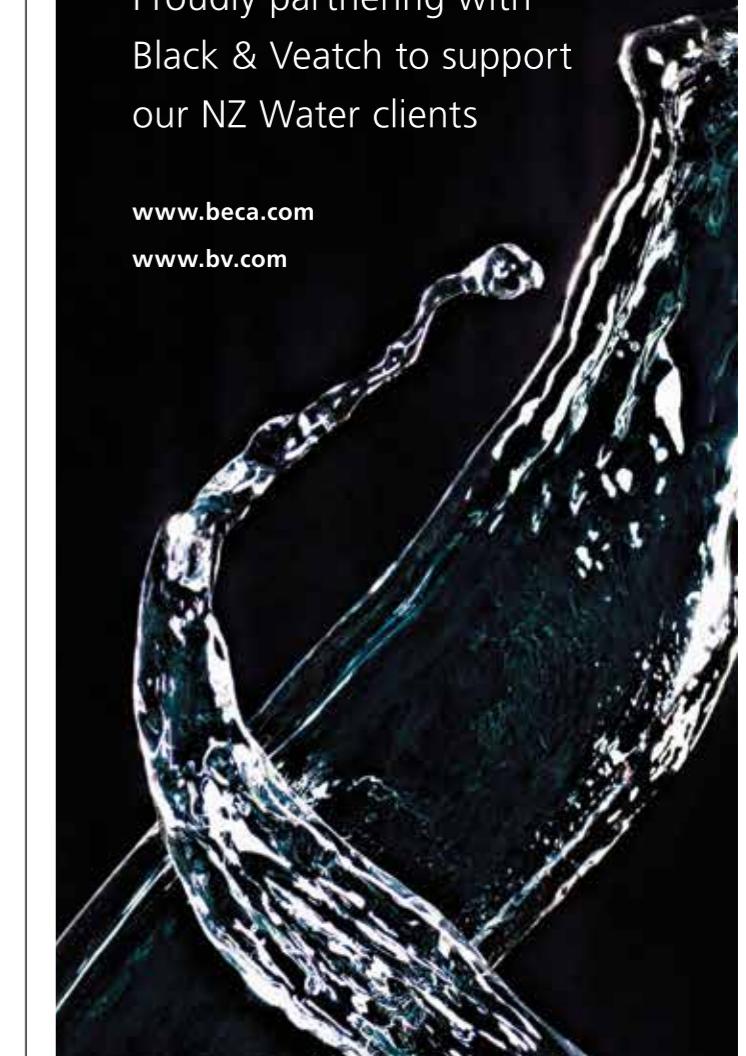
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process, Scottish Water is setting out succinct yet comprehensive investment appraisals that will allow stakeholders to provide an informed view on its proposals.

Importantly, the appraisals will cover impacts on, and views of, customers and communities; and consider the wider benefits of any investment.

In both cases, these approaches seek to address the previously perceived bias towards capital expenditure in creating new assets to solve problems, rather than considering any improved, better operational practices that might provide more sustainable solutions.

Asset management and data

In the words of Mark Kaney, asset management director (Europe), Black & Veatch, “You don’t need a digital strategy, only strategies for a digital world.”

The development of asset management policies, processes and procedures (associated with ISO 55000) has enabled the UK water companies to embed asset management as a core competence to help them address the various challenges described above.

In parallel, ever-improving data and knowledge acquisition tools and techniques, coupled with innovative software and evolving IT infrastructure, have enabled the development of information management and analytics to support better understanding and decision-making.

The quality, accuracy and transparency of the data, and its management, is vital in successfully underpinning business knowledge and as an aid to decision-making (be that for investment or operational purposes).

As is detailed water domain knowledge; data supports, not replaces, water industry experience. That said, the time and resources needed to obtain and build robust and consistent data on the assets of a newly-formed utility entity should not be underestimated.

Scottish Water is committed to ever more effective asset management to support achievement of net zero emissions, customer service excellence and great value, by transforming their understanding of its assets and approach to monitoring, maintenance, replacement and enhancement.

At the core is better investment decision-making, so it has embarked on a comprehensive ‘asset management transformation route-map’. The map includes a benefits framework, customer involvement, system planning and comprehensive investment appraisals to demonstrate clear improvement in asset management maturity.

The aim is to provide greater trust and confidence to customers and stakeholders.

Operational efficiency

Overall, experience in Scotland is that jobs in the water sector have increased. There may be changes for whom people work but the opportunities are, and always will be, there.

Operational expenditure efficiency can sound bad, but it builds opportunities for niche suppliers for funded services and frees up resources for comprehensive and robust capex programmes. Experience shows that one of the main reasons for high operational expenditure is due to reactive responses to under-invested assets.

The privatised solution

In England and Wales, water and wastewater services were moved from the public to the private sector in 1989.

This change was part of a broader UK government strategy, which also encompassed the telecom and energy sectors, to privatise the ownership and management of public utility assets.

For 16 years prior to privatisation, these services were the preserve of catchment-based public water authorities. During the 1980s, water authorities became increasingly affected by limits on public sector borrowing that were imposed to contain inflation.

It was challenging to fund asset maintenance and improvement, and also meet water quality and environmental directives set by the European Union. The UK government’s solution was to change the water authorities into private regulated companies, able to access private investment capital, and this was when England and Wales’ 10 private vertically-integrated water and wastewater companies were formed.

There were also several smaller water-only companies that had existed in private ownership for many years.

In Scotland, the challenges were the same, but the timescale and solution was different; with three former public regional water authorities consolidated into Scottish Water (a single Government-owned company) in 2002.

Scottish Water is regulated in a similar manner and by equivalent bodies to those in England and Wales.

Making full use of the supply chain

The supply chain – consultants, contractors, suppliers – provides a significant resource to the UK water companies; be that additional skills, broader knowledge base, innovative ideas or different perspectives from similar work elsewhere.

In Scotland, as elsewhere in the UK, there has been a significant and successful move away from single projects to multi-year framework or programme contracts.

This has unlocked efficiencies in the supply chain through providing certainty of workload, better use of equipment, and staff planning. This allows better cost control, with a longer-term programme view bringing better productivity and hence efficiencies.

The real mutual rewards are gained from early supply chain involvement, when the water company shares its challenges and desired outcomes and seeks support from its suppliers.

The next generation

Addressing the challenges facing the water sector worldwide over the next 30 years will provide fascinating career opportunities, some that have yet to be imagined.

Scottish Water is already working with academia and others on various applied R&D projects to bring new insights into the organisation. It is also supporting graduate and apprenticeship training schemes to secure its future workforce.

The latter being particularly important to address an aging operational workforce that has been typical of many public utilities.

From Scotland, to our colleagues in New Zealand: You are not alone, welcome to the club!



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Action for healthy waterways decoded

When we think of our majestic natural landscapes and seeming abundance of clean and clear rivers, lakes and streams some of us believe we live in a ‘100 percent Pure’ paradise. The truth, however, is that our waterways are not nearly as pristine as most of us would like. By Garrett Hall, Beca technical director environments, and Sarah Blair, Beca environmental scientist.

The Government recently announced its *Action for Healthy Waterways* package, which sets out a new direction for national freshwater management and the rules and regulations to enforce it.

The package was developed in response to growing concern that waterways are under severe threat of damage and degradation due to population growth and pollution, from land-use intensification in urban and rural environments.

For example, 94 percent of urban streams and 82 percent of streams in pastoral areas are not suitable for swimming at least some of the time.

A vast body of technical evidence, over 17,500 public submissions, and numerous policy revisions were considered in the development of the *Action for Healthy Waterways* package.

Here are some of the key points to be aware of.

The action plan

A three-stage action plan has been developed and includes the following measures:

1. Stop further degradation now

- Protection for wetlands, streams, and fish passage, to avoid any further loss of wetland and stream ecosystems and restore fish habitat.
- Reduce excessive nitrogen use through a cap on synthetic fertiliser (190 kg N/ha/year), to reduce losses of nitrate to groundwater through excessive fertiliser application.
- Targeted rollout of enforceable freshwater farm plans beginning with at-risk catchments. The aim is to work with farmers to develop environment plans specific to their farm and reflecting local climate, soils and other environmental factors.
- From July 2023, all dairy cattle and pigs must be excluded from waterways more than a metre wide. Removing stock from waterways is seen as an action with immediate benefits in terms of improving the microbiological quality of surface waters.
- Controls on intensive farming and minimum standards for feedlots and stock holding areas. This is to prevent excessive nutrient and sediment losses into surface waterways.
- Continued policy work to support freshwater quality improvements.

2. Material improvements in water quality – within five years

- Stock exclusion for cattle, pigs and deer in low-slope areas, some hill country wetlands, and all other areas that are intensively farmed.

Minimum three-metre fence setbacks from rivers and streams – with the aim of providing a buffer from waterways to prevent stock access and provide filtration of surface runoff from paddocks.

- Requirements for real-time measuring and reporting of data on water use, to improve the understanding of water use patterns in a more timely and understandable way.
- A new planning process for freshwater for faster and nationally consistent regional plans. However, questions remain over whether sufficient resources are available to undertake the significant amount of work required of regional councils.
- New or updated regional plans are notified by December 2024, setting out implementation of the new *National Policy Statement for Freshwater Management* and the new *National Environmental Standard for Freshwater*.

3. Restore our waterways to a healthy state – within a generation

- Mandatory and enforceable freshwater farm plans in place for all commercial farms.
- Communities work towards meeting the requirements of region-specific freshwater plans.
- Freshwater is recovering and on track to meet national bottom lines and community aspirations.

Changes to regulatory mechanisms

Implementation of the Action Plan will be supported in a five-prong approach through the following regulatory mechanisms.

Update to the *National Policy Statement for Freshwater Management* (Gazetted 3 August, 2020).

Proposed new *National Environmental Standard for Freshwater*.

Proposed amendments to the *Resource Management (Measuring and Reporting of Water Takes) Regulations 2010*.

Proposed *Resource Management Act Section 360 Stock Exclusion regulations*.

Proposed changes to the changes to the *Resource Management Amendment Bill 2019* to provide for a regime of certified Freshwater Modules in Farm Plans and a new streamlined freshwater planning process.

These regulatory changes will enable the enforcement of your obligations under the Action Plan.

What this means for ...

Regional Councils

The package will require significant council expenditure (estimated at \$42 million a year) with the highest costs expected to fall on Waikato, Canterbury and Otago, due to issues arising from intensive dairy farming.

The increased workload will include updating regional policy statements and plans, engagement with stakeholders, working with farmers to implement freshwater farm plans, and compliance monitoring.

Amendments to the RMA will provide for a more streamlined freshwater planning process and enable councils to meet the 2024 deadline to notify new or updated regional plans and policy statements.

Further details on the streamlined planning process are described below.

Farmers

Farmers will also face significant costs (estimated at \$124 million annually) stemming from the implementation of stock exclusions from waterways, freshwater farm plans, reduced fertiliser use, and water use monitoring.

Some immediate support is available for the primary sector in government funded programmes.

Maori

The new requirements in the *National Policy Statement for Freshwater Management* and *National Environmental Standards for Freshwater* are about strengthening Te Mana o te Wai, improving water quality and ecosystem health.

Te Mana o te Wai is about integrating Maori-tanga values into freshwater management and prioritising the health and well-being of water bodies over the needs and wants of people and other uses. Further policy work is also planned to address Maori tribal rights and interests in freshwater.

The public

The wider benefit to the public is estimated at \$359 million annually, through recreation benefits (including improved ‘swimmability’ and reduced public health risk), the retention of ecosystem services from wetlands (including flood attenuation and water storage), and improved ecosystem health outcomes.

Streamlined Freshwater planning process

The *Resource Management Amendment Bill* came into law on June 30, 2020 and provides for a more streamlined freshwater planning process. In summary:

Regional councils must publicly notify freshwater planning instruments that give effect to the *National Policy Statement for Freshwater Management 2020* by December 31, 2024.

Within six months of public notification of a freshwater planning instrument, regional councils must provide all relevant reports and submission information to the chief freshwater commissioner.

The chief freshwater commissioner (who is a current or retired Environment Court judge) convenes a freshwater hearings panel which makes recommendations back to the regional council,

which can include matters outside the scope of the submissions. Professor Peter Skelton CNZM has been appointed as chief freshwater commissioner and alternate Environment Court judge Craig James Thompson as deputy chief freshwater commissioner.

The relevant regional council then has a duty to consider the recommendations and notify decisions on them.

If the regional council rejects the freshwater panel recommendations, then appeal rights are provided for submitters to the Environment Court.

If the regional council accepts the freshwater panel recommendations, then submitters may appeal to the High Court only.

Changes from the 2019 consultation freshwater package

Public consultation on the new *National Policy Statement for Freshwater Management (NPS-FM)* and *National Environmental Standard (NES) for Freshwater* was undertaken over a period of two months ending in October 2019.

A number of changes have been adopted to address the feedback provided from the public consultation, the Independent Advisory Panel, and in response to Covid-19. Key changes include:

Strengthening the nitrate and ammonia toxicity water quality standards to provide protection for 95 percent of species (up from 80 percent).

Delaying consideration of a dissolved inorganic nitrogen bottom-line water quality attribute state for 12 months.

A water quality attribute state was not set for dissolved reactive phosphorus to recognise the high level of natural variation for this attribute. However, there will be a new action-planning attribute for dissolved reactive phosphorus, meaning that councils will need to monitor and manage to make sure levels of dissolved reactive phosphorus don't increase.

The stream setback requirements were reduced from an average of five metres to a minimum of three metres.

In the NES, stream reclamation becomes a discretionary activity but without any specific requirements as to how such applications must be assessed by regional councils. This is less onerous than the consultation version but will have significant implications for greenfield developments where stream works are involved.

For the horticulture sector, the NPS-FM confirms two ‘specified vegetable growing areas’ in Pukekohe and Horowhenua. The relevant regional councils (Auckland/Waikato and Manawatu/Whanganui) are required to have specific regard to the contribution these vegetable growing areas make to the domestic supply of vegetables and New Zealand’s food security, when giving effect to the NPS-FM in these areas.

Get in touch

There's a lot to consider and think about for protecting and restoring our waterways, and a variety of implications for everyone.

Beca has a large team of freshwater planners, scientists, and ecologists who can assist with the new freshwater planning process. Get in touch to find out more, and to discuss further about what the *Action for Healthy Waterways* package may mean for you.

Email: garrett.hall@beca.com or sarah.blair@beca.com.

Emission calculation tools for our water sector

Greenhouse gas emissions can be a good proxy for resource efficiency, and evidence suggests that increasing focus on reducing emissions in infrastructure delivery also promotes collaboration across the supply chain, unlocks innovation, and reduces costs.

By Karl van Staeyen, Hannah Edmond and Nick Dempsey of Mott MacDonald, Chris Thurston of Watercare Services, and Emma Judd of Auckland Council.

The water sector can make a substantial contribution to reducing emissions as required under the Zero Carbon Bill.

Since the sustainability of three waters services fundamentally relies on a ‘stable’ climate, the water sector is naturally looking to step up and lead by example in the response to climate change.

Taking up the challenge to foster low emissions ‘thinking’ across the entire supply chain, Healthy Waters and Watercare Services worked with Mott MacDonald over the past year to develop a ‘carbon (emissions) reduction’ tool suitable for all infrastructure projects.

Infrastructure carbon emissions are a good proxy for resource efficiency and asset owners can unlock innovation and reduce costs by integrating a focus on emissions into their existing management systems.

UK asset owners have, for example, improved infrastructure value through reduction of whole life emissions and cost across their capital programmes through adopting management principles and implementing an emissions management process (as defined in the ‘Publicly Available Specification (PAS) 2080’).

Emissions management process

By adopting PAS 2080, asset owners can focus on emissions saving opportunities throughout the project, starting in the early planning stages and engaging the full supply chain including asset owner, contractor, designer and product/material supplier.

This is demonstrated in the emissions reduction hierarchy (figure 1), which provides a structure to approach reduction opportunities through considering options to building nothing, building less, building clever, and building efficiently. This hierarchy helps to identify opportunities available through different phases of a project development and focusses the efforts of the supply chain at key phases to enable innovation and optimisation.

Emissions portal

Our ‘Carbon Portal’ (covering all emissions) has been developed in partnership with Healthy Waters and Watercare from Mott MacDonald’s internal tools.

Using the infrastructure industry’s most comprehensive data, it is the first emissions calculator capable of measuring the capital and operational carbon footprints of Building Information Modelling (BIM) designed assets.

The tool leverages global best practice for whole-of-life analysis to enable long-term decision making. It is PAS 2080 compliant and includes natural solutions with carbon absorption potential.

It also offers intuitive user experience, a suite of carbon hotspots visualisation and reporting options, and robust touch points for integration into other systems, enabling engagement with supply chain and carbon experts, while ensuring transparency of assumptions.

Watercare’s reduction approach

To guide the delivery of this infrastructure, Watercare’s infrastructure team created a vision: ‘40:20:20 Build Better Infrastructure’ that outlines three complementary and equally important measures of value: Reduce construction emissions by 40 percent by 2024; reduce construction cost by 20 percent by 2024; and improve health, safety and well-being by 20 percent year-on-year.

All three areas – sustainability, cost and health – are important individually, but combining them in a single vision allows us to unlock real synergies, innovation and collaboration.

The Enterprise model

To realise this ambitious vision a new approach encapsulated in the *Enterprise Model* was developed taking key aspects from the ICR, PAS 2080 framework and Project 13 (ICE, 2018) and developed with Watercare partners Fletcher Construction, Fulton Hogan, Beca, GHD and Stantec (including Mott MacDonald).

The model comprises two core components: Programme First, which is a business unit that integrates the asset owner (Watercare) and the construction and design partners to work as one inhouse team; and Programme Delivery, which is the integrated development of the infrastructure cycle, from business cases, designs and construction.

The focus is to extract maximum value from the infrastructure programme while delivering the 40:20:20 vision. Programme-wide gains are front and centre as well as a continual improvement mechanism to create efficiencies within individual projects. Creating long term relationships between the programme partners is also key to achieving these goals.

Emissions baseline

Mott MacDonald has worked with Watercare to use the models

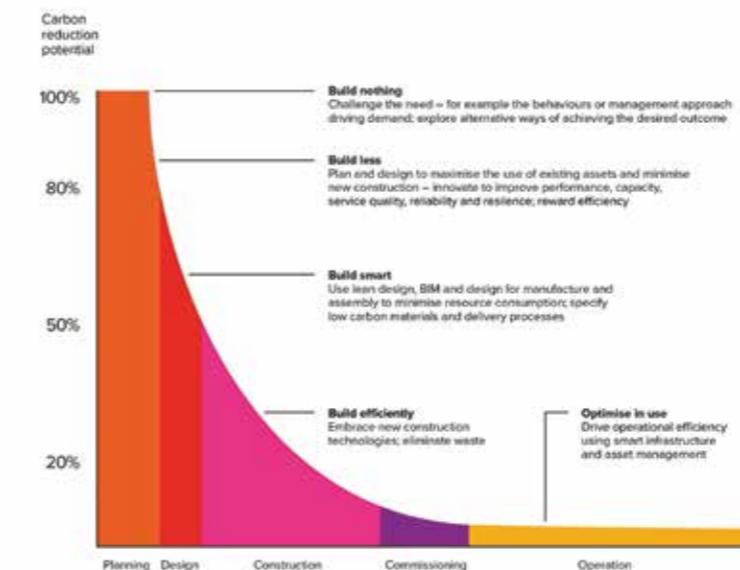


Figure 1: Carbon (emissions) reduction hierarchy.

for the ‘Carbon Portal’ in development of a Carbon Baseline for the Enterprise Model. This allowed leverage of international best practice, and to identify the real carbon hot spots.

The resulting carbon information on a programme wide level for Watercare is considered to be a first within Australasia.

Some results were previously anticipated but not proven, and others were unexpected. For example, the emissions for these projects is more than Watercare’s expected operational emissions over the same period of time; most of the capital carbon occurs in networks and transmission, as opposed to treatment infrastructure; and concrete and steel make up a large percentage of the baseline.

With a clear understanding of the capital emissions

involved in its planned programme of works, Watercare is now starting to apply the emissions reduction hierarchy to achieve potential emissions savings.

The baseline also provides the opportunity to focus on emission hotspots for unlocking low emission opportunities and new solutions, which the programme partners are now focusing on. In particular, an early focus is on concrete, pipe material and low emissions construction techniques.

Integrating carbon (emissions) management into the delivery processes also allows new assets to be built in more intelligent ways and achieve better performance from existing facilities.

Conclusions

Findings from water infrastructure projects and delivered programmes of work show that whole life emissions and cost savings can be achieved by adopting the PAS 2080 management process and implementing the emissions reduction hierarchy. Such approaches promote a culture of challenge and innovative thinking, through focusing on resource efficiency instead of cost alone.

Through embedding emissions focus in our business cultures and asset management programs and systematically applying the reduction hierarchy, substantial reductions and cost can be achieved in our water sector.

This effort can be supported by using the Carbon Portal as a common approach to infrastructure emissions calculations. In this manner, international asset managers have achieved reductions of up to 40 percent and average cost reductions of 25 percent against defined baselines.

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Study into local microplastics

An important study by ESR on how microplastics are interacting with marine ecosystems has been restarted after lockdown delays.

Just days before level four lockdown commenced, scientists at ESR deployed structures into the sea, not knowing when they could check on them again.

The study deployed five different plastics in coastal waters around the country to study how microplastics are interacting with marine ecosystems. The plastics, held in place by large steel frames, are being deployed at marine sites in Auckland and Nelson, and at the Port of Lyttelton for one year.

The full-scale experiment follows a pilot study at the Port of Lyttelton between June and August last year, which looked for biofilms that developed on two different plastics. The samples from this experiment are currently being analysed and the first samplings from these structures took place in Nelson back in June.

Project co-lead ESR scientist Dr Olga Pantos says the projects team was keen to get back to the sites.

"We did get the structures out at all three marine sites across the country, but obviously we went into lockdown, abruptly halting plans.

"The whole time we are thinking, we have to get back in and sampling as soon as possible, but there was uncertainty about the levels. We have found that a fantastic world has formed as we all stayed home."

The deployment of the plastics in the coastal environment will allow the researchers to study changes to the plastics over time and chemicals and organisms that become associated with them.

"By establishing the relationship between different plastics, the chemicals and microbes that become associated with them, we can better understand the risks they may pose the environment."

The team spent lockdown making new sampling plans to suit different scenarios for when and in what form they'd be able to access the experiment again.

While lockdown meant that short-term time points had to be missed, the experiment will continue for a year and new plastics will be deployed to capture what was missed.

About the project

The work is part of a five-year research programme looking at contemporary microplastic pollution and is called Aotearoa Impacts and Mitigation of Microplastics (AIM²).

This project is the first comprehensive research investigating the



Scientists at ESR deployed structures into the sea, not knowing when they could check on them again.

impact of microplastics and the threat in New Zealand, and brings together a multidisciplinary team of researchers, community groups from across the country to assess the risk microplastics present to the environment, economy and general well-being.

The information gained from these experiments will be used to determine the level of risk posed by different plastics. This will be used in combination with the information gained on the distribution and levels of plastics in the coastal ecosystem, to determine the potential impact on the nation.

The AIM² team includes 11 students from the Universities of Auckland and Canterbury. These students will be looking for the chemical contaminants that become associated with the plastics in the environment.

They will also study the microbes' ability to fully degrade the plastics, plastics in soils, their sources and their impacts on soil health, the effects of plastics on marine biosecurity, plastics in freshwater systems, and potential impacts on the ecology, and the ecotoxicological effects of plastics and their associated chemicals, inherent or acquired.

The Ministry of Business, Innovation and Employment funded study is 20 months in and is led by Dr Pantos and Dr Grant Northcott of Northcott Research Consultants. It includes scientists from University of Auckland, University of Canterbury, Scion and the Cawthron Institute.

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Identifying contamination before it does harm

As water suppliers look to meet incoming legislative drinking water safety requirements, a novel GIS Dynamic Catchment Risk Assessment Tool provides a powerful way to identify and respond to source contamination risks. Supplied by Tonkin and Taylor.

No incident has shaken the water sector as profoundly as the Campylobacter outbreak in Havelock North in 2016. More than 2500 people got sick, and four died. Many more had long-term illnesses. It is unsurprising that the Government moved to prevent a recurrence.

The subsequent Water Services Bill will require action on six fundamental principles of drinking water safety based on recommendations from the inquiry into the contamination event.

Under the Bill, which is expected to be passed in mid 2021, source waters are to be identified, managed, and monitored with measures to control any risks published on a regular basis.

But if the need is straightforward, putting it into practice has been anything but.

At Havelock North, the source of the contamination was floodwater entering the aquifer and water supply bores.

This outbreak, in turn, followed an alignment of many high-risk events that allowed significant surface contamination to accumulate and migrate to the public water supply bore.

"The outbreak was a classic 'Swiss cheese' model, whereby a number of events came together to create a perfect storm," says Christopher Shanks, a hydrogeologist at Tonkin and Taylor.

Around the world, a multiple barrier approach is adopted for delivering safe drinking water. Measures are applied at several steps through the entire catchment-to-tap process. But catchments can contain thousands of contaminant sources within highly complex and dynamic systems. Identifying them all is not easy. Councils will be keen to comply with new legislative requirements, but for many doing so has been a challenge.

Working with the Hastings District Council, Christopher recognised from an early stage the need to develop a better solution. Over the past two years, he and a team of 10 at Tonkin and Taylor have developed a wholly new automated GIS Dynamic Catchment Risk Assessment Tool which uses available GIS data and an understanding of catchment processes to identify and prioritise contamination risks quickly.

"Because the input GIS data is live, and often hosted



Christopher Shanks.

by regulatory authorities or the water suppliers themselves, this tool can respond in real-time to changes in the catchment and identify new potential contaminant sources as well as ways to reduce risk."

Instead of looking for needles in haystacks, a water supplier or decision-maker can identify, prioritise and respond to source risks in real-time and as they emerge.

Drawing on several unique new approaches, the tool represents the forefront of catchment risk management in New Zealand.

"We wanted to provide water supply managers and decision-makers with something that would enable them to maintain an updated understanding of potential risk even when catchments are highly complex and dynamic."

Essentially, risk turns on two factors: a source of contamination, and a pathway for it to reach a receptor, like a water supply bore or supply intake. The new Tonkin and Taylor tool uses GIS data to identify potential sources of contamination and interrogates these in terms of aquifer vulnerability and transport mechanisms to where water is removed.

The tool harnesses quality GIS data to identify contaminants associated with land-use activities drawing on an understanding of spatial trends in the aquifer's vulnerability to surface contamination and of groundwater flow within the catchment.

Numerous GIS data sources allow for the identification of potential contamination, including contaminated land databases and district and regional land-use and surface water mapping. These are added to by hazardous substance registries, discharge consenting and wastewater infrastructure data, and data showing the location, age and construction material of wastewater infrastructure, or areas of historical quarrying, mining and landfilling.

Risk scores are extracted from the data and calculated using Feature Manipulation Engine (FME) software. They are then shown as a 'heat map' on an interactive GIS viewer, which displays the results and allows a user to interrogate the supporting data.

Even if information is sparse, conservative scoring can be revised on a case-by-case basis as more data is gathered.



Over the past two years, Christopher and a team of 10 at Tonkin and Taylor have developed a wholly new automated GIS Dynamic Catchment Risk Assessment Tool which uses available GIS data and an understanding of catchment processes to identify and prioritise contamination risks quickly.

address the highest risks, then measure value in terms of risk reduction."

The contamination event at Havelock North followed a confluence of multiple contributing factors. Based on real-time depth of knowledge of threats to a catchment the new Tonkin and Taylor automated GIS risk tool provides a powerful way to navigate through these to a clear conclusion,

"The tool allows for a new level of responsive and proactive decision making, which is a big step forward in catchment risk management."

And is helping to prevent an event like Havelock North ever happening again.

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Strengthening a seawall for a climatic future

Running the length of Quay Street is an historic seawall that has retained, and protected, land reclaimed over 100 years ago to form Downtown Auckland.

Over the past 18 months, strengthening of a 600-metre section of the seawall has been underway and lays the essential foundations for the Downtown transformation. The project has also been hitting some critical deadlines.

Eric van Essen, Programme director of the Downtown Programme says work is progressing with full completion due early next year.

"We reached a major milestone early this year with the completion of the section between Queens and Marsden wharves and have just completed the Princes Wharf section."

The strengthening has been approached in four sections, with the design team from Tonkin and Taylor developing different methodologies with the Downtown Joint Venture through Early Contractor Involvement (ECI) to match the

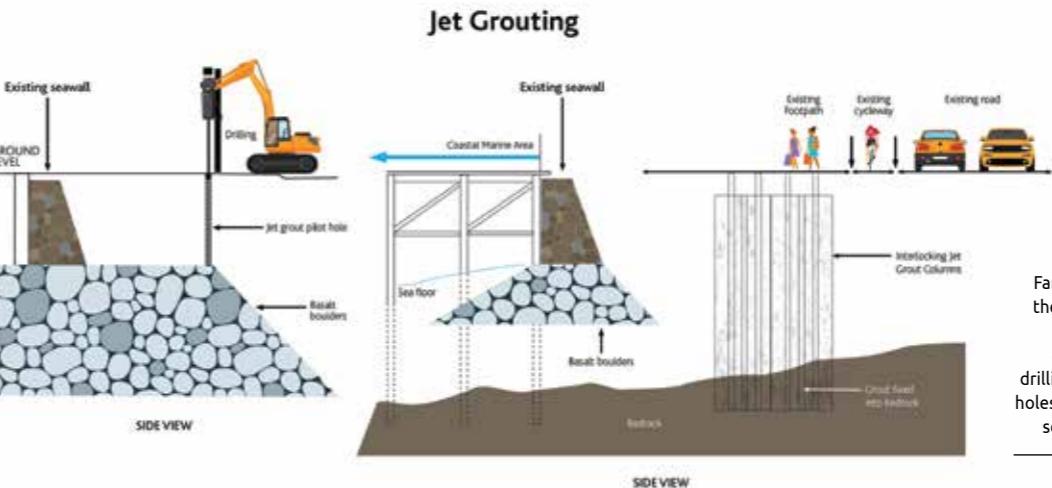
ground conditions, location, design requirements, and to minimise street level disruption.

"Between Queens and Marsden wharves, a palisade wall approach was taken which involved constructing 96 reinforced concrete piles along the length of the sea wall," says Eric.

"Each pile has a diameter of 1200mm with pile lengths varying from 10 metres to 25 metres."

For Princes Wharf, a different method was required to avoid relocating the high concentration of underground utility services in this area.

Jet grouting, a relatively new technique, involves drilling approximately 200mm diameter holes into the East Coast Bays rock layer some 10 to 15 metres below ground. A rotating nozzle then injects a water cement mixture into the soil forming



Far left: Inclined anchor drilling rig for the Ferry Basin section of the seawall.
Left: Diagram showing jet grouting, a relatively new technique, involves drilling approximately 200mm diameter holes into the East Coast Bays rock layer some 10 to 15 metres below ground.

a column as it moves back from the rock up to ground level.

There are now 153 jet grout columns arranged in groups of four positioned about three metres apart, extending 110 metres along Quay Street in front of Princes Wharf. With these seawall works completed, the enhancement of Quay Street with wider footpaths, an integrated bi-directional cycleway, raingardens and new street furniture can get underway.

Another approach altogether has been adopted for the Ferry Basin and the area in front of the Ferry Building.

Eric says in these two sections, the seawall is being strengthened by drilling a series of inclined rock anchors inserted through the seawall. These are made up of high strength steel tendons that anchor the seawall to the bedrock and protect it from sideways

ground movement in an earthquake.

The Downtown Programme is one of the largest urban transformation projects to be undertaken in Auckland, requiring the coordination of multiple related projects and deadlines.

Eric says a strengthened seawall is the foundation upon which all the other projects depend.

"While strengthening works have been highly visible requiring some very impressive construction and drilling equipment, the seawall itself is largely unseen beneath Quay Street.

"It is reassuring to know that this critical strengthening work will secure the resilience of the city against seismic events and climate change for another 100 years and beyond."

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More public drinking fountains called for

A national survey of public drinking fountains undertaken by RefillNZ has shown that, on average, there is only one drinking fountain for every 3303 Kiwi citizens and as few as one fountain for every 17,000 people in the worst-affected area.

Although a few councils have really good drinking fountain coverage in their communities, it is very inconsistent and it's becoming a serious public health issue," says RefillNZ founder Jill Ford.

"When we don't have ready access to free tap water, sugary drinks become the cheapest, most convenient option for people when they're out and about.

And this is contributing to our dreadful health statistics. New Zealand is number three for sugar consumption and the third most obese nation in the OECD, which is also a significant risk factor for complications of Covid-19.

Sugary drinks are a contributing factor to weight gain and dental decay. Kiwis consume approximately 73 litres of sugary drink per person, per year."

Ford says more drinking fountains could reduce the consumption of sugary drinks and bottled water, reducing both sugar-related health issues and plastic waste.

Sugary drinks particularly affect the health of our children. In 2019, the number one reason why Kiwi kids were admitted to hospital was to have their teeth removed under general anaesthetic."

Dr Rob Beaglehole, spokesperson for the NZ Dental Association, says that the number one source of sugar for New Zealanders aged 0-30 years is sugary drinks, leading to a crisis in dental health for children and teenagers.

In 2019, 8700 children aged 0-14 years were admitted to hospital to have their teeth removed under general anaesthetic with thousands more on the waiting list. Children and young people are suffering high levels of pain that impacts on their ability to eat, speak, and sleep, he says.

The procedure is costly, both financially and from a well-being perspective. Each operation costs around \$4000, which is borne by taxpayers.

But the health impacts are even more severe. Having healthy baby teeth is crucially important to the development of healthy permanent, adult teeth. When baby teeth are removed early, it affects the positioning of the incoming adult teeth.

This can lead to lengthy, complex and expensive orthodontic treatment to correct the issues that arise, creating an additional burden on the public health system.

"One of the worst days in my dental career was when I had to remove 10 teeth in one surgical procedure from an 18 month-old baby, still in nappies," says Beaglehole.

With one 600ml sugary drink containing up to 15 teaspoons



Children enjoy fountain access in Porirua, where the local community has been the driving impetus around investment in village drinking fountains.

of sugar – five times the recommended daily intake for a child according to the World Health Organisation – Beaglehole fully supports RefillNZ's call for better access to public drinking fountains across the country as an important step in supporting Kiwis to drink tap water, rather than sugary drinks.

"There's also mounting evidence that children who have had one general anaesthetic for teeth removal are much more likely to have further teeth removed.

"Because baby teeth are small, they abscess easily, which means these children are ending up in a cycle of pain, sleeplessness, and poor health outcomes due to the consumption of sugary drinks.

"Creating a sugar addiction at such a young age bodes poorly in terms of future health issues like obesity and type 2 diabetes, which are strongly linked to sugary drinks."

Jill Ford has been working with councils around the country to add more drinking fountain locations and says that since completing the survey and sharing the results with local authorities, there has been an encouraging response, with councils looking for advice and support to improve drinking fountain infrastructure.

RefillNZ's online map shows 2059 locations where you can fill reusable drink bottles for free with good quality tap water. These locations include cafes, local businesses, public libraries, and outdoor drinking fountains.

"It's great to see councils responding to the issue and taking positive action. There is some good work underway in some areas of the country, but more needs to be done," she says.

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Restoring Lake Hayes



There is no silver bullet to restore the water quality of Lake Hayes, says Selva Selvarajah from Enviroknowledge, unless the four Ps of planning, precaution, patience and perseverance are employed.

Lake Hayes is probably one of the most photographed lakes in New Zealand, but underneath its alpine beauty this 276 hectare, 33 metre-deep lake holds highly polluted water and a lake bed smothered with historical sediments and nutrients from predominantly pastoral catchment, mostly dumped by Mill Creek.

Over the summer the lower lake water column becomes oxygen deficient, which is hostile to aquatic life. The depth of the oxygen deficient water column has been increasing steadily over the past two decades and rendering 75 percent of the lake water oxygen deficient during summer.

The Otago Catchment Board recognised the issue in the 1960s. In the 1990s, its successor Otago Regional Council (ORC), in collaboration with Queenstown-Lakes District Council (QLDC), launched its ambitious Lake Hayes Management Strategy.

There were signs of water quality improvements, but the lake health remained stubbornly poor.

With rising pollution episodes, local community (for example the Friends of Lake Hayes) interest also grew with the view of restoring the lake.

ORC has responded by committing to restoration in consultation with the community. This is welcome, and an opportunity to showcase effective restoration, given many lake restorations around the world have become lifelong white elephants.

My literature research indicates copycat lake restoration is risky, given wide-ranging lake dynamics. I attribute many of the failures to a lack of sound planning/rationale and critical information including nutrient budgets.

Mill Creek, despite its very good water quality grade, could still dump six tonnes of nitrogen and 0.3 tonne of phosphorus into Lake Hayes every year.

The lake holds more phosphorus than nitrogen needed for algal blooms, which is more dangerous than having more nitrogen and less phosphorus. This is because cyanobacteria, also known as blue-green algae, thrive on phosphorus and can introduce atmospheric nitrogen into the lake to satisfy its nitrogen needs.

Adding more nitrogen into the lake can make the lake worse. To date, the key algal nutrient driving poor lake water quality has been phosphorus.

Thus, the priority should be to reduce phosphorus from entering the lake from the catchment and to remove historical phosphorus stored in the lake. I am confident catchment phosphorus runoff losses can be reduced by currently available mitigation measures.

I believe the most effective long-term restoration rationale is by permanent removal of phosphorus accumulated in the lake system.



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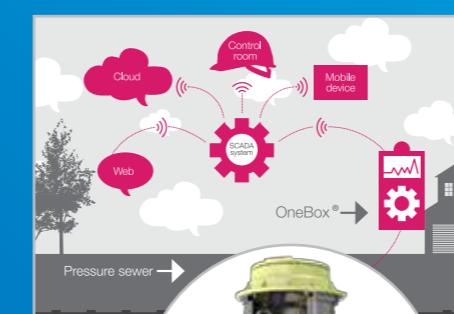
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Drinking water lessons from Germany

By Dr Dagmar Kaschuba, product manager, disinfection.

D rinking water in Germany comes from a variety of different sources, ranging from deep wells to rivers and the sea. Depending on the source, the composition of the water can vary significantly.

Each source of untreated water has different contents of minerals, salts, trace substances, nitrate etc. and must therefore be processed in a specific way.

Operators of water facilities and their staff face increasing challenges to meet this objective. For instance, legislators are demanding more and more quality measurements and water analyses and are tightening existing limit values, for example in the European Water Framework Directive (WFD) or the German Drinking Water Ordinance.

Water facilities in Germany are set up not for the purpose of generating their own profit, but to ensure a reliable supply of clean drinking water to the population. Disinfection, for example using ozone, plays an important role here in achieving the correct condition of the water during treatment.

When the water is being transported to its destination, free chlorine or chlorine dioxide is often used due to their lasting disinfectant effect. This residual effect ensures that the water is disinfected while in transit from the water facility to the user's tap, thus preventing the formation of a dangerous biofilm.

Drinking water plants in Germany can vary greatly, depending on the catchment area. A direct comparison between a large drinking water treatment plant on Lake Constance and a smaller drinking water plant in Germany highlights the differences, but also the similarities.

The Lake Constance water supply system supplies about 320 cities and municipalities with water. This means that up to four million inhabitants receive fresh water from Lake Constance every day. The Dobeln-Oschatz Water Board supplies water to about 8000 inhabitants in the cities of Waldheim and Hartha, among others. The distribution networks of these two drinking water plants are therefore very different.

For example, there are 1700 kilometres of pipeline in Baden-Wurttemberg compared to 105km in Saxony. At the remotest point of supply, the water in Hartha can remain in the pipeline for up to three weeks compared to up to seven days in the Lake Constance water supply system. In both cases, it is essential that the network is protected using an appropriate disinfectant.

At Lake Constance, chlorine gas is added to the water via a volumetric closed-control loop. This means that a specific quantity of chlorine gas is added, depending on the volume of water processed. The amount of disinfectant added is therefore based on the volume of water to be disinfected and not on the final concentration measured.

This usually amounts to 0.22 mg/l of free chlorine. To ensure that

Solutions for drinking water monitoring

Apart from measuring chlorine content, a comprehensive system for monitoring drinking water quality also involves measuring other parameters such as turbidity, pH and conductivity.

This measuring technology is typically installed in the bypass. This is due to the fact that the sensors require a precise level of flow, are not capable of withstanding the full range of operating pressures and also because the use of pH glass sensors directly in a drinking water pipeline is far from ideal. The complete solutions provided by Endress+Hauser combine all of the relevant parameters and, thanks to their special geometry, ensure that all sensors are subjected to optimum levels of flow.

This prevents small particles, such as sand, from circulating in the application. Instead, these particles are filtered out and do not have a negative impact on the measuring signal. However, the most important advantage of this special flow geometry is that up to three times less water is required for measurement in the bypass compared to conventional systems.

These water savings play a role in ensuring the reliable operation of these water facilities into the future, despite the ever-increasing challenges posed by drought periods and falling groundwater levels.



this guideline value is continuously monitored, two independent measuring points are installed at the start of the distribution network. The free chlorine sensor, the Memosens CCS51D, measures the chlorine content of the water at this point. The two water lines are controlled in exactly the same way, ensuring maximum reliability through redundancy. It is particularly important that the measuring technology is accurate and stable, since any deviation in the value being controlled causes an alarm to be triggered, which in turn requires personnel to perform an inspection directly on site.

Therefore, the problems commonly associated with chlorine measurement, such as increasing volumes of air bubbles, should

be avoided if possible. The design of the assembly used and the geometry of the sensor ensure that the sensor measures reliably, even in the case of low flow.

Another important point is the ease and speed with which the measuring technology can be maintained; otherwise, continuous measurement would not be possible. Continuous online measurement, in particular, is a key factor in ensuring a consistent level of water quality.

The Memosens CCS51D sensor proves its worth in this regard: thanks to its convex, dirt-repellent diaphragm, the membrane cap and electrolyte only have to be replaced approximately once a year. Furthermore, the Memosens technology used in the sensor means that the sensor can be replaced quickly on site, since the sensors can be precalibrated in the lab and connected using plug and play.

Last but not least, Heartbeat Technology ensures that the measuring point continuously monitors its own condition and supports predictive maintenance with diagnostic messaging and recommended measures.

At the small drinking water plant in Hartha, the measuring point with the Memosens CCS51D chlorine sensor is also installed at the start of the distribution network.

In this system, however, it is the measured value of the sensor that is the determining factor. In other words, the addition of chlorine bleach to the water is dependent on the measured concentration of free chlorine. The objective here is to achieve a value of only 0.14 mg/l, which the sensor is capable of monitoring due to a high level



Source basin of Lake Constance water supply system

of dissolution in the trace range and maximum accuracy.

The sensor is unique in the speed of its response to even the slightest change in the chlorine concentration of the water. This guarantees the stability of the control function and the lowest possible level of disinfectant dosage and consumption.

Thus, regardless of the size of the water facility, the Memosens CCS51D plays its part in ensuring that 670,000 cubic metres of raw water per day at Lake Constance and 1000m³ in Hartha reach their destination in a clean condition. Two examples of drinking water plants that rely on high-precision and low-maintenance measuring technology.

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Water management

Aussie lessons

After a largely rain-free spring, summer and autumn, hundreds of thousands of

Kiwis are living under water restrictions that illuminate the complexities of our national water services. By Richard Coulter, water and wastewater sector manager, Schneider Electric New Zealand.

According to news reports, Sydney Water is among the public sector bodies setting the standard for the use of technology in large, often aged, infrastructure systems.

A University of New South Wales researcher is now undertaking a study using sonar arrays to detect cracked pipes in Sydney's water system, which is losing around 10 percent of its daily water to leaks. This is not unusual – at any given time, around 30 percent of water is being wasted through leaks in pipes, water collection and distribution infrastructure globally, often due to aging infrastructure.

The researcher says the technology components are not expensive and could make for a "potentially very cheap" water main system.

Technology like this and the Internet of Things provides a whole smart sector network that includes miniaturised sensors and changes the game for water management and crises.

It is now possible to incorporate virtual sensors throughout a water network, allowing for real-time management of hydraulic, energy usage and water quality parameters. They will detect breaches of pressure, water quality or other factors, produce alternative what-if scenarios and compare their benefits with BAU scenarios, and much more.

Importantly, it allows for predictive and pre-emptive maintenance, which saves money and time and prevents loss of water, and makes the most of the infrastructure we already have.

We are looking at a huge opportunity without a large capital investment that, if taken advantage of, can create a long-term, inexpensive, reliable supply of a precious resource.

Tried-and-true supporting the new tech

Man's best friend might be coming to the rescue once again, also in Sydney: Dogs are now being trained and deployed to sniff out wastewater leaks and contamination that is so slight, even sensors might miss it.

Again, this is an affordable investment in public health and infrastructure that targets the problem and doesn't require



Richard Coulter

digging up metres of pipe in order to find a leak.

It is a very intriguing methodology that shows there are many ways to solve the problem of aging infrastructure while causing minimal disruption to economic and social activity in busy cities.

Businesses benefit from water reforms

In early July, the government announced long-awaited investment in water reform, with the funding and agenda being championed by the likes of Infrastructure NZ. It committed \$761 million in investment to local councils that opt-in to the wider water reform programme.

Infrastructure NZ has made the comparison with Scottish Water, which after undergoing its reform process two decades ago was able to double its capital expenditure and its customer satisfaction, while lowering water rates by 40 percent over a decade and a half of reform.

There are clearly huge economic advantages to increasing the scale and capacity to plan, fund, finance and operate increasingly complex water systems. The benefits of significant government investment can be felt across all regions, as businesses can rely on steady, secure, clean supply, and there is a correlative improvement to public and environmental health of superior water infrastructure.

Solutions from the smallest and largest of scales

Another Australian example comes from Yarra Valley Water (YVW), the largest of Melbourne's three water corporations, which provides water supply and sewerage services to over 1.7 million people and over 50,000 businesses. It now uses a cutting-edge 30,000-point SCADA system to monitor approximately 550 sites, from treatment plants to water pump stations and sewer relief, pump and flow control facilities.

The water network spreads over 4000 square kilometres, with population growth meaning the pressure is on to deliver sustainable water solutions.

The system also reduced the maintenance support cost;

reduced reported faults by 66 percent within eight months of going live; and reduced external support cost by 80 percent. Other key benefits include real-time performance and operational reporting and business reporting, to streamline the dispatching of work crews and increase efficiency.

The combination of increases in performance, safety, maintenance control and reductions in cost is crucial for any taxpayer-funded system on which hundreds of thousands of people and businesses depend.

Another interesting note about the Australian approach to water: Across the Tasman, water is allowed to be traded by irrigators – so it has a value as a commodity and attracts investment. Could a similar approach here encourage better management of water scarcity issues?

Following other countries' leads

Leading on a world stage for technology adoption is New Zealand Agriculture – the past decade has seen the implementation of water management telemetry systems.

Typically, farming communities now have a high degree of awareness of compliance and are more focused on consumption measurement and efficient use. Many farm managers use SCADAFarm, an industrial cloud software platform that helps farmers check and control irrigation over a broad geographical area or multiple farms, often using just a smartphone app.

Local government bodies also use this type of technology to manage assets.

Global fresh water demand will increase 55 percent by 2050, and currently 70 percent of all fresh water is used in agriculture, so tools of this type show an appreciation for the value of water and illustrate the potential for more capability in the measurement and control of responsible usage, from fresh to grey water.

Industry wide collaboration

There is a tonne of expertise among private companies in our country, and collaboration between government and the private sector could be something worth further investigation. The equation for long-term security of water services provision is local government, service providers and tech partners.

The only true barrier we have is mindset.

We need to move away from a traditional, slower-moving approach to water (a 'man in a van' coming to fix the tap) and towards a sophisticated digital approach (the IP of NZ Inc) that helps us conserve precious resources, measure everything we are doing and take the risk out of water services provision.

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McConnell Dowell reached a major milestone at its St Marys Bay project in Auckland when three sections of the tunnel boring machine (TBM), 'Hinehoaka', was carefully lowered into the Pt Erin shaft.

Hinehoaka was positioned on a steel cradle where the new tunnel begins inside the Pt Erin shaft. Over the following two weeks the team connected the hydraulics, performed surveys, set up the guidance system and tested the TBM before she began tunnelling back in early July when it created a new two-kilometres long pipeline for the St Marys Bay Area Water Quality Improvement project in three tunnelling sections or drives.

The stormwater storage pipeline will meet an increasing demand on the sewer system as Auckland's population grows. It will also significantly reduce combined wastewater and stormwater discharges and by improving water quality, will make local beaches safer for people and wildlife.

The scope of works includes; building a new two-

kilometres long, 1.8 metre diameter stormwater storage pipeline; constructing three shafts at Pt Erin, St Marys Road Park and the corner of London and New streets; performing three tunnelling drives to connect the shafts and create a tunnel out to the outfall location in the Waitemata Harbour; assembling a 468 metre long high-density polyethylene (HDPE) marine outfall assembled in Kaiaua, Coromandel then towed 90 kilometres to Auckland; building a new pumping and screening station and odour control unit in the Pt Erin Park shaft; and constructing a new weir structure and odour control unit in the St Marys Road Park.

Construction began in January 2020 and is scheduled for completion in mid-2021.



The tunnel boring machine (TBM), Hinehoaka, was tested before she began tunnelling back in early July when it created a new two-kilometres long pipeline for the St Marys Bay Area Water Quality Improvement project in three tunnelling sections or drives.

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Electrochemical process kills water contaminants

University of Sydney engineers have used electricity to clean up heavily polluted industrial wastewater. They hope the findings will help wineries, pharmaceutical manufacturers and other industries that must comply with strict wastewater regulations. By Luisa Low,
University of Sydney.

A team of engineers may be one step closer to cleaning up heavily contaminated industrial wastewater streams. Researchers from the School of Chemical and Biomolecular Engineering developed an electrochemical oxidation process to clean up complex wastewater containing chemical pollutants.

"Our study, published in *Algal Research*, involved industrial wastewater that had been heavily contaminated with a cocktail of organic and inorganic species during a biofuel production process," says Julia Ciarlini Junger Soares, who is completing a Ph.D. in chemical and biomolecular engineering under the supervision of Dr Alejandro Montoya.

The wastewater, which contained carbon, nitrogen and phosphorus, was generated in a pilot plant, designed by the team for the production of biofuels using naturally abundant microalgae.

The process involved treating wastewater with electricity using specialised electrodes. They discharged electricity, then drove oxidation reactions near the electrode surfaces, transforming the organic contaminants into harmless gases, ions or minerals.

"We have employed an incredibly powerful process that eliminates even the most persistent non-biodegradable pollutants, such as pharmaceuticals and pesticides, as well as various classes of organic compounds that can be found in many industrial effluents."

The process is relatively simple, does not require the addition of chemicals or severe operation conditions, and does not produce additional waste streams.

"Wastewater is a significant issue for our environment, as well as for many industries who use substantial volumes of water in their processes, such as in reactions, transport, and washing and cooling. Finding suitable solutions for reuse or disposal is often very challenging and costly."

"The electrochemical method that we used can be readily applied to industries that must comply with strict regulations for wastewater disposal, such as pulp and paper processing, wineries, as well as pharmaceutical production facilities."

"Worldwide, researchers are investigating methods for the development of biofuels from algae. Developing alternatives for the treatment and reuse of this industrial



PHOTOS: JULIA CIARLINI JUNGER SOARES

"We have employed an incredibly powerful process that eliminates even the most persistent non-biodegradable pollutants."

effluent is a hot research topic and can bring opportunities for energy and resource recovery within a circular bio-economy framework."

The team will soon carry out research focused on specific contaminants to better understand the chemical transformations that take place during electrochemical oxidation and will scale up the process.

A 2017 Unesco report found that the opportunities from exploiting wastewater as a resource were vast, and that safely managed wastewater is an affordable and sustainable source of water, energy, nutrients and other recoverable materials.

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The company believes in developing skills within its staff and offers apprenticeships and training programmes as part of the GFS team development and to support the health of the industry in the long term.

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Northland's annual hull inspection

Those charged with defending the Northland region's marine environment from invasive pests say it's a tough fight, but an increasingly supportive public is allowing them to chalk up a number of successes.

Councillor Jack Craw, who chairs the Northland Regional Council's (NRC) Biosecurity and Biodiversity Working Party, says while the threat from a variety of marine pests is ever-present, Northland has had a successful 12 months across a number of fronts.

One of the crucial tools employed by the council is an annual 'hull inspection' programme that targets everything from recreational boats to superyachts and fishing vessels to barges.

Craw says the inspection programme has been running for several years and typically begins in October, before vessel owners start travelling to new areas with the onset of warmer summer weather.

"Of the more than 2000 vessels checked last season, roughly one in five, or 389 of 2048 vessels, had been harbouring marine pests. Of those, 115 were harbouring Mediterranean fanworm (*Sabellapallanzanii*) or Undaria (an unwanted seaweed)."

Of the 115 with marine pests of particular concern, 45 owners had received formal 'Notices of Direction' requiring them to haul their vessels out and clean or treat them in a timeframe appropriate to the level of risk.

"Thirty-two others had their offending pests removed by council's contract divers and 38 had been resolved without enforcement action."

"Two warnings and one infringement notice had been issued, the latter in response to a heavily-infested vessel hull in Mangonui.

"Currently 15 out of Northland's 17 harbours and significant marine areas are still fanworm-free and we've managed to successfully eradicate fanworm in Tutukaka. We're keen to maintain these successes and build on them where possible."

Craw adds that there have been 27 cases where fanworm had been discovered on vessels that had then immediately been required to clean/leave the area.

Of those 27 incidents, nine involved fanworm found while a boat was at anchor, nine in marina berths and nine on moorings.

The good news is that only a third of the 27 cases involved a cluster of more than 10 fanworm and only two or three were thought to have included those mature enough to reproduce, with none showing evidence of recent spawning events.

"The majority only had a few individuals in niche areas (like the base of the keel, and behind anodes and bow thrusters) representing a much lower biosecurity risk."

The 27 cases were a good result for the region's environment,



Mediterranean fanworm (*Sabellapallanzanii*)

he says, as all had been successfully detected in areas outside of Whangarei (a known Mediterranean fanworm spot) or Opua, where the pest is a more recent arrival that is being actively managed.

Meanwhile, efforts to control fanworm at Opua are continuing, with an additional \$100,000 support expected over the next 12 months from the Ministry for Primary Industries and the council was also doing increased surveillance following the discovery of a fanworm-infested boat moored in Mangonui Harbour in February.

After the discovery, by dive contractors, the 13.5 metre twin-masted ketch involved had been ordered out of the water for immediate cleaning.

Craw says public support is integral to successful marine biosecurity and he and his fellow councillors are "thrilled" at the level of engagement with the community.

"We've had literally dozens of calls over the past few months from concerned vessel owners/members of the public who have noticed unusual species and a number who have also provided positive feedback on our programme.

"Passive surveillance and vessel owners calling in if they see anything unusual is a key part of a successful programme."

"There's also been a noticeable change in the public attitude to maintaining clean vessel hulls in recent years with many more boaters ensuring their hulls and associated equipment is clean."

In-water cleaning rules are now operative, providing a cost-

effective cleaning option where infrastructure is lacking and the council says it is continuing to work with its biosecurity colleagues in three other northern regions to develop an inter-regional marine pathway plan.

"This inter-regional collaboration will ensure an improved and coordinated approach to prevent dirty hulls transporting marine pests and should mean vessels are arriving in Northland from other regions with clean hulls," says Craw, and adding that a draft proposal is expected to be ready for consultation about the middle of next year.

"Council is also working with MPI and industry to address niche area issues by investigating a national standard for antifouling/cleaning."

Collectively all this work boosts the resilience of our marine biosecurity network and ensures that we are as well-placed as possible to deal with any threats encountered, he says.

In another marine biosecurity issue in the Northland region, biologists discovered last summer a new and unwanted arrival in Northland – a sea squirt called Lightbulb ascidian (*Clavelina lepadiformis*).

"It was found in January on a vessel (which was on its way to Tutukaka) in Marsden Cove," says Craw.

"Its concerned and helpful owner assisted staff by immediately organising for the vessel to be hauled and cleaned."

Lightbulb ascidian is thought to have been in New Zealand since 2008 but, until now, was only known to occur in the South Island and Wellington.

Originating from the Shetland Islands, the species has subsequently invaded Africa, Northwest Atlantic, the United States and other nations.

"It forms colonies of transparent tubes about five centimetres long, with white, yellow or pink bands that make it appear to glow like a light bulb, hence its name."

Most commonly spread on vessel hulls, Craw says it's a problem because like Mediterranean fanworm and other marine pest species, it can form large colonies on hard surfaces such as marinas and rocky sub-tidal and inter-tidal habitats.

"These in turn then dominate disturbed habitats and can outcompete native species and may impact upon the mauri [health] of the moana [sealife]."

Don McKenzie, Biosecurity manager for the Northland Regional Council, says it's vital boaters ensure their vessel and any associated equipment is clean and free from fouling which may contain marine pests like fanworm, especially if they were returning from/travelling to areas known to have established fanworm populations.

"Under regional council rules, it's an offence to transport marine pests in Northland. "Vessels entering Northland and moving between harbours must have no more than 'light fouling' on their vessel." (Light fouling is classified as a slime layer and/or barnacles, and up to five percent macrofouling).

McKenzie urges anyone encountering marine pests, or anything unusual, to notify the authorities as soon as possible.

Information on a range of marine pests can be found at: www.nrc.govt.nz/pestcontrolhub



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Freshwater regulatory reforms

Recent enactments as part of the Essential Freshwater package have been gazetted this month with strong implications for water users and councils. Freshwater Improvement Funding has also opened with applications being taken as early as September and the High Court has heard a case that pits the approval of representative body Southland Fish and Game against the disapproval of the anglers it represents.



By Helen Atkins, Director and
Tom Gray, Solicitor, Atkins Holm Majurey.

Action for healthy waterways

New Action for Healthy Waterways reforms have now been made. The new National Policy Statement for Freshwater Management 2020 (NPS-FM), National Environmental Standards for Freshwater 2020 (NES-FW), stock exclusion regulations, and measurement and reporting of water takes regulations were gazetted on 3 August, taking effect from 3 September 2020.

Considered the most significant freshwater reforms since the enactment of the RMA, the package aims to "stop further degradation, show material improvements within five years, and restore our waterways to health within a generation".

The NPS-FM sets national objectives and policies that regional councils must 'give effect to' in planning documents. This will include setting targets and limits for maintaining or enhancing water quality and the ecological health of water bodies over time.

The concept of Te Mana o te Wai is strengthened through the NPS-FM by a requirement to manage freshwater in a way that 'gives effect' to Te Mana o te Wai. This requires actively involving 'tangata whenua' and communities in freshwater management, setting out a 'long-term vision' in the regional policy statement, and a new 'hierarchy of obligations' – prioritising the health and well-being of water bodies, then the essential needs of people (drinking water), followed by other uses. There is expected to be more updates coming for Te Mana o te Wai as these requirements are implemented across councils.

'Bottom lines' are also defined in the NPS-FM and require all water bodies to be at least maintained, with degraded water bodies required to be improved. Annual monitoring and reporting requirements are also included, with a synthesis report to be published every five years.

Under the RMA, Regional Councils have until 31 December 2024 to notify regional plans (or plan changes) that give effect to the NPS-FM and must implement those changes "as soon as reasonably practical".

Those with freshwater plan change processes underway, or coming up, may elect to include such provisions now to avoid repeating the process in four years.

The NES-FW sets additional performance standards and new requirements for resource consents. This includes regulations on

feedlots, agricultural intensification, fertiliser nitrogen discharges, setbacks on wetlands for earthworks, and fish passage in culverts, weirs and dams.

National environmental standards do not need to be implemented in the same way as policy statements, but plans will need to be reviewed for 'duplication or inconsistency'.

The Resource Management (Stock Exclusion) Regulations 2020 also come into force on 3 September and prohibit access of cattle, pigs and deer to wetlands, lakes, and rivers. An exemption is included where there is a permanent fence in place before the Regulations come into force.

Future reforms to come from the Essential Freshwater discussion document are also signalled to deal with further freshwater regulations, including the ownership and allocation of water.

It is not yet known how these will tie in with the proposed repealing of the RMA suggested in the Randerson Report.

Freshwater Improvement Funding

The Ministry for the Environment has opened two new rounds of funding from the Freshwater Improvement Fund (FIF) to support initiatives that provide employment opportunities to restore wetlands, rivers and streams to health.

This comes as part of the Jobs for Nature programme and opens \$55 million from the FIF, available to apply for over two rounds.

The first round is accepting applications between 7-21 September, prioritising investment ready projects, with the second longer period accepting applications from 27 January to 10 February to allow more time to develop proposals.

An additional \$30 million will also be made available to iwi and Maori through the targeted Te Mana o te Wai fund.

Priority will be given to Maori landowners, hapu (sub tribes), whanau (family) and marae groups and is expected to begin taking applications later this year. The Te Mana o te Wai fund will support tangata whenua to play an active role in restoring the mauri of Aotearoa's freshwater and comes as the new NPS-FM brings stronger requirements for

tangata whenua involvement.

As part of Budget 2020, \$1.3 billion has been allocated to the Jobs for Nature programme, designed to benefit local communities and businesses, accelerate regional economic recovery, and provide significant environmental benefits.

NZ Southern Rivers Society Inc v Gore District Council [2020] NZHC 1996

The NZ Southern Rivers Society Inc (Society) has challenged Gore District Council's (Council) decision to grant non-notified land use consents to establish a river rafting tourism activity on the Mataura River (Consents).

The Mataura River is subject to a Water Conservation Order that includes protections for the outstanding fisheries and angling amenity features. However, the Order does not address other uses of the Mataura River (including rafting) nor what land use consents could be issued.

The Consents were applied for with the written approval of Southland Fish and Game Council (Fish and Game), Te Ao Marama Inc, Te Runanga o Ngai Tahu, Land Information New Zealand and Environment Southland.

Section 95A of the RMA provides rules for when to publicly notify an application for consents, including determining whether an activity will have adverse effects on the environment that are minor or more than minor. In doing so, the consent authority "must disregard any

effect on a person who has given written approval to the relevant application".

The Society claimed three errors of law, the first being that the Council had treated Fish and Game's approval as representing the interests and views of the angling community, amounting to an approval of that community to the adverse effects on their recreational amenity.

The second and third errors were that Council misdirected itself when deciding not to publicly notify the application by failing to take into account relevant matters, and that Council had no evidence and failed to be sufficiently informed on adverse effects.

The Court discussed Council's identification of anglers and jet boaters as the main existing users of the Mataura River and found that consideration of the adverse effects on those users was the antithesis of treating Fish and Game's approval as representing the interest and views of the entire angling community, declining the error of law.

The Court then held that Council had accurately recognised the outstanding fisheries and angling amenity and drew from information before them regarding that nature and duration of the rafting excursions. Council concluded that the excursions were "not significantly different to a non-commercial operation" and to be "infrequent and short term".

Reaching this conclusion, the Court declined the second and third grounds, dismissing the application.

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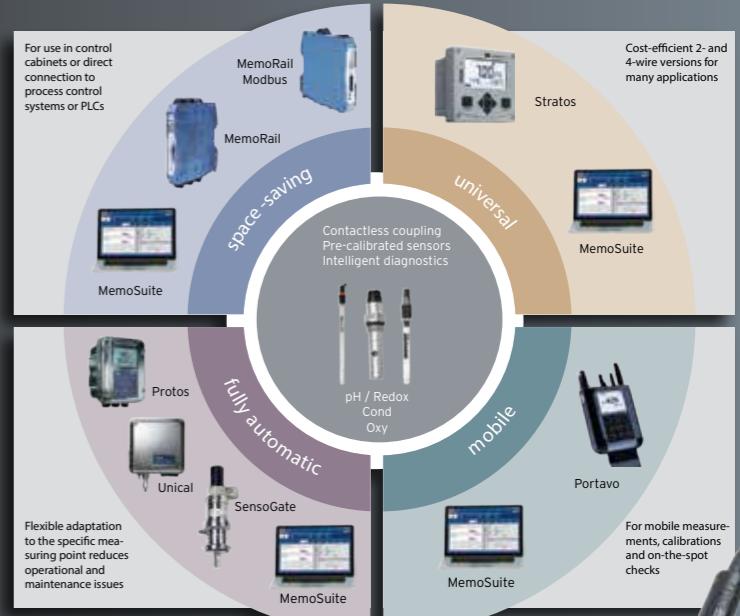
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Save pipes from wipes

The recent spike in community transmission of Covid-19 has led to another increase in pipe blockages caused by the increased flushing of wipes. This has led to Water New Zealand, once again, reminding people that blocked pipes put our “essential workers” at risk.

Following the first lockdown campaign, Water New Zealand has reshared the ‘Bin it, don’t block it’ poster on social media channels to remind the public to only flush the three P’s down the loo – pee, poo and (toilet) paper.

An increase in wet wipes in wastewater systems have been causing issues.

The Gisborne District Council saw a massive spike in blocked pipes in its system due to a Covid-related increase in wipes being used, which saw a 600 percent increase in blocked pipes across the local system under Level 2 lockdown.

Senior wastewater operations engineer Phillip Dodds says the blockages had been caused by people flushing wet wipes down the toilet.

“We saw this in the past lockdown. Wet wipes caused a 2400 percent increase in blockages and we very nearly couldn’t handle it.”

Despite packaging saying wet wipes were flushable, Dodds stresses they ‘are not’!

“If we get in the position we were in the past lockdown, we will have to look at opening the pipes into the rivers. That is how serious this is.”

Around the same time fat and rags almost completely blocked a Gisborne sewer and, in July, a ‘fatberg’ outside a Mobil petrol station on Wainui Road caused traffic problems.

Meanwhile the international pandemic has delayed Water New Zealand’s progress on the development of joint Australian-New Zealand flushability standards due to a slowdown of testing.

Water New Zealand technical manager Noel Roberts has been working on the development of the standards. It is now expected that the proposed ‘Flushability Standard’ will be released for consultation in November 2020.

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Building now with an eye for the future



By Philip McFarlane,
market leader
– Water and
Waste Water,
WSP.

Like most infrastructure, water systems are taken for granted by users, many of whom don't give them a second thought until things go wrong.

But if 2020 has taught us anything so far, it's that things can and do go wrong, and the impacts can be at levels never seen before. As we emerge from the pandemic we have an opportunity to take a new approach to managing our water infrastructure, transforming the way we deliver and manage water services.

Adopting a new mindset will help us deliver resilient services that can withstand impacts of a changing climate, legislative changes, fluctuating demand and continue to meet user expectations.

So, where do we start making the change?

One of the biggest issues is a lack of visibility at what's happening in our systems which, in many cases, isn't significantly different than when the Romans built the first systems. We still put our focus on getting water into pipes at one end and having it come out somewhere else, without a lot of knowledge about what's happening while water is flowing.

However, there are an increasing number of technologies that we can turn to including monitoring sensors and software, which enable far more active management. Operators are given an accurate understanding of what is happening in the network and can make adjustments to improve performance in real-time.

Because there's an early warning for issues, they are resolved quickly which provides value in reduced energy consumption and less negative impact on users.

We've seen this used well in Adelaide, where SA Water installed a grid of more than 300 sensors that monitor flow, pressure, water quality and acoustic leak protection. This approach has several benefits.

First, pipe breaks are reduced and the life of pipe assets is extended by identifying and eliminating the source of pressure fluctuations, such as repairing faulty valves. Monitoring pressure fluctuations can also provide early warning of when pipes have broken, enabling repairs to be undertaken quickly and the risk of contamination reduced.

This visibility into the network has resulted in reduced water loss and water service interruptions. SA Water reports that several leaks in hydrants, stop valves and pipes have also been found and fixed, some of which may have led to large water loss and unnecessary costs.

The advent of cheaper and more precise system sensors and monitors will allow even more focused operation, and even prediction of events to help ensure the necessary supply resilience and cost optimisation.

Another tool we can use is well-constructed and calibrated hydraulic and hydrological models. These can clearly demonstrate the consequences of fluctuating and increased water demands, pipe flows and pressures in water and wastewater systems; the impact of climate on the distribution and quality of water resources, above and below land surfaces, and on infrastructure by forecasting water pressures and flows, deficiencies and risk; and lay bare the effectiveness of proposed solutions.

Both hydraulic and hydrological analyses create opportunities for improved operational performance and cost savings.

For example, South West Water (SWW), a provider of water and sewerage services in Cornwall and Devon, UK, engaged WSP to build a water distribution network model for the Pynes distribution zone serving Exeter and parts of the surrounding area, to simulate flows and pressures throughout the zone and calibrated it against field test data.

We subsequently converted to a web-enabled dynamic model with output visualisation that could show conditions in the network on a minute-to-minute basis and identify anomalies that indicated incidents requiring operational response interventions.

We used the model to confirm the required network changes enabling the outage of a service reservoir, allowing SWW operation teams to have increased confidence that there would be no detriment to customers.

Another area ripe for improvement is in using data to inform evidence-based decision making around investment in infrastructure.

Already we're seeing data shared more widely across organisations to provide a better picture of how assets

perform, which is being used to improve productivity. However, to do this properly requires common data standards.

The NZ Metadata Standards developed by LINZ have gone some way to helping this, but more work is required to make the standards simpler and more widely adopted. Meanwhile, the University of Canterbury Quake Centre is helping to move the conversation from data standards to how best to use data for making better infrastructure decisions and improving productivity.

Perhaps one of the biggest changes we need to address is our workforce because it's not just our infrastructure that's aging. Because many of us stay in the industry for a long time, there is a need to engage and train younger workers to come through and fill the gaps made by an aging workforce.

As seen by the trends above, the water professional of the future will need to use data analysis skills to interrogate data and use statistical approaches to identify trends and test different intervention approaches.

The water industry in New Zealand has undergone a massive change in demand, impacts and community and cultural expectations. Further change is imminent with a new water regulator and new legislation covering drinking water and wastewater discharges.

"Adopting a new mindset will help us deliver resilient services that can withstand impacts of a changing climate, legislative changes, fluctuating demand and continue to meet user expectations."

On top of this, we have additional challenges of affordability, community expectations, cultural views, climate change, carbon reduction, sustainability, aging water infrastructure and potential new Regional Water Entities.

Clearly, our future professionals and decision-makers will have to be agile, innovative and have access to a diverse range of disciplines, thought processes, skill sets and decision-making aids.

This is a challenging and exciting time to be part of shaping the future of our water industry. Accelerating investment in water infrastructure offers an ideal opportunity to kickstart our economy after the pandemic shutdown.


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Clean water gives the gift of education

Many people in rural Papua New Guinea (PNG) cannot get clean water and women and girls have to walk for hours to collect dirty water that makes them and their children sick.

Girls can also miss out on education during their periods, because they lack necessary hygiene items, and their schools do not have adequate bathroom facilities.

Alongside local partners and generous donors, Oxfam is delivering safe drinking water and sanitation facilities to 12 schools and eight healthcare centres in remote areas of PNG, reaching up to 30,000 people.

Oxfam's latest four-year project, FLOW, is based in the Henganofi district in the Eastern Highlands of PNG. The project officially started in June 2019 and will run until June



PHOTOS: BELINDA BRADLEY/OXFAM

2023, with the aim to improve health, resilience, and quality of life for remote and vulnerable communities, particularly women and children, in the rural parts of the country.

In Papua New Guinea only a third of remote villages have a safe water supply and dirty water leads to frequent illness and high mortality.

New Zealand-based engineering company and Oxfam partner – Lautrec Technology Group – travelled to the Henganofi district in September last year. While there, they met with our local partners – Touching the Untouchables and Appropriate



1. A photo of the Oxfam in PNG team, which collaborates closely with local partners on the delivery of the FLOW project. 2. A TTU workshop, where they create the hygiene packages to be delivered to schools and health facilities in rural PNG. 3. A full-team photo of one of Oxfam's local partners – Touching the Untouchables. At least 95 percent of the staff are women, and they are the lead implementing partner responsible for delivering behavioural change, promotional, and awareness activities in sanitation and hygiene. 4. Girls can also miss out on education during their periods, because they lack necessary hygiene items, and their schools do not have adequate bathroom facilities.

Technology Projects, and provided them with technical advice. They were also able to participate in one of the community workshops and met with the local government representatives to support the Henganofi Water, Sanitation and Hygiene (WaSH) policy and plan.

FLOW has a strong focus on partnership with the local government to support a more robust WaSH system and practice. The project aims to motivate government agencies to implement the WaSH policy, and to stimulate communities to demand and support the rollout of essential project-related services.

So far, extensive community consultations and site visits

have laid a solid foundation for delivering this life-changing work. The Oxfam team in PNG consulted female students in particular to talk about the importance of water to them.

One student shared her thoughts: "Clean drinking water is a big problem. Women are responsible for getting water. The cleanest drinking water is in the mountains, and so women walk long distances to get it. It is not always safe."

In the face of global and local adversity, our key partners, staff members and beneficiary communities have worked together to identify needs and move towards necessary solutions. Together, we can help people living in poverty gain access to the most basic of human needs – safe, clean water.



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It's a perception of value



We can observe challenges faced by the other industries and consider the learning opportunities available. **By Gareth McCabe**, technical consultant, and senior researcher at Waterpro Environmental.

The New Zealand dairy industry, for example, continually faces many and varied challenges. In January 2013, Rod Oram described (via RNZ) a scenario where Pfizer sold its nutrition business to Nestle for US\$11.85 billion and a business that was heavily supported by Fonterra milk products originating from New Zealand farms.

He strongly implied that New Zealand undervalued our resources from source to end-user. I believe a similar perspective is observable within our water industry.

In Diane Abad-Vergara's 2009 documentary, *Living with Coffee*, she explored the coffee trade from the Columbian highlands to New Zealand roasters and cafes. The most surprising reveal was the growers' lack of awareness of our own coffee culture.

The concept of 'sipping a flat white at the local cafe for some me-time' was literally foreign. The humble growers' existence was governed by commodity pricing by far away international coffee houses; and often barely enough income to cover production costs.

It is the perception of value, or lack of perception, that can drive the lowest price point. To borrow from economic theory, perfect competition thrives with perfect information; fair-trade organisations seek to rebalance producer returns through diminishing the power of the buyer's moat, or specialist consumer knowledge.

Fast forward to July 2020, and Ngati Awa is challenging in the Environmental Court Nongfu Spring's proposed expansion of its Otakiri (near Whakatane) bottling plant. In the world of bottled water, value is enhanced



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wherever water is bottled at the source; consider Fiji Water, Evian and Antipodes.

We may have differing points of view on Ngati Awa's legal bid, however it difficult to argue against the substantive value extracted by a vertically integrated production and marketing organisation obtaining source material at minimal cost (notwithstanding the initial capital investment). Nongfu will have a forward leaning strategy built around the size, spending and preferences of its target consumer market. One can assume this strategy is forecasted to return multiples over the initial investments costs.

However, the intrinsic 'value' was already created. Our country's relatively transparent and uncomplicated business and trade processes provide a commercial paradise for international organisations. The global marketing perception of 'clean and green' adds further value to a resource that only requires a four inch DHH drill and a resource consent, and no ongoing royalties. Across the Pacific, the Fijian Government recognised the retail value of its national resource and has legislated a large-scale bottlers' levy – a charge equivalent to 3.5 percent of the retail price.

We have an abundance of water requiring minimal intervention from abstraction to consumption. There are proven technical standards to address almost all treatment, disinfection, and distribution challenges.

The councils and engineers we work with have a collaborative nature, striving to solve common problems through shared experiences and knowledge. All this expertise is producing commodity potable water; the same stuff we water our lawns and wash our cars with; the same stuff sold overseas in pretty bottles for a small fortune.

I have faith the new water regulator (Taumata Arowai) will play referee and help focus the water quality game and there are plenty of good people throughout the industry to meet the challenge.

The broader issue will be transforming our value perspective of potable water. The National Policy Statement for Freshwater Management 2020 and its concept of *Te Mana o te Wai* addresses the fundamental importance water and the circular relationship of water with the local environment and the community. While *Te Mana o te Wai* is relevant to all freshwater management, will we grasp the value potable water has beyond our borders and treat it with the respect it deserves?

Perhaps the conversation starts with understanding how to capture value at our borders to ensure sustainable potable water management for generations to come.

Achieving optimum aeration efficiency and reliability

Kaeser Compressors will share an excerpt from its recent whitepaper 'How to achieve optimum aeration efficiency and reliability – A guide for Wastewater Treatment Plants', at the Water NZ Conference & Expo.

This paper looks at three key factors that can assist a WWTP in optimising the efficiency and reliability of its blower aeration process.

Blower air is indispensable to the biological processes that take place in a wastewater treatment plant (WWTP). Blower system integration – on both the blower and the system level – is essential in order to maximise energy efficiency and reliability, ensuring that this critical service is readily available for the communities that the WWTP serves.

Each step of the wastewater treatment process is vital in ensuring that water is properly purified. Effluent ends up in a WWTP, which contains substances such as pulp, food and waste – that must be removed before the water can be properly cleaned and returned for use. After this stage, the water then requires further scrubbing with the aid of bacteria. It is at this stage that compressed air plays a vital role.

Wastewater treatment plants mirror the biological self-cleaning process that occurs in natural waters – although faster than Mother Nature! Bacteria are added to the wastewater at the start of the process in order to speed up clarification. These microscopic assistants take care of the cleaning work. To do so however they require oxygen.

Oxygenation in wastewater treatment plants is carried out by injecting streams of fine air bubbles through the water. The best tried-and-tested method to achieve this is by using compressed air generated by rotary blowers. Why? Because this application normally requires a gauge pressure of only approximately 500 mbar.

As positive displacement machines, rotary lobe blowers displace air rather than compressing it. In this way, the pressure generated is no higher than actually needed. As a result, there is no over-compression or generation of unnecessarily high pressure. Greater pressure means greater costs. With energy the single highest operating cost in a WWTP, and the energy to operate blowers for aeration being the largest energy consumer – it therefore pays to be efficient.

Additionally, ensuring a dependable source of compressed air at all times is absolutely critical. The WWTP's biological processes require a constant supply, and large amounts, of oxygen. The success of the water purification process depends entirely on continuity, after all microorganisms can only perform their work if their life cycle is uninterrupted. If their air supply is cut off – the bacteria die. And, any interruption will lead to a breakdown in the clarification process. If this happens, the bacteria culture must be rebuilt from scratch. This is why it is especially important that the blowers used in the aeration process provide absolute reliability.

Given the demands of wastewater treatment plants and the importance of aeration to their processes, an ideal blower package should be energy efficient and reliable. So, what is the best way to ensure efficiency and reliability? The key is integration – in terms of the individual blower packages as well as the system as a whole.

To download the full whitepaper visit nz.kaeser.com.

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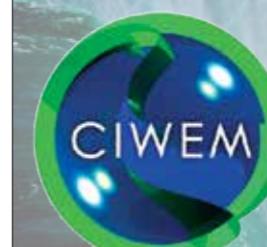
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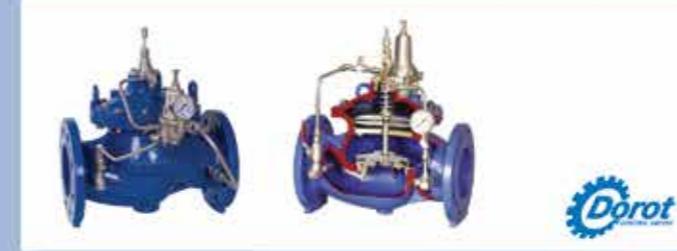
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