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MAY/JUNE 2020 ISSUE 214

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Cover Photo: Otaki Beach Stormwater Upgrades and Pumping Station outlet, Kapiti Coast District Council. Photo supplied by: Cuttriss Consultants.

'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'



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.

Time to forge a better future than 'BAU'



Kelvin Hill,
President, Water New Zealand

Well, as we know from history, there's nothing like a crisis such as a pandemic or war to make us rethink the way we live and work.

From what I've seen, those of us lucky enough to still be working have adapted well to the new world of working from home through Zoom, webinars, team meetings and so on. Technology has certainly made us more adaptive and agile, and it's likely we won't see a return to the 'old' way of working.

Covid-19 has also given us an opportunity to rethink how we need to kick-start the economy and not just how to get back into work quickly, but also an opportunity to do things better.

In the water sector, this means it's time to embark on a bolder and more sustainable capital works programme, address our infrastructure shortfalls and rectify imbalances and problems that have developed in previous decades.

Importantly, it also means that we need to use this opportunity to re-set rather than merely rebuild.

The Government has received a big response to its call for big-scale "shovel-ready" projects and it will need to provide strong leadership to ensure that these programmes of work are effectively coordinated, funded and delivered.

In the water sector, this is a once-in-a-generation opportunity to prudently invest in resilient water infrastructure to create sustainable outcomes that go beyond just the Three Waters. Water New Zealand, as part of a collaboration of not-for-profit organisations, has urged the Government to seize this opportunity to improve the performance of the water sector and create those sustainable outcomes through the delivery of this programme. See details on page 6.

This is also an opportunity to listen to the call for change in the wake of climate change and unacceptable pressure on our freshwater resources.

In this issue of *Water* we look at the call from many sectors, including the Urban Water Working Group, to take a re-set approach that goes beyond simply rebuilding (see page 8).

This is a call for a shift in mindset towards more interdisciplinary thinking, integration and distribution systems and using water to support resilient and thriving communities and environments for future generations.

And that any return to a fragmented infrastructure build will continue the downwards trend across a range of ecosystem health measures which we now realise are intrinsically linked to our social, cultural and economic prosperity.

The integration of safe and sustainable drinking water will continue to be vitally important to our health and well-being as well as underpin progress across our Three Waters system.

We are optimistic that both the Taumata Arowai Bill and Water Services Bill will continue to move through Parliament before the election despite the obvious setback caused by the pandemic. We strongly support and urge the Government to continue to hold to these vitally important reforms.

This legislation, as well as the development and delivery of a sustainable and resilient 'once in a generation' infrastructure programme could be a defining moment in our history.

On a final note, I would like to acknowledge the work and contribution of one of our most respected members of Water New Zealand.

Known as the "pipe whisperer", John Black has decided to retire after 57 years in our industry.

In our next edition of *Water* we hope to take a closer look at John's valuable contribution to the water sector.

In the meantime, I wish John all the best for a much-deserved retirement.

Nga mihi maioha
Kelvin

Stormwater 2020

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New dates are 26 – 28 August

Planning for the Stormwater Conference has been underway for months and the programme is complete. Due to COVID-19 the Conference has now been postponed from both its original date in May and alternative July date. The new date for Stormwater Conference is now 26 – 28 August 2020. Earlybird and Corporate Registrations are extended to 26 June. If you are already registered you do not need to do anything further.

Water New Zealand remains excited to host the Stormwater Conference and we look forward to meeting all our delegates, sponsors, exhibitors and speakers at our new dates in August.

www.stormwaterconference.org.nz

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Water Infrastructure Delivery through our Covid-19 recovery

By John Mackie, Acting Chief Executive, Water New Zealand.

Three decades on from the dis-establishment of the Ministry of Works and Development, there are renewed calls for a similar Crown entity to be established to assist in the economic recovery of the nation, as we enter the recovery phase of the Covid-19 pandemic.

The focus is on the health and well-being of New Zealanders and creating jobs for those displaced as a result of the crisis – in addition to creating/upgrading much-needed core infrastructure.

While it is true that our current generation owes a debt of gratitude to the Ministry of Works and its predecessor, the Public Works Department, for the core infrastructure we now rely on, including transport, power and water schemes, many are cautious about a “back to the future” approach for establishing a state owned infrastructure department.

When the call went out to the industry from the Infrastructure Minister on 1 April 2020, seeking “shovel ready” infrastructure projects over \$10 million that could be mobilised within six months, a wave of anticipation swept across the nation. Both private and public sector organisations have submitted many hundreds of projects valued in the billions of dollars.

The Government has received a lot of feedback on the proposal and submissions from a variety of public and private sector organisations has flooded in. This is not surprising, as this pandemic has presented us with a once-in-a-generation opportunity to prudently invest in resilient water infrastructure to create sustainable outcomes across the four well-beings.

During April, a joint submission was made by a collaboration of not-for-profit organisations, commending Government on their efforts to date and recommending a means by which the objectives of both the Infrastructure Industry Reference Group programme and the water services regulatory reforms, could be aided.

In this submission, Infrastructure New Zealand, Water New Zealand, Irrigation New Zealand, the Quake Centre and the Institute of Public Works Engineering Australasia (IPWEA NZ) jointly urged the Government to seize the opportunity to improve the performance of the water sector to create sustainable outcomes through the



John Mackie, Acting Chief Executive, Water New Zealand.

delivery of this programme.

They also consider that this programme of work needs to be effectively coordinated, funded and delivered.

A Collaborative approach

The opportunity is broader than just the Three Waters. Te Mana o te Wai, Our Freshwater 2020 and the Living Standards Framework all recognise the importance of a healthy and sustainable water systems.

The distinction between rural and urban water services is becoming less clear, as climate change impacts traditional weather patterns and increases the importance of water storage. During the droughts this year, many communities could not access fresh drinking water, due to lack of storage, while other communities had an abundance of water and some with significant flooding.

By working collaboratively, the group sees the benefits of large water infrastructure programmes, including the establishment of large water storage facilities, which can benefit New Zealand and New Zealanders with sustainable access to fresh water for:

- Safe and drought resilient drinking water for communities;
- reliable supplies during periods of flood, when run-of-river supplies are compromised;
- provision of environmental flows to enhance ecosystem health;
- the ability to re-allocate water in fully allocated or over-allocated catchments, which will be particularly important for enabling development of Maori land that currently cannot access water;
- water for horticulture, land-use flexibility, efficient agriculture, growing our food exports as well as the availability of high-quality food for New Zealand;
- capability for small and micro-hydro schemes to power remote areas with green energy;
 - recreational uses that support well-being; and
- managed aquifer recharge to restore the quality and quantity of accessible groundwater and reducing legacy nitrate problems.

The group considered that the

recovery from the Covid-19 global pandemic, which also triggered a National Civil Defence Emergency and placed the country in an unprecedented lockdown, requires an equally comprehensive recovery plan as we have seen in previous national emergencies.

The letter advocated for the immediate establishment of an infrastructure alliance (or alliances) similar to SCIRT and NCTIR, that were set up in response to the Canterbury (2010/11) and Kaikoura (2016) earthquakes.

Alliances of this sort, leveraging accelerated Resource Management Act, Public Works Act, procurement and community consultation regimes, produced award-winning results for Christchurch and Kaikoura infrastructure.

Such alliances can balance all four well-beings at pace.

The NCTIR alliance was established one month after the 2016 quake and was employing workers and shifting dirt inside two months of the quake.

The NCTIR alliance has proven there is no conflict between the need for immediate jobs as part of our Covid recovery and long-term programmes of work.

Immediate work in the water space could be focused on employment-intensive renewals, growth projects, planned maintenance, riparian planting and flood protection, which are ‘no regrets’ investments.

Previous alliances have had strong independent governance

and have included representation from both owner (Crown and councils) and non-owner participants.

Integrating mana whenua (tribal territorial rights) representation and embedding the values of Te Mana o te Wai into new arrangements will be an essential element of any new alliance model in order to rapidly co-design and deliver our new water infrastructure.

Programmes versus Projects

Programmes of work are significantly better than individual projects at optimising:

- Risk management;
- community engagement;
- industry capacity, including ability to train new staff;
- procurement, including social procurement outcomes for local jobs and supply chains;
- value for money;
- sound asset management practices;
- centres of excellence; and
- comprehensive data and building information for use in monitoring and resilience.

The development and delivery of this multi-billion-dollar infrastructure programme could be a defining moment in the history of our nation, provided we don’t race “back to the future”, or return to the refuge of “business as usual”.



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What if we had the benefit of hindsight?



Acting Chair of the Urban Water Working Group, Stu Farrant (pictured), says Covid-19 offers a chance to build a more sustainable future and he's urging the government and councils to use this opportunity to re-set, not simply re-build.

It's said that the benefit of hindsight is a wonderful thing. This statement is often used as a convenient way to deflect scrutiny at times when short-sighted decisions have resulted in poor outcomes, often with long term consequences for environments and people.

The somewhat unexpected and alarming global pandemic is already prompting reflection and talk of hindsight with regards to the preparedness of our health systems, reliance on complex global supply chains and economic dependence on a resource-intensive consumptive model. But, as we emerge from this surreal period of lockdown and look to regenerate our shattered economy, our country does have the benefit of hindsight to build on.

When we look back only six months, before the Covid-19 virus had even entered the human population, there was already a clear mandate for change developing across the country. Students were skipping school to highlight frustrations at inaction on climate change. Reform in the protection of our precious freshwater resources was attempting to reverse the perilous decline in ecosystem health and biodiversity.

A revolution in transport options was transforming our cities with e-scooters, e-bikes, active transport networks and shared cars providing options to individuals and businesses alike. Consumer awareness of the insidious and pervasive impacts of our rampant plastic use was fuelling a reborn consciousness around waste and packaging.

And what was once a fringe preference for local, seasonal and sustainable food was becoming mainstream with a shift away from our traditional meat and dairy diets towards more plant-based proteins and regenerative farming practices.

As the traditional economic model, based on unchallenged growth, resource exploitation and the undervaluation of 'externalities' such as environmental impacts began to be questioned, an ever louder call for change was being made.

Fast forward to today. We are entering an unexpected phase of unprecedented government stimulus to kick-start the businesses, industry and services that make our country tick. Investment in infrastructure projects deemed to be 'shovel ready' or able to be fast tracked have been earmarked to stimulate the construction sector, and related industries, at the same time as providing tangible community value.

Councils across the country have understandably scrambled to pull together billion dollar wish lists where government finance will ease the burdens on ratepayers and/or expedite projects which were

on a longer term delivery trajectory.

These projects cover a wide range of areas including transport, civic buildings, public housing and upgrades to our ailing three waters infrastructure of pipes, treatment plants and reservoirs. Many of these projects appear to be worthy candidates for funding, and all will deliver the short term employment injection desperately needed at the moment, but it is hard to see past the fact that almost all are examples of 'yesterday's ideas' at a unique time when we can use this situation as a chance to reset rather than merely rebuild.

As a country, we are at a junction where we can make the choice to return to business as usual, and all the well documented negative consequences, or forge a different path which is founded on a vision of regeneration.

To make this change will require strong leadership and a willingness to embed innovation into the planning, design and delivery of our future built environment. In the water sector, this needs a shift in mindset towards interdisciplinary thinking, integration and distributed systems which seek to reconnect our people with the environment on which we are so dependent.

Change needs to move beyond a mindset of our water resources as disparate workstreams to be 'managed' and instead seek the nexus of water with energy, food and human health to support resilient and thriving communities and environment for future generations.

In recognition of the urgency of the salient decisions which the government (through the Infrastructure Industry Reference Group) must make regarding stimulus spending, a letter from the Urban Water Working Group (UWWG) was sent in the third week of lockdown to key cabinet ministers and chief executives and chairs of all the local and regional councils across New Zealand.

The UWWG was convened by the Ministry for the Environment around two years ago as an independent collaborative body comprising urban water practitioners with expertise in policy, planning, engineering, ecology and urban design.

Having worked with the Ministry to substantiate existing problems the group developed a vision and 10 'Urban Water Principles' to drive better outcomes for current and future communities.

These principles were endorsed by Local Government Minister Nanaia Mahuta in late 2018 who said; "I am excited to consider how we can incorporate the intent of these principles into decision-making at every level, including policy, planning and infrastructure design".

While, the UWWG did not foresee the opportunity that Covid-19 would present to expedite the transition towards better water outcomes, it recognises the magnitude of the upcoming investment in our country's infrastructure and the important role it will play in how our future communities thrive in coming years. The UWWG therefore urged key cabinet ministers and council heads to:

- Require new projects to demonstrate that they will deliver net improvements in water quality and ecology where relevant and practicable;
- Prioritise projects which demonstrate understanding, support and enable the aspirations of Maori in relation to urban development, matauranga Maori, tikanga Maori, kaitiakitanga and cultural values to be exercised, including enhanced mahinga kai, protection of wahi tapu, and give effect to Te Mana o te Wai;
- Explore opportunities and incentives to fast track regulatory approvals for projects which clearly demonstrate best practice water management and are in accordance with relevant council urban water strategies and Water Sensitive Design guideline documents;
- Support bundles of smaller projects which collectively deliver widespread positive cultural, environmental, social and economic outcomes;
- Develop selection criteria for business cases for new projects which include non-monetary values such as protection of indigenous freshwater species, community health and well-being, indigenous biodiversity, resilience to climate change and carbon sequestration.

This considered and forward-thinking approach can provide a pathway for all New Zealanders to benefit from the transformative potential of stimulus investment of the scale expected across the country.

The alternative of business as usual investment in large scale fragmented infrastructures will continue the worrying downwards trend across a range of ecosystem health measures which we now realise are intrinsically linked to our social, cultural and economic prosperity.

As the late Leonard Cohen sang in the song Anthem, "There is a crack in everything... That's how the light gets in".

It is clear that this pandemic has indeed created a seismic crack which spans the entire globe but it is also clear that this moment can enable the light to get in and seed a better future founded on a more sustainable, regenerative model.

Wise decisions made now can ensure that future generations of New Zealanders can look back at this global crisis and reflect that it was the catalyst for a change in how our towns, cities and rural landscapes interact with the natural environment on which we all depend.

For me personally I am motivated by the voice of all those thousands of students at the global climate marches six long months ago. I want to be able to look back in years to come and see that we did act on the information at hand and transform New Zealand/Aotearoa into a global exemplar of sustainable and resilient urban communities.



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Bright future for water professionals

Water New Zealand Principal Data Scientist Lesley Smith says trends show the future looks positive for skilled water professionals.

Water professionals are in hot demand. The years leading up to the pandemic have been characterised by steady increases in staffing levels and a persistently high vacancy rate.

Each year data on our workforce is collated through the National Performance Review (the Review), Water New Zealand’s annual benchmark of drinking water, wastewater, and stormwater services.

The Review shows us that our water workforce is sizeable. Participants in the Review employed 4133 full-time employees: 2590 directly as staff and a further 1543 contractors working on a semi-permanent basis.

In the 2018/19 fiscal year staffing levels climbed by more than six percent, creating more than 200 new jobs on the previous years. That follows on growth rates of seven and nine percent in the preceding two years.

Another trend evident across the sector is the high level of vacancies. Over the past three years the vacancy rate has hovered at around 10 percent.

Vacancies were reported in organisations from large to small, from Southland to the Far North. As of June 2019, 179 positions were vacant across the country.

For those of us working in the sector these trends should prove reassuring. Given water services are an essential service anchored on public health, significant contraction in our workforce seems unlikely, despite a widely forecast economic downturn in the economy.

Instead, contraction in other sectors is likely to present opportunities for the water industry to address longstanding staffing shortages, as workers in sectors impacted by the Covid-19 economic fallout seek employment elsewhere. In the words of Connexis chief executive Toby

Beaglehole; “It’s a chance to upskill our people and utilise skills across industries.”

Water New Zealand is positioning itself to seize on this opportunity with a new campaign aimed at attracting the best and brightest to the water sector.

Those interested in collaborating with the initiative are encouraged to contact Water New Zealand’s marketing co-ordinator renee.butler@waternz.org.nz

The National Performance Review also corroborates often-discussed gaps in formal training and professional development opportunities for New Zealanders working in water. Around one third of the sector’s staff have no formal qualifications and few are enrolled in continual professional development programmes.

The Water Industry Professional Association (WIPA) is a recently-launched professional development and registration programme that aims to fill this gap.

Developed as a joint collaboration

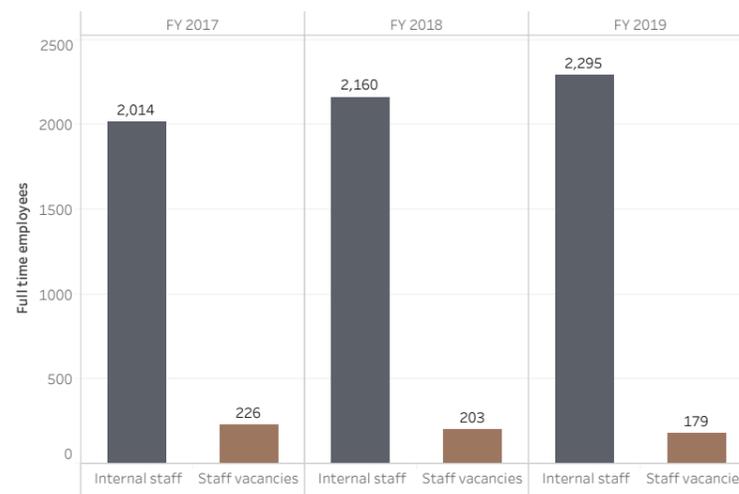
between Water New Zealand and the Water Industry Operators Group, the WIPA was developed by and for water and wastewater operators, and will no-doubt grow in importance with the step up in drinking water signalled by Taumata Arowai. (see box, New opportunities to upskill on page 11 for more details or go to www.wipa.co.nz)

In my view, never has there been a better time to invest in professional development, or more importantly, work in water.

More about our sector’s workforce and performance elsewhere is available through the National Performance Review data portal and report are available at: <http://www.waternz.org.nz/NationalPerformanceReview>

Footnote: The graph figures includes review participants who have provided information to The Review for four consecutive years. This represents 33 organisations with jurisdictions covering 3.9 million New Zealanders.

Full time employee and vacancy numbers of National Performance Review participants



New opportunities to upskill

Water New Zealand Training and Development Manager, Mumtaz Parker, outlines the latest professional development and training opportunities for water sector workers.

The Water Industry Professionals Association (WIPA) Continuing Professional Development and Registration programme was jointly established by the Water Industry Operations Group and Water New Zealand to provide a system of recording the professional development of those working in the water and wastewater industry.

Water industry professionals employed in the water/wastewater industry may enrol in the WIPA programme. This provides access to WIPA-approved courses that trainees can attend to gain CPD credits that contribute towards registration.

Once all the criteria are met, trainees can apply to become a “Registered Water Industry Professional”. The WIPA vision is having a competent and capable water industry workforce supported by a comprehensive continuing professional development and registration programme.

It is extremely easy to enrol onto the WIPA programme and 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 you 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.

There are a number of training providers who have listed their courses with WIPA including WSP, LeHunt and The Questioning Engineer. More courses are being added as they become available.

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

The Competency Framework

A workforce with the right skills and capabilities is key to developing an effective, efficient, accountable and

resilient three waters sector.

The Water New Zealand Competency Framework describes what people should be able to do and what they need to know to competently undertake their work.

This competency framework is a work-in-progress and should be viewed as the first step in a journey the water sector is taking to upskill a fit-for-purpose workforce.

The framework is being developed on a role-by-role basis, beginning with treatment operator roles, the people who operate, monitor and maintain water and wastewater services, as a starting point.

Currently this competency framework includes the following roles:

- Drinking Water Treatment Operators. These are the people who operate the systems and equipment that are used to treat raw water so that it can be supplied to the community. They operate water treatment processes like chemical dosing, filtration and disinfection. They collect and analyse data on the processes and carry out first line maintenance tasks.
- Wastewater Treatment Operators (Will be available shortly). These are the people who

operate the systems and equipment that are used to ensure that sewage is treated before being returned to the environment. They operate wastewater treatment processes such as preliminary and biological treatment, they collect and analyse data on the processes, and carry out first line maintenance tasks.

- Drinking Water Distribution Operators (in development). These are the people who look after the pipes, mains and pumping stations that supply the community with water. They carry out planned, preventative maintenance as well as respond to incidents such as burst pipes and major leaks.

- Wastewater Network Operators (in development). These are the people who look after the sewers and pumping stations which carry wastewater from people’s homes to wastewater treatment plants. They carry out planned and preventative maintenance and also diagnose and respond to faults and blockages.

The framework is intended to help the water industry to identify the knowledge and skills required by their workforce, to help assess levels of staff training that may be required and to develop training programmes.

Further information is available at bit.ly/2Sj05Rx

Training Initiatives

Currently work is underway with cross-industry partnerships with Auckland University, Canterbury University, IPWEA and WIPA focusing on better business case modelling working across the industry to ensure that industry needs are met and matched.

Work is also underway on the creation of an Emerging Leaders programme that will include leadership, coaching and mentoring.

To be involved in any of these programmes of work or initiatives please email training@waternz.org.nz.

New qualifications to address water skills shortage

Two new water-related qualifications aimed at supervisors and managers have just been released to help address the skills shortage in the water sector.

The Industry Training Organisation (ITO) for the Infrastructure industry, Connexis, has released two new Level 5 water-related diplomas: Drinking-water Treatment, and Wastewater Treatment.

These diplomas have been developed with industry and are targeted at qualified operators working in supervisory positions within our water and wastewater treatment plants.

“The management of both drinking-water and wastewater are crucial to all New Zealanders,” says Connexis chief executive, Toby Beaglehole.

“It’s imperative that the industry gets it right in addressing the challenges of a growing population and ever-increasing usage demands.

“Suitably qualified people are the key to ensuring we have safe drinking water and clean and usable beaches and rivers

now and for future generations.”

He adds that, as the standard-setting body appointed by Government for the infrastructure industries – Civil, Energy, Telecommunications and Water – Connexis is committed to continually upskilling the nation’s infrastructure workforce.

“The new Level 5 diplomas will take approximately 20 months to complete through blended learning including online, on-the-job and off-the-job block courses.

“They are focused on managing and optimising plant operations to ensure compliance with regulatory requirements along with health and safety.

“The diplomas add another qualified skill level to water infrastructure staff nationwide, at a critical time when there is an immediate need by local government to step up our country’s water infrastructure.”

Enrolments for both diplomas are now open.



Caitlin Robertson is one of the first to sign up for the Diploma in Drinking Water Treatment L5 course. She works for the Dunedin City Council, based at the Southern Water Treatment Plant as a Water Treatment technician. Caitlin also runs the Outram and West Taieri Water Treatment Plants. This new diploma will build on Caitlin’s already sound industry experience, including achieving her Level 4 National Certificate in Water Treatment in 2017 and the accolade of the Water Industry Operations Group Young Operator of the Year 2016 award.

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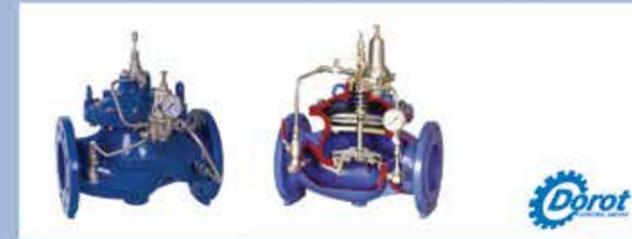
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Fart in a bathtub demo at AKL modelling symposium

By Nadia Nitsche, Chair of Water New Zealand Modelling Group.

Back in March, in the time when social gatherings were still normal, 60 modellers from around the country attended the Water New Zealand Modelling Symposium in Auckland.

Hydraulic and hydrological modelling has been an important analytic tool for several decades. Modelling continues to develop as an analytical tool and other data analytic methods and datasets are also maturing rapidly.

The symposium aimed to bring together those involved in using these tools and interpreting their outputs to be able to discuss the different advances in the modelling world.

The sessions started with keynotes on both days, the first was about NIWA's flood forecasting tool that is being developed, and the second was about modelling a swamp and river in Australia's Banyule catchment and how modelling can answer questions around water quality and ecology.

There was a range of topics presented and all the presentations were well received. It was good to have discussions with other modellers around New Zealand and Australia about how they tackle similar challenges.

There were numerous papers from Auckland Council on the recent modelling it is completing for water quality, flood options and rain tanks.

The highlight of the symposium, however, was a trip to the University of Auckland's Fluid Lab. We were like kids in a lolly shop.

The university research lecturers and students highlighted some of the recent research they were looking at, which included air trapping in pipes (research for Auckland Interceptor), sediment transport, culvert overtopping etc.

My absolute favourite was experimenting the wave action in Waitemata Harbour should an Auckland volcano erupt. It was lovingly named the "fart in a bathtub" experiment by the researchers.

A networking event was held the first evening and it was good to have discussions in a social event.

Overall it was a very successful and inspiring two days and certainly worth getting together to discuss and debate modelling challenges and current issues.



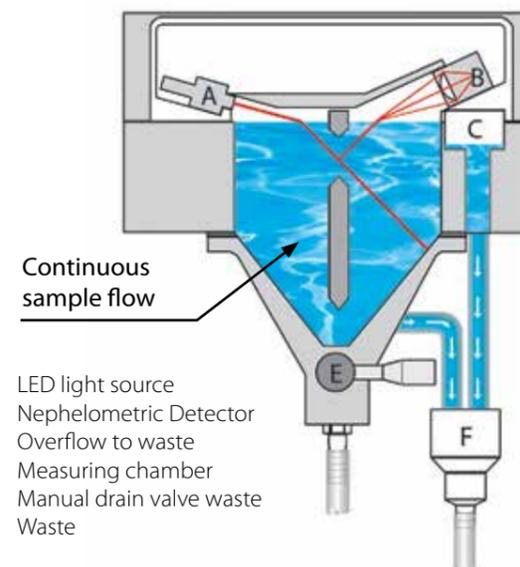
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"Don't Flush Wipes" campaigning gears up

The "don't flush wipes" messaging received a big push during the lockdown as various organisations joined Water New Zealand's campaign.

Back in March, many utilities reported a big spike in pipes blockages as a result of the increased use of wipes due to the home-centred lockdown.

Water New Zealand issued a media release followed by a social media campaign aimed at protecting our essential workers – the teams that had the job of unblocking the pipes during the lockdown.

"We were concerned about the risk to wastewater staff as well as the risk of utilities not being able to keep up with clearing blockages, says Water New Zealand Technical manager Noel Roberts.

He says he was pleased to see Countdown Supermarkets quickly come on board with their own release and importantly, place notices in supermarket shelves urging people not to flush wipes.

This was quickly followed by another social media campaign – this time by the Ministry for the Environment, and again focusing on the risks to essential water workers.

"We've been working on the problems associated with flushing wipes for a number of years now, so it's heartening to see this gaining traction, says Roberts.

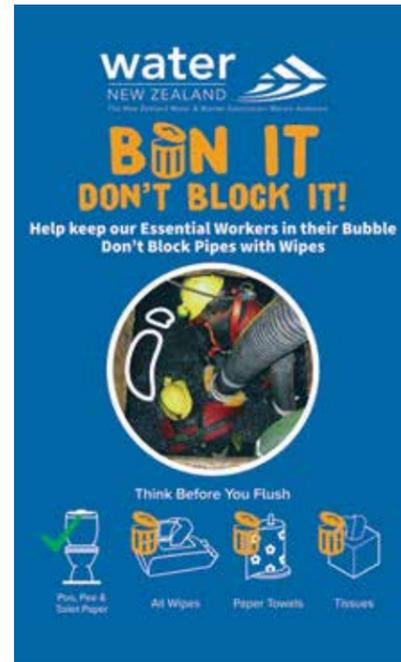
He says Water New Zealand has also been working with its counterparts in Australia to develop 'flushability' standards and it's hoped that the draft standards will

be available for public comment in the next few months.

"In the meantime, we urge water service managers to keep us informed about their level of blockages. This is information that we will need to ensure that MfE has in order for the Government to continue to support us over this issue."

Please contact Noel Roberts noel.roberts@waternz.org.nz if you require further information.

Right: The "don't flush wipes" messaging received a big push during the lockdown as various organisations joined Water New Zealand's campaign. Below: Countdown Supermarkets placed notices in supermarket shelves urging people not to flush wipes.

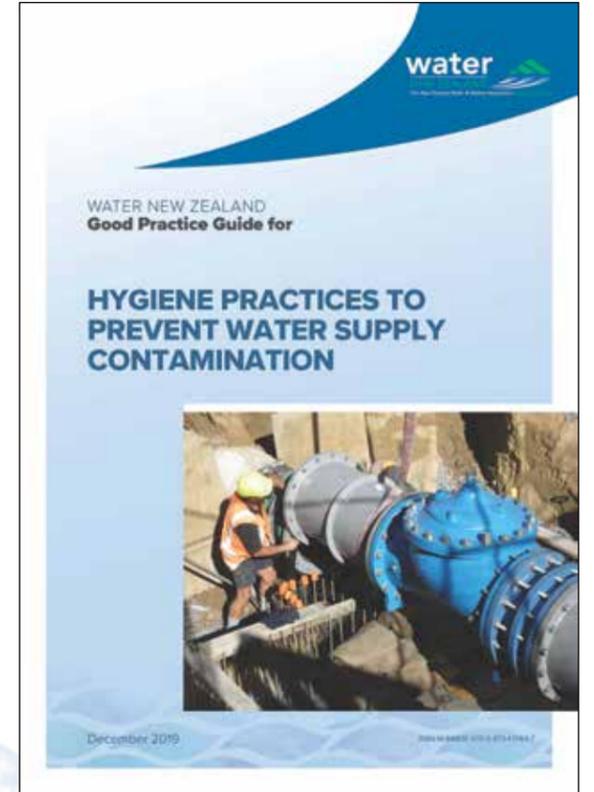


Hygiene practices to prevent water supply contamination

Water New Zealand has produced a new hygiene guide outlining procedures to prevent supply contamination, especially around pipe repair operations.

We encourage councils operating public water supplies to adopt this document, and to ensure staff and contractors working on their systems adopt the practices it contains.

Copies of the guide are on our website. (For the electronic version – www.waternz.org.nz/Article?Action=View&Article_id=1836)



Our expertise can still cross borders

The solution is clear

When our client's chlorination programme resulted in discoloured water, our local team went virtual. They combined their understanding of the water network with the expertise of Dr Laith Furatian, a Canada-based expert in water quality and distribution networks. Together, we determined the root cause of the issue and developed a study programme to understand the chemical and hydraulic drivers behind it. The result? A range of options to achieve a safe, clean and reliable water supply for the community.



DR LAITH FURATIAN
Water Treatment Specialist

Trusted advice

When two of our local government clients were collaborating to invest in four new water treatment plants, they knew we could help. Even the threat of a certain algae in the source water wasn't an issue as our local team called on the international expertise of Dr David Pernitsky. The result? A workshop which reassured our clients that the technologies being considered were correct and in line with best practice. Best of all, David remains in virtual contact with the team to help deliver the project.



DR DAVID PERNITSKY
Global Practice Leader - Water Treatment

Young professionals meet in Brisbane

Joan Davidson is a senior consultant at Morrison Low and the Chair of Water New Zealand's Young Water Professionals (YWP) Auckland Chapter. Water New Zealand recently funded Joan's attendance at the IWA/AWA Australia-New Zealand Young Water Professionals Conference in Brisbane. She provides her reflections on the event.

A lot can change in a week. I set off to the IWA/AWA Australia-New Zealand Young Water Professionals Conference in Brisbane on 11 March 2020.

As a member of the organising committee, I was diligently reviewing the best paper submissions on my way. I could not have known that I would be hurriedly rescheduling my return flight before self-isolation and border restrictions came into effect and New Zealand would enter Level 4 lockdown 10 days later.

While Covid-19 was lingering somewhere in the background, our thoughts were universally focused on the stories and conversations stimulated by the energy of some 250 young water professionals from across the globe.

The conference was a sell-out event with the theme "What's your water story?". It became very apparent that the stories we have are wide and varied, the theme created an inclusive environment where delegates were able to share their passions, roadblocks and challenge ideas openly.

We heard from Safaa Aldirawi, who was born and raised in a refugee camp in Gaza strip. Safaa reflected openly on the challenges she has faced along with her work to provide access to clean water and adequate sanitation services in a politically charged environment.

Rosie Barber addressed the crowd; no small achievement for an eight-year-old! She expressed her hopes for the future, and I expect now has more job offers than most recent graduates.

I attended a tour at the Urban Utilities Innovation Centre, conveniently located within the Luggage Point Wastewater Treatment Plant. The measures being taken by Urban Utilities to promote innovation and ingrain it in their culture is inspiring. From water saving reservoir maintenance procedures to a network fully accessible in virtual reality space; their passion for innovation was infectious and is a culture to be aspired to.

The award for 'best paper' was Learning with Schools to Change our Water Future, written and presented by Kristy Ratcliffe with its focus on Hunter Water's education programme. The programme is delivered within local schools and aims to engage students and teachers on the value of water and to develop innovative ideas to reduce water consumption.

The award for 'best poster' went to Thais Pimenta a Water Architect and Urban Designer from Spiire. The focus of Thais' work was Knowledge Empowering Community towards Sustainable Water Management.

Beyond the key notes and awards there were simultaneous streams of thought-provoking presentations and workshops. As



with any conference with such energy and relevance, my key regret was not being able to be in all places at once.

I found the resounding themes were the need to engage and educate, innovate and most of all to work together. Innovation will take the form of new mechanisms to genuinely collaborate. The participants at the conference, my peers, recognised that if we want to see a shift to a sustainable water future, we cannot do what has always been done.

We will need to draw on wide, varied skills and knowledge which invariably result from our different stories and experiences.

Furthermore, the water industry does not stand alone. Lateral cross industry co-operation is essential and of the conversations I had, the food and waste industries are just the obvious ones.

Closer to home, while Auckland faced a potential one in 1000-year drought, our counter parts in Australia know all too well what water shortage looks like.

The astonishing cost of water reform in our country is looming and certainly hasn't taken centre stage of late.

I do wonder, if we took the same approach to our water as we have to our health what the situation would look like?

Because, if there is one thing I have learnt, it is that if it really needs to, it can all change in a week.



Opposite: Joan Davidson, senior consultant at Morrison Low and the Chair of Water New Zealand's Young Water Professionals (YWP) Auckland Chapter. Top: Brisbane YWP Rosie shares her water story. Middle: Group shot of conference attendees. Above: Conference organising committee.

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When 'water is life' takes on new meaning

Young water engineer Jules Scott-Hansen has recently returned from a stint as a volunteer in Kiribati. She talks to **Mary Searle Bell** about the experience and her hopes for the future.



Jules Scott-Hansen's inclination to follow her heart and jump at every opportunity has ensured she has been both stimulated and rewarded by her career thus far.

She's recently returned from a six-month stint in the tiny Pacific island nation of Kiribati where she was working on implementing a trial with solar distillation technology, a project that is a joint partnership between Volunteer Service Abroad (VSA) and Engineers Without Borders New Zealand (EWB).

This technology will provide an alternative source for drinking water, as the water supply on the nation's 33 atolls is limited and unreliable.

"I got involved with EWB when I was at the University of Canterbury, joining the student chapter and eventually becoming its president in my final year," she says.

"It was EWB and working in developing communities and those without access to clean water, that really got me excited about engineering and particularly water."

However, water wasn't Jules' focus when she started her degree. She thought she would head down the route of mechanical engineering before civil engineering piqued her interest.

"I did this paper in my first year that had aspects of both mechanical and civil engineering and I found the

mechanical lectures went way over my head.

"On top of that, with my love of the outdoors and interest in the environment, civil engineering seemed to be a better fit.

"I felt the greatest connection with the environment in civil engineering was within water, so I started choosing more and more water-related papers towards the end of my degree."

When she finished studying, she was offered a graduate position in the environmental team at WSP (formerly Opus) in Christchurch, which mainly focuses on water-related projects.

"As a graduate, the job market can be pretty confusing as most big companies look the same, and coming out of uni you're not even really sure what it means to be a consultant versus a contractor. You just kind of jump on the first place that will hire you.

"That first job you take can inadvertently shape or change your

career, and my team at WSP was a great fit for me.

"That's the thing with the engineering and the water industries – they're both really broad fields and there are so many options. I struggle a bit because I find it all really interesting, so I haven't been able to choose just one thing to focus on and instead have ended up doing a bit of everything."

Jules says she's inspired in her work by everyday situations that Kiwis often take for granted, like surfing at a clean beach and drinking water straight from the tap.

"Our access to fresh clean water is pretty special and something we need to safeguard because our lives depend on it.

"That becomes pretty apparent when you spend time in a developing country, and the slogan 'water is life' suddenly takes on a new meaning.

"When the opportunity arose to go

to Kiribati, I jumped at the chance. I'd always wanted to work in a developing country and, when this came up, I thought it's now or never.

"It was a bit scary at the time and seemed like a big deal, but it showed me that it's worth the risk to take six months out of 'normal' life to do something you've always dreamed of.

"In that six months I probably learned as much as I would have in three years living in the comfort of New Zealand."

While her experience overseas was awesome, life in Kiribati was both wonderful and challenging, she says.

"They have all the good and all the bad at the same time. It's beautiful, the people are happy and they have a very relaxed pace of life.

"But the water supply has limited resilience, and technology such as the solar distillation panels we are trialling there will hopefully give them another option for fresh water.



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“The technology can be particularly beneficial in the remote outer islands, as well as providing relief following a natural disaster or in urgent drought situations.”

Jules’ six-month placement came to an end in March, with her returning home a few weeks earlier than planned due to the escalating pandemic situation. Since then, she has joined the Christchurch City Council as a project manager in its stormwater and waterways team, tasked with delivering capital projects.

These include projects to naturalise stormwater drains and build wetlands among other things that appeal to her nature-loving side.

“I think this work will suit my personality.

“I’ll be involved in a lot of different things at the same time and it will keep giving me a broad range of experience.

“I’m definitely more of a generalist. I don’t want to get pigeonholed in one

area, at least not yet. I enjoy doing a bit of everything.”

The other key appeal of the council role is being involved in a project from initiation to completion.

“As a consultant, you’re often only involved in one part of a project. Also, working on the council side, I hope I’ll be able to influence the project for better environmental and social outcomes.”

In her leap from consultant to client, there is some reassuring familiarity. She worked on several Christchurch City Council projects during her time at WSP, so many of the names and faces are already familiar, and some of her old projects are even still kicking around.

This is something she’s grateful for, as the lockdown has had her working from home since she started her new job.

For Jules, the nation’s response to the pandemic has also thrown into

contrast the environmental challenges the world is facing due to climate change.

“In many ways it’s easier to deal with something that is so urgent and in your face as the pandemic has been. People adapt quickly to change when they really have to.

“The problem is, climate change is like a slowly boiling pot, and we might not make the necessary changes until it’s too late.”

However, Jules says that even though it will require a collective human effort, engineers have a big role to play in the fight against climate change.

“It should be a very exciting future, but there will definitely be challenges to deal with.

“At the end of my career, I would like to be able to look back and think that I was part of a solution for the better, so I’ll just use that as my moral compass and see where the path leads me.”

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Working wetlands at a landscape scale



Stu Farrant is an Ecological Engineer and manages the southern region for Morphem Environmental. He shares his passion for pursuing better outcomes for our freshwater resources.

As people hunkered down over the lockdown, over 130,000 recently planted plants have been quietly growing on what was once the shores of Te Waihora (Lake Ellesmere).

Put in the ground in the months leading up to the pandemic, this mix of terrestrial, riparian and aquatic species were the finishing touches on the ambitious Whakaora Te Ahuriri project, which has converted a five hectare grazed paddock into a large scale demonstration of how green infrastructure (GI) can deliver multiple benefits to current and future generations.

The Whakaora Te Ahuriri wetland project had its inception in the historical management of the once vibrant Te Waihora coastal lake.

Flanked by extensive wetland complexes at the margins of fresh and saline waters and supporting an abundance of fish, shellfish and birds, Te Waihora provided a treasured food source to local Maori who lived in the many habitats (kainga) that surrounded it.

It was a resource through trade and provided for visitors passing through the Canterbury plains. As a valued source of food, these wetlands were protected and cared for over the changing seasons as a treasured life force.

With the arrival of European farming practices in the mid 1800s these same wetlands were seen as incompatible with 'productive' use of the land and drained to make way for pasture, windbreaks and fence lines.

At Ahuriri Lagoon, this included the straightening of the Huritini/Halswell River through the 'Halswell cut', which sliced through more than eight kilometres of the river named for its 'many turns' creating a long uniform channel to the now distant shores of Te Waihora. Traditional food resources were cut off from water, swamp forests felled and birds moved from the land.

The installation of aquatic plants and protective netting.



Runoff from farms and townships now passed through networks of linear channels and drains and into the vast shallow waters of Te Waihora with the predictable consequence of nutrient enrichment, algal blooms and sediment smothering freshwater mussel beds.

This trajectory of degradation has more recently been seen as unacceptable and in 2011 the journey of the Te Waihora Co-Governance Group was started.

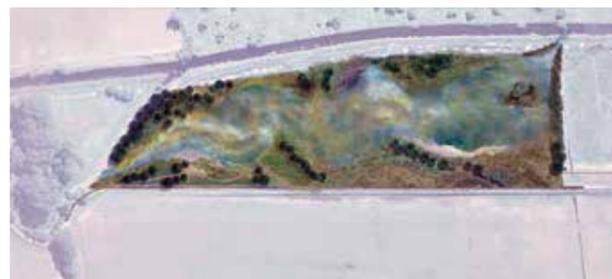
This group is a cornerstone of a formal agreement between Te Runanga o Ngai Tahu and Environment Canterbury, and has grown to include Selwyn District Council, Christchurch City Council, and the Department of Conservation.

As a key part of this journey the Whakaora Te Waihora programme was set up with a vision to “restore and rejuvenate the mauri and ecosystem of Te Waihora and its catchment”.

To do this, the programme is leading an extensive ecological and cultural restoration programme for Te Waihora/Lake Ellesmere that includes the former site of the Ahuriri Lagoon. Early development and concept design for Whakaora Te Ahuriri was made possible through a collaborative process involving local farmers, runanga (Maori council or board in the South Island), and members of the Co-Governance Group.

The project’s goal is to create a constructed wetland that would improve both water quality as well as mahinga kai (Ngai Tahu’s interest in traditional food resources) and biodiversity values. Funding from Environment Canterbury and the Government’s Freshwater Improvement Fund have enabled the design and construction to be fast tracked, while outcomes of the project are being measured through a ‘matauranga Maori’ (universal knowledge) monitoring programme as well as an applied science methods led by NIWA.

Morphum Environmental was engaged in 2018 to develop the wetland design and has worked through a collaborative process including a number of meetings, site walks and interviews to consider a range of options for the site based on the aspirations and values of Ngai Tahu as key project partners and other representatives from the wider Te Waihora



Right: Landscape render of Te Ahuriri wetland (Wraight + Associates)
Below: Whakaora Te Hui overlooking ahuriri lagoon.



Co-Governance Group. The final design has enabled the re-engagement and restoration of approximately 550 metres of the relic Huritini/Halswell River channel (cut off when the Halswell cut was constructed in early 1900s) to divert a portion of flows into the four hectares of Te Ahuriri wetland positioned almost exactly where the river once connected with the Ahuriri Lagoon.

The wetland has been designed with expansive areas of shallow and deep water and littoral margins able to support a diverse and rich plant palette suited to the seasonal water fluctuations and able to strip nutrients from the waters draining the outskirts of Christchurch, Tai Tapu, western Port Hills and the mosaic of farmland between.

Controls at the inlet and outlets enable manipulation of the flows through the wetland to support a long-term study of the effectiveness of constructed wetlands to contribute to the progressive improvement of our freshwater lakes and estuaries.

This is based on a combined matauranga Maori monitoring programme and run in parallel with a long-term water quality monitoring programme being implemented by NIWA.

This offers the potential for shared learnings for Maori, scientists and engineers on the role of wetlands in our future landscape.

Morphum has continued to support Environment Canterbury through the consenting, tender documentation, procurement and construction supervision phases of the project. Wraight and Associates provided landscape design and visual support material for engagement.

With the planting of over 80,000 aquatic rushes and reeds completed in late February 2020 (further to 44,000 riparian and terrestrial species planted in 2019) the wetland is already attracting birds not seen for a long time awaiting the return of invertebrates, fish and shellfish which will move in as the waters rise with the passing of the long dry summer.

As a large-scale and high-profile example of how ‘green infrastructure’ can play a vital role in reversing the decline in our precious freshwater environments, Whakaora Te Ahuriri looks to the future while reflecting the past.

As cyclists and walkers pass by on the Little River Rail Trail it will serve as a lasting reminder of the numerous large wetlands which once covered our lowland plains and the biodiversity and amenity that these supported.

It will also serve as a practical example of the role that the return of these wetlands can play in supporting customary mahinga kai practice, education of future generations and hopefully the return of Te Waihora to a vibrant and thriving ecosystem.

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A future jigsaw for healthy urban communities

Liam Foster, from WSP, discusses a bold Christchurch Green Infrastructure stormwater re-design project that reflects the urban environmental design challenges of the future.

Stormwater management in the past focused on drainage, with the principal purpose of getting rid of the water on flat land for development.

This approach of channelling and piping original natural waterways, and the efforts of the Christchurch Drainage Board, enabled the ‘Garden City’ to thrive and grow on flat, low lying and originally swampy ground that makes up the city. While allowing for the growth of Otautahi (Christchurch), this method also led to areas being exposed to flooding, erosion and poor water quality (including hydrocarbons, metals, nutrients and sediment pollution).

On top of this the drainage and stormwater systems are now aging and the funding of replacement infrastructure is challenging. Current stormwater designs now risk locking councils into large-scale infrastructure investments that may not perform over the long-term. In recent years, the design shift has been to re-engineer existing buildings and urban

infrastructure to achieve something more than the sum of the parts.

This concept of ‘placemaking’ also takes on the challenge to create appealing spaces where people want to live and work, and start a ‘re-healing’ of previous urban development approaches that haven’t been successful.

Cities and urban areas are largely seen as being the driver of this change to more creative and innovative Green Infrastructure (GI), and WSP worked with Christchurch City Council to produce a vision of how a typical urban creek catchment in Otautahi can and should look like in 50-100 years’ time. We were given free licence to scour international good practice and identify a future-ready and sustainable smart urban environment.

This work followed on from our Vision and Values works delivered with the council across the four urban river catchments of the Otautahi, Otakaro/Avon River,



Puharakekenui/Styx River, Huritini/Halswell River, and Opawaho/Heathcote River.

These projects provided a template for delivering the council’s high-level aspirations in the city’s Stormwater Management Plan documents.

The catchment is also a prime example of how we have historically undervalued the opportunities that, through GI, a healthy and open water environment can provide.

The waterway is heavily modified, largely culverted, with a catchment made up of a range of distinct land use zones – light industrial, commercial and residential. It is an urban catchment that has, over time, ‘forgotten’ the watercourse flowing through the area, resulting in disconnected ‘islands’ of open waterway covering less than 35 percent of the lineal length of the watercourse.

It was deemed unlikely that ‘ad-hoc initiatives’ around the old catchment would restore waterway health to a pre-developed condition due to the extent of catchment modifications.

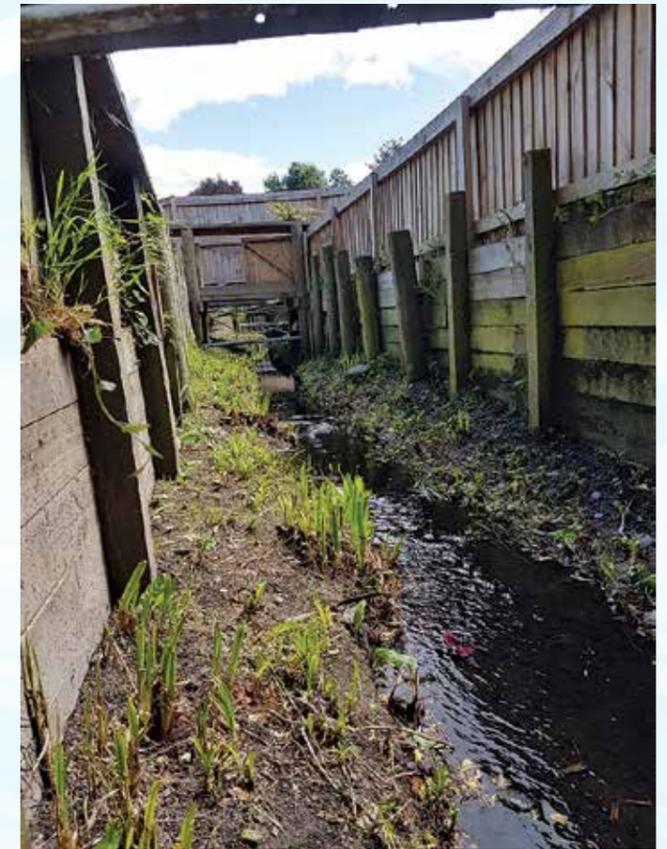
Taking a GI approach it is possible to achieve substantial improvements in natural geomorphic integrity, riparian corridor integrity and social amenity to create an ecosystem that is resilient to future changes in catchment conditions.

An integrated approach is key

Using the lenses of economics, culture, geography, ecology, society, architecture and planning presented a *Future Ready* vision for any urban catchment and was designed to persuade the communities and the council involved to develop a clear and agreed cross-disciplinary trajectory for the catchment’s enhancement.

What is clear was the need to develop an integrated approach to water management across Christchurch as the most cost-efficient way to approach the challenge facing the city through greater levels of urbanisation and projected climate change.

The project exercise identified: A vision for placing people at the centre of the redevelopment in a sustainable manner delivering low-carbon [dioxide] communities (through doubling the current density in Christchurch); an interpretation of a vibrant and future proofed community



Left: The outlet to the river (no fish passage). Above: High back yard fences, vegetation and sediment build up – communities turning their back on the waterway.

precinct with connections across the city and wider region; a connected network of green/blue corridors for more effective stormwater management into the future, delivering better receiving water environments; an activation of the river corridor for improving multiple co-benefits; and vibrant, high quality, well-designed precincts that encourage inward investment, delivering a circular and lower consumptive community.

This vision also presents a range of initiatives with the



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Connected urban blue – green creek corridor.



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The connected natural habitat corridors.

power to transform the catchment and reconnect residents to the original creek and the broader natural environment.

We believe better economics, social fabric, productivity, environmental well-being and cultural identity are outcomes of this process.

The costs and complexity of transforming existing urban environments are piecemeal in nature and costly.

New urban developments can tackle some of these issues as shown by the ‘eco city’ concept across Europe and we can take a similar approach with the environmental regeneration of our changed natural habitats.

We need to think of this vision as a jigsaw puzzle of the future; a puzzle that allows an integrated approach to be delivered with different stakeholders coordinating their funding and efforts.

This requires a shift in our current planning approaches to go beyond the 10-year cycle and take on a longer time horizon.

Thinking in this way enables us to capture the collaboration between communities, private and public organisations.

This new jigsaw, alongside a ‘flexible attitude’ to its delivery will appeal to many of our communities’ aspirations, such as a clean urban waterway which people could be proud of, where mahinga kai could be gathered once more, as well as the creation of a connected linear waterway urban park where our tamariki can safely engage with the waters once more.’

Finally, imagine that we don’t have to ‘visualise’ these better outcomes for our urban creek catchments, but make the right decisions now to allow the first ‘future jigsaw’ pieces to be placed on the way to delivering a more connected, vibrant and healthy urban community.

This way we could avoid continuing to deliver the same-old-same-old (our current jigsaw) and avoid us continuing to ‘lock in’ current land use approaches.

Instead, we use the natural hydrological catchment as the fundamental basis for seizing the opportunity to set a clear future-ready vision for urban catchments, thereby avoiding the piecemeal future urban renewal that typically occurs.



A street scene where the route of a typical urban creek is buried below ground.

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A career through national institutes

Chris Nokes says his natural curiosity and bent for chemistry provided him with a full and interesting career in the water sector. BY MARY SEARLE BELL.

ESR science leader Chris Nokes developed an interest in chemistry when he was a 13-year-old at Christchurch Boys' High School.

"I had a science teacher who was very clear and very good, who spurred me along," he recalls.

By his sixth form year this had developed into a keen interest in air pollution, so he chose to do a chemistry degree at the University of Canterbury, followed by Honours and then a Ph.D.

"At that time there was a lot of interest in air pollution – smog and the depletion of the ozone layer, which receive less attention these days."

Chris's doctorate had him studying heavy metal vapours, and following the completion of his thesis, he went to the University of Edinburgh in Scotland for two years of post-doctoral study.

"I spent many hours sweating in a small dark laboratory that often got to 30 plus degrees because of the oven I used to vaporise the cadmium I was studying. It was all fairly esoteric stuff, but it did give me a lot of hands-on work, which I enjoyed.

"When I returned to New Zealand, with a wife and newborn, along with a mortgage, jobs in my research area were few and far between. I was also wanting to do something that had clearer practical application.

So, with the aim of doing more applied science, I took a job in the water section of the chemistry division of DSIR [Department of Scientific and Industrial Research]."

This was 1985, and the role looked fairly mundane to Chris.

"My expectations for exciting science were not high," he recalls, "but water provided the opportunity to do something useful."

Initially, the work was analytical, testing water samples for the Department of Health. Each water supply around the country was sampled once every five years – from the source, the treatment plant, and the reticulation.

He was aided and frustrated in his work by a piece of new technology called an ion chromatograph, one of only a couple in the country. The fancy machine allowed the concentrations of several ions to be measured at once rather than having to undertake several different tests.

However, the machine kept breaking down.

"It could process a large number of samples overnight, however, I often came in to work in the morning to find it had stopped working during the night and, instead of making things easier, it had put me behind schedule."

Technological frustrations aside, Chris was becoming more and more interested in the results from the tests.

"For each water sample received we produced a report which tabulated the test results and provided brief comment.

"I took the opportunity to look more closely at the results to understand them better – what they said about the source water, the treatment process, and the

implications for the final quality of the water going out to the consumer.

"I would expand the comments provided at the end of the report – it helped my understanding, and it improved the value of the information to the health protection officers who took the samples.

"Consequently, by the early 90s, as well as providing an analytical service, the advisory role of our section had increased."

Around that time, in 1992, DSIR was dissolved and Chris found himself working for ESR [Institute of Environmental Science and Research], one of the bodies that was set up as a result.

"Dr Michael Taylor, who had newly joined the Department of Health, came to us one day and asked, 'what are you doing with these numbers?'

"His questioning of the traditional approach to the surveillance of the chemical quality of drinking-water supplies set a new direction for checking the chemical safety of water supplies.

"The 1995 edition of the *Drinking-water Standard for New Zealand* introduced a risk-assessment approach to chemical monitoring of drinking-waters to make better use of resources.

"Microbial testing is done for all water supplies, but chemical testing now targeted only chemicals likely to be in the water – there's no point testing for disinfection by-products, for example, when a supply is not disinfected."

In his work, Chris was involved in a number of different projects to help

the Ministry of Health develop drinking water standards and improve water supply management.

"Heavy metals, lead particularly, were often found in reticulation samples. We asked children from several schools to take samples from their home taps and found that the lead was leaching from the taps themselves and would build up in the water overnight.

"We concluded that flushing a small volume of water from the tap would reduce people's exposure to lead. As a result, the standards now require the public to be regularly advised to flush their taps each morning."

At this time ESR also played an important role in introducing risk management into water supply management. Chris says this established a 'fence at the top of the cliff' rather than relying on an 'ambulance at the bottom'.

It focused on preventing contamination, rather than depending on testing to show that contamination had occurred, and then having to react.

ESR developed a framework to support water supplies in making this change.

"This was cutting edge work in those days, and it generated international interest."

Chris was subsequently invited to present on New Zealand's risk management framework at a WHO conference in Berlin in 2003.

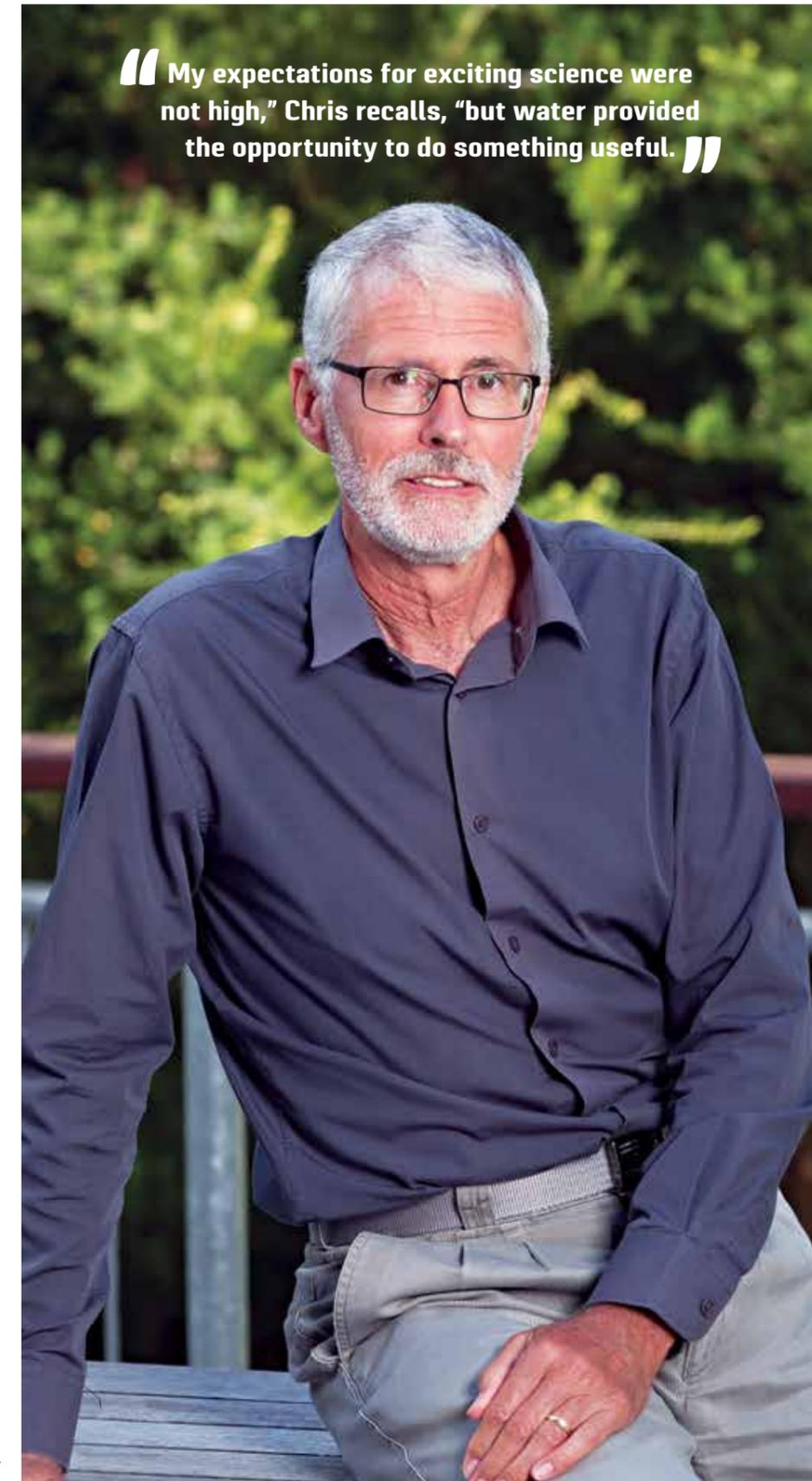
In 2011, Chris was given responsibility for looking after the environmental health component of ESR's contract with the Ministry, which, along with water, includes things like air quality and wastewater. Most of his time is taken up in a management role, "which I've been trying to avoid since before ESR was formed," he says with a laugh.

As he turns 65 later this year, he will soon be leaving ESR and the water industry behind. However, he hasn't ruled out doing a bit of contract work for ESR if it has trouble replacing his particular set of skills, gained through years of experience.

But he's keen to share his other areas of expertise; "I have been a competitive fencer since late high school and I'd like to coach local youngsters again," he says.

He'd also like to learn how to paint properly, do more photography and write fiction for kids.

It's certainly different from his career, but it sounds like Chris's retirement is going to be just as busy.



“My expectations for exciting science were not high,” Chris recalls, “but water provided the opportunity to do something useful.”

ESR science leader Chris Nokes.

Re-building a community through flood control

When the Rangitaiki River stop bank breached in April 2017 it caused extensive flooding to the town of Edgumbe damaging property and infrastructure.

Waiotahi Contractors was awarded the Edgumbe College Road Breach Site Stop Bank project by the Bay of Plenty Regional Council. Works were completed in November 2018 as a high priority for the council to make the town safe from further destructive flooding.

Working beside a river with the constant threat of rain both rising the river level and affecting the fill material – this project required engineering skill, agility and clever planning. Work started on March 23, 2018, with a completion date of November 21 that year.

Waiotahi worked in collaboration with consulting engineers GHD and the BOPRC to get the job done to specified standards and engagement with locals to lessen the disruption for an already traumatised community.

Added complications were that the two dams up-river (Aniwhenua and Matahina) let water out every afternoon to generate electricity that raised the river level. The stop bank job had to be carefully staged, opening up no more than 50 metres at any one time to enable quick closure if flooding was anticipated.

All machinery had to be carefully placed at times of river level increases while also working in confined spaces, constrained between the river side and the road side. The ground conditions were challenging, with saturated spoil and debris from the original stopbank.

Work took place at College Road, Edgumbe, the main road in this small Bay of Plenty town, that sits alongside the Rangitaiki River. The road features residential housing, two schools, businesses and sportsgrounds, and adjoins SH1 at its southern end.

Planning and control

Engineering aspects of the project included: Stop bank construction earthworks; ground improvement works; road construction; and drainage systems.

A contract-specific Environmental Management Plan (EMP) addressed erosion and sediment controls, dust management, reduction of noise, management of fuels and oil, waste management, stakeholder management, accidental artefact

discovery, auditing, and silt and dewatering.

A GHD consulting engineer was needed on site almost full time to sign off earthworks hold points during the stop bank construction phase of the works.

The project manager developed the construction programme and made updates throughout the works. As the job held many unknowns and complexities, he was constantly assessing where the team could work smarter and gain some time. It was essential that everything worked like clockwork to take advantage of the suitable fill material when it was available.

Physical works – the risks

Rain posed the main risk. The potential for the river level to rise again while the stop bank was being excavated and re-built was ever-present.

Once sections of the ground were opened up there was the risk that machinery could get stuck and sections were at risk of giving way. The area was also built on a clay layer, making it susceptible to vibration.

Part of the scope was the removal of 420 lineal metres of asbestos water pipe – this was handled by specialist contractor Shane Moore Services.

The project took place within a residential area, with two schools on College Road. The contractor had to maintain safe access for residents to their houses and enable school children to safely access the schools each day.

It was essential that this stop bank never failed and the town could feel safe again. Quality control and daily testing were key to determining success in this area.

Over the 10 months of delivery, the team experienced all weather conditions. Working in close proximity to the Rangitaiki River posed the risk of drowning, so all machine operators were required to wear inflatable life jackets.

Four king tides throughout the project meant dealing with exceptionally higher than normal river levels and planning works accordingly.

A decision by the engineer to remove the entire old stop bank, and construct a new one, had the potential to extend the programme. So, teams worked ‘smarter’, taking advantage of times when the weather was good which sometimes meant seven-day working weeks.

Construction

Planning and programming were complex. More constraints were added to the project when the engineer decided to limit the working area for stop bank works from a full open site to sections of 50 metres at a time.

Quality and the associated checks were a major part of the project with a stringent testing routine in place. Working within a 50-metre section at a time on the stop bank, materials were quality tested six times per sample, and density checks taken every 200mm. Every 10 lineal metres the layer below had to be re-checked.

A qualified engineer was on site at all times, with nuclear densometer testing undertaken by Opus Rotorua (WSP) lab in the mornings and Opus Tauranga lab in the afternoons working in a ‘tag team’ to keep up with construction.

To mitigate the risk of working in a residential area while managing multiple large truck and machinery movements, the site



Left: Completed Edgumbe College Road Breach Site Stop Bank project. Top and above: Excavators and road construction vehicles working on the stop bank.

was fully fenced with a one-way traffic movement system in place. If a visitor came to the site, the procedure was 'bucket down' at all times.

Waiotahi used local Edgumbe businesses wherever possible. Beulah Concrete Services worked on the footpaths, vehicle crossing works and concrete supply – work which equated to eight percent of the total contract value.

Peppers Building Supplies provided the timber for boxing and framing, paint and cement. RD1 supplied pipefitting and hand tools.

And, at every opportunity, contractors bought food at the local College Road Bakehouse.

External relationships

It was important that the community and public were involved with the project wherever possible as work took place within the residential community.

Contact with residents occurred several times a day. The site team knew the homeowners by name and where they lived. They talked with those whose homes had been demolished.

Concerned that the local Bakehouse would lose business due to being located on the closed road, Waiotahi encouraged its team and the truck drivers to buy their lunches there. The firm held its site meetings at the shop and, when targets were met, celebrated with doughnuts purchased from the store.

Contractors retrieved a section of the old stop bank featuring an eel mural. This, and a section of stop bank discovered in the shape of a heart, were both placed in the reserve area as a memorial.

When the footpaths were constructed through the reserve section, the numbers of the houses which had been permanently removed were stamped in the kerbs as a remembrance of where they had been. This was done by the previous house owners and was a very moving occasion.

Many local residents shared with staff their traumatic escape stories; some having had barely minutes to get out of their homes.

Team culture

The area worst affected by the breach of the stop bank was between house numbers 2-68 College Road and 16-18 Rata Ave. Houses in these areas were so badly damaged that they had to be demolished. The land was then purchased by the BOPRC to make this a reserve area as a memorial for future generations to

remember what had happened that day.

Several of the residents still living in College Road and adjacent to the works were disabled, for example two in wheelchairs, and a blind person. The contractors made it a priority to ensure they, in particular, were not inconvenienced by the works.

Waiotahi staff were encouraged to help residents wherever they could. They moved residents' wheelie bins out for collection when the road was closed, built a gravel pathway to replace a muddy path so a blind resident could safely access the road from their property, and built a ramp for one resident and her wheelchair.

Client satisfaction

The project contained three parts: excavate and remove the existing stop bank; re-build a new stop bank; and reinstate new services and build a new alignment of College Road.

There were two major increases in scope which, through collaboration with BOPRC, Waiotahi managed to incorporate without an increase in budget or in the time it took to complete.

This project was of high importance to the BOPRC as part of its wider flood remediation and repair works, and the highest priority in terms of risk and mitigating further damage, and to further add to the recovery for the town of Edgumbe.

"Council knew that residents would need an extraordinary level of communication from our contractors; and that's what Waiotahi delivered," says BOPRC engineering team leader Peter Hay.

"In addition to the usual letterbox drops notifying homeowners of the impact of scheduled work, staff identified those residents who needed an even higher level of interaction.

"For some, this looked like one-on-one, at times, daily briefings in addition to other measures the wider council staff were using to support affected residents.

"We know that community engagement is a necessary aspect of modern engineering practice, but the degree to which Waiotahi staff sensitively included this in the delivery of the College Road contract was a leading example."

The Edgumbe stop bank project led to the council also awarding the Omeheu Stop Bank project to Waiotahi.

Waiotahi Contractors entered the project into the CCNZ/ Hirepool Excellence Awards 2019 under 'Category 1B' for projects with a value of less than \$5 million. This article is based on the original award entry.



Stormwater 2020



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Respiration-based toxicity testing



Hugh Ratsey, Wastewater Process Scientist with The Wastewater Specialists, explains a new tool available for respiration-based toxicity testing.

A wide range of microorganisms make up the biomass population of a secondary wastewater treatment process such as activated sludge, trickling filter, and waste stabilisation pond (WSP). These include bacteria, protozoa, worms, and microscopic animals, of which bacteria are the most important group in biological wastewater treatment.

It is the bacteria that break down dissolved contaminants, converting them into less harmful substances such as carbon dioxide, water, and new bacterial cells.

In secondary wastewater treatment processes, contaminants are primarily broken down by aerobic bacteria, which utilise oxygen.

Therefore, the rate of oxygen consumption, or uptake, is an indicator of biomass activity; a healthy functioning biomass population will utilise oxygen at a faster rate than an unhealthy biomass population, all else being equal.

There are two groups of bacteria, heterotrophs and nitrifiers, that are critical to a well-functioning biological wastewater treatment plant (WwTP).

Heterotrophic bacteria use carbon as their energy source, so these are responsible for carbonaceous biochemical oxygen demand (cBOD).

There are a wide range of heterotrophic bacteria present in the biomass from a secondary treatment process, and this diversity provides a reasonable resilience to toxic shocks and loading.

The nitrifying bacteria, which convert ammonia, via nitrite, to nitrate, are far more specialised bacteria, including species such as *Nitrobacter* and *Nitrosomonas*. These nitrifying bacteria are significantly more susceptible to toxins than heterotrophic bacteria.

Therefore, an inhibitory trade or industrial wastewater is more likely to have a greater adverse effect on the nitrifying population than on the biomass population generally.

This is of particular relevance in wastewater treatment because the majority of modern resource consents include strict effluent quality conditions for ammonia due to its high toxicity in fresh water.

Many WwTPs in this country receive a combination of domestic wastewater and trade and industrial wastes. These trade wastes may be discharged by an industry directly into the municipal sewer, or they could be tankered to the treatment plant.

Most territorial local authorities (TLAs) have trade waste bylaws in place, the majority of which are based on the Model Trade Waste Bylaw (Standards New Zealand, 2004).

With regard to potentially inhibitory substances, the Model Trade Waste Bylaw refers to “Table 5 in Guidelines for Sewerage Systems: Acceptance of Trade Wastes (Industrial waste)”.

This document lists the concentration of close to a hundred compounds or elements that are known to inhibit the activated sludge, anaerobic digestion, and/or nitrification processes (ANZECC, 1994).

The Model Trade Waste Bylaw also states: “Should any characteristic of a discharge be found to inhibit the performance of the wastewater treatment process, such that the WWA (wastewater authority) is significantly at risk or prevented from achieving its environmental statutory requirements, then the WWA reserves the right to amend the corresponding consent summarily.”

Conventional laboratory analysis can determine concentrations for a wide range of compounds, however testing for an extensive suite of determinands is a costly process. In addition, the concentration of individual contaminants alone does not allow for synergistic or antagonistic effects of a combination of chemicals with regard to toxicity.

To allow for this, some TLAs have been more prescriptive regarding potentially inhibitory industrial discharges in their Trade Waste Bylaws.

For example; “No waste being diluted at a ratio of 100 to 1 wastewater shall inhibit the performance of the wastewater treatment process...” (Gore District Council, 2016; Hamilton City Council, 2006).

Respiration-based toxicity testing (RBTT) is a far more economical and proven targeted method for determining the actual inhibitory effect a trade or industrial wastewater has on the biomass from a biological wastewater treatment process.

It also enables a risk profile of different wastes streams to be determined by the TLA. The timing, and location of discharge, of more toxic wastes can be optimised to reduce risks of WwTP inhibition.

In addition, cost recovery on the waste loads can be achieved on a far more equitable and defensible basis if desired.

With RBTT, the inhibitive effect of a trade or industrial wastewater is determined by measuring the difference in the rate of oxygen uptake for a given biomass population when fed a control food source, as compared to the rate when a diluted fraction of the trade waste is fed along with the control food source.

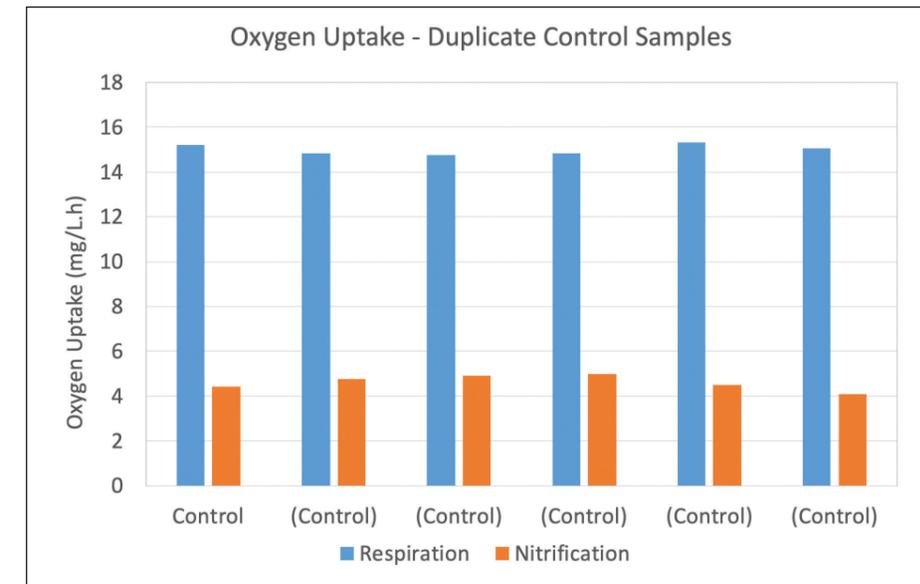


Figure 1: Oxygen Uptake in Duplicate Control Samples

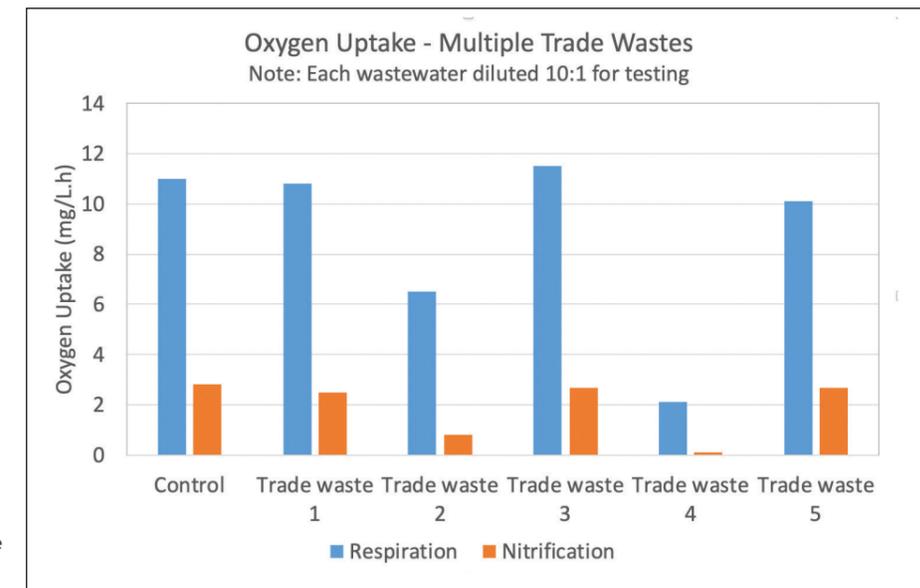


Figure 2: Oxygen Uptake in Multiple Samples of Trade Waste

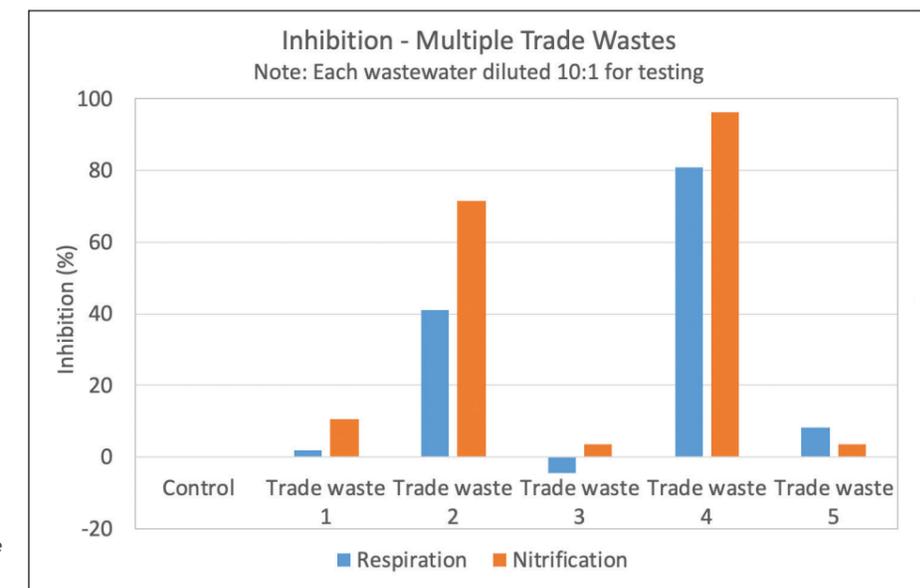


Figure 3: Oxygen Uptake Inhibition in Multiple Samples of Trade Waste



Figure 4: Inhibition Curve for a Single Trade Waste Sample

The more inhibitory a trade waste, the lower the oxygen uptake rate will be when fed the mixture of the waste and control. The method for such testing is described in OECD Guideline 209, *Guidelines for the Testing of Chemicals: Activated Sludge, Respiration Inhibition Test (Carbon and Ammonium Oxidation)* (OECD, 2010).

RBTT offers the ability to differentiate between the total oxygen uptake by the general heterotrophic population, and the oxygen uptake rate by the more sensitive and critical nitrifying bacteria.

This difference is determined by running the test twice.

First, measuring the total oxygen uptake rate including the nitrifiers and, second, measuring the oxygen uptake rate used only by the heterotrophic population. A nitrification inhibitor is used in the second test, so the oxygen consumed is only that used by the heterotrophs. Therefore, the difference between the two measured uptake rates is the oxygen consumed by the nitrifying bacteria.

Identifying inhibition of nitrifying bacteria is a vital component in the toxicity profile of a waste stream, however the oxygen uptake due to nitrification is typically only 10 to 30 percent of the total oxygen uptake.

One of the challenges with RBTT is to provide a highly repeatable methodology which allows potentially small differences in oxygen uptake rate to be accurately measured.

If tests are undertaken sequentially, inconsistencies can mask the actual impact a trade waste may have on oxygen uptake rate. While the majority of such inconsistencies can be minimised by using quality instrumentation, such as high precision dissolved oxygen (DO) electrodes, and robust laboratory techniques, it is not possible to eliminate all variability.

For example, the rate of oxygen uptake by biomass from a WwTP is influenced by the time of day it is collected, the time period between collection and measurement, and any residual substrate available.

The repeatability of RBTT is enhanced by running several tests concurrently, rather than sequentially. The oxygen uptake rates measured when running RBTT tests simultaneously on six identical samples are shown in Figure 1, where the measured total oxygen uptake rates were within \pm five percent, and the oxygen uptake rates

due to nitrification were within \pm 15 percent.

By running an initial screening test on a number of samples, the likely toxicity of several trade wastes can be identified at the same time.

More detailed analysis of inhibitory trade wastes can then be undertaken at an appropriate dilution series. This flexibility provides a cost-effective tool for rapid screening of a range of trade or industrial wastes for toxicity, and/or to determine the dilution at which inhibition by a toxic waste becomes negligible.

Example outputs from an initial screening test on multiple trade waste samples, each diluted 10:1, are shown in Figures 2 and 3.

Figure 2 shows the oxygen uptake rate by both the total biomass and the nitrifying bacteria, however the inhibitory effect on oxygen uptake is shown more clearly in Figure 3.

In this example, Trade Wastes 2 and 4 exhibited significant inhibition to both the general biomass and the nitrifying bacteria at the 10:1 dilution. As is generally the case with an inhibitory wastewater, the adverse effect on sensitive nitrifying bacteria was greater than the effect on the general biomass population.

If an initial screening test indicates a trade or industrial wastewater is inhibitory at a 10:1 dilution, or if a TLA receives a request for treatment of a new trade waste with little information about toxicity to their plant, a more detailed RBTT will determine the extent of inhibition and the level of risk.

Testing the trade waste at a range of dilutions from 100 percent to 0.01 percent reveals the concentration at which a given percentage of the total and nitrifying biomass are inhibited. This provides an excellent metric for determining whether a trade waste is likely to inhibit the performance of a wastewater treatment process.

The resulting inhibition curve for a single trade waste, displayed on a logarithmic x-axis for clarity, is shown in Figure 4.

The actual concentration at which an inhibitory effect is of concern for a WwTP will be influenced by a wide variety of factors.

Obviously, the available dilution should be a consideration, but this is not the only consideration. Some types of secondary treatment processes are more resilient than others.

An activated sludge process, which operates at an elevated mixed liquor suspended solids (MLSS) concentration, would generally

be relatively resilient. Less intensive processes, such as trickling filters or WSPs (and their modifications), would generally be more susceptible to inhibition due to the lower biomass inventory held.

Therefore, a trade waste which is inhibitory at a one percent solution may not adversely affect an activated sludge process, providing such dilution was available, but may cause loss of

nitrification in a modified WSP or trickling filter.

Another factor to be considered when interpreting RBTT results is the resource consent conditions. The compliance of WwTPs with more stringent consent conditions, particularly for ammonia, are more likely to be adversely affected by inhibitory substances in the wastewater.

Summary

The actual inhibitory risk of a trade or industrial wastewater can be accurately measured through RBTT, now cost effectively available in New Zealand.

This provides a defensible metric for TLAs that receive combined domestic and industrial wastewater at their WwTPs to determine if

a trade waste is inhibitory to biomass from a secondary wastewater treatment process.

By completing RBTT tests simultaneously on a range of dilutions using high precision DO probes, oxygen uptake rate, and therefore inhibition, can be accurately measured both for heterotrophic and the more sensitive nitrifying bacteria.

Therefore, the inhibitory effect described in the Model Trade Waste Bylaw, and adopted by the majority of New Zealand TLAs in their trade waste bylaws, can now be defensibly measured. This allows for optimisation of the toxic stream, by load, time and sites, and robustly determines the risk profile of a trade waste with regard to potential biological failure of a WwTP.

References:

- Australian and New Zealand Environment and Conservation Council (ANZECC, 1994); *Guidelines for Sewerage Systems: Acceptance of Trade Waste (Industrial Waste)*; November 1994.
 - Gore District Council (2016); *Trade Waste Bylaw*.
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 - The Organisation for Economic Co-operation and Development (OECD, 2010); *Guidelines for the Testing of Chemicals: Activated Sludge, Respiration Inhibition Test (Carbon and Ammonium Oxidation)*. Guideline 209.
 - Standards New Zealand (2004); *Model General Bylaws: Part 23 – Trade Waste*; NZS9201.23:2004.
- For more information on respiratory-based toxicity testing, Hugh can be contacted on 027 4411664, or hugh.ratsey@twws.co.nz

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Supporting Pacific communities in difficult times

By Dane Hart, chief executive, Engineers Without Borders NZ.

When drought hits the Pacific, it is less resilient communities that feel the effects first. After six months without rain, and with an in-operational desalination plant, the communities on the island of Aniwa in Southern Vanuatu were fast running out of water.

A team from the Vanuatu Department of Water Resources (DoWR) was sent in to deliver drinking water supplies and get the desalination plant up and running again.

One of the members of this team is Michelle Knappstein, a volunteer with the joint EWB NZ (Engineers Without Borders New Zealand) and VSA (Volunteer Service Abroad) programme, whose role it is to build the technical capacity of her teammates.

By providing advice as she works alongside them, Michelle can teach skills that will be practical, and can provide impact that will last the entire career of each of her colleagues. EWB NZ and VSA take this approach as they believe it is the most sustainable way to achieve impact.

“One of the most rewarding experiences has been watching my counterparts grow and take responsibility for their work and decisions,” says Michelle.

In the light of the Covid-19 outbreak, where agencies are actively encouraging communities to wash their hands thoroughly and often, the supply of safe drinking water is more important than ever.

A pandemic in communities with limited medical infrastructure, and at a time when key allies such as Australia and New Zealand are facing their own challenges, could be devastating.

The risk to human life has been further compounded by the destruction caused by Tropical Cyclone Harold, a category five cyclone which hit the northern islands of Vanuatu on April 6, destroying the homes of entire communities, and leaving many people without access to safe drinking water.

Providing support to the DoWR in these difficult times is more important than ever. However this has proved a challenge for the EWB NZ/VSA team, as the Covid-19 outbreak has significantly impacted international travel.

It is recognised that now may be the time for a shift in thinking to a world of remote connectivity and the team are working together to find new ways to continue to deliver impact.

With this in mind, the EWB NZ team are working with





partners to explore the viability of delivering virtual support. This may look like:

- Providing remote technical support for local engineers working on specific projects;
- Providing mentoring for graduate engineers to assist with learning on-the-job;
- Supporting the establishment of a Vanuatu Institute of Engineers and Architects to advocate for the sector and provide a means for accreditation of engineers and architects;
- Developing online training programmes and other forms of continuing professional development for water professionals, including engineering graduates at DoWR;
- Supporting local groups to develop and run schools-based programmes to encourage students to pursue a STEM-based career.

We believe in taking a whole-of-sector or systems approach in all that we do, and so we feel it is important that our work considers the development of the engineering profession as a whole. Shifting our work online has its challenges, but we are confident that our relationship with the DoWR is strong enough that we can work through it together.

If you are able to provide financial support or technical expertise that may enable this programme, the team at EWBNZ would love to hear from you.



We are also recruiting for capable water professionals to take on Michelle's role with the Department of Water Resources in early 2021.

For more information please contact Dane at dane.hart@ewb.org.nz.

Michelle's placement at the DoWR is made possible with the support of the Ministry of Foreign Affairs Aid Programme, and is a collaboration between EWBNZ and VSA.

Stormwater 2020

26 – 28 August 2020 | Tauranga

New dates are 26 – 28 August

Planning for the Stormwater Conference has been underway for months and the programme is complete. Due to COVID-19 the Conference has now been postponed from both its original date in May and alternative July date. The new date for Stormwater Conference is now 26 – 28 August 2020. Earlybird and Corporate Registrations are extended to 26 June. If you are already registered you do not need to do anything further.

Water New Zealand remains excited to host the Stormwater Conference and we look forward to meeting all our delegates, sponsors, exhibitors and speakers at our new dates in August.

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BETWEEN SKY AND SEA

Water issues under lockdown

There has been considerable movement in legal and government matters despite the current standstill caused by the Level 4 lockdown. Plan Changes have continued and Government reports on freshwater have been released.



By Helen Atkins, Director and Tom Gray, Solicitor, Atkins Holm Majurey.

A review of the Overseer nutrient loss model is underway and Hawkes Bay councils have begun working together to review the current and potential three waters delivery options. The Government has also released a drought relief package and continues parliamentary processes such as the progress of the Water Services Regulator Bill.

Waikato Plan Change decision notified

The decisions version of the Healthy Rivers/Wai Ora Proposed Waikato Regional Plan Change 1: Waikato and Waipa River Catchments (PC1) was notified on 22 April 2020, largely accepting the recommendations made by the Hearings Panel.

The plan change was first notified in October 2016 (then varied in 2018) and is the first stage in an 80-year plan to improve water quality in rivers so that they are safe for food gathering along their entire length and meet the requirements of Te Ture Whaimana o Te Awa o Waikato, the Vision and Strategy for the Waikato River.

PC1 comprises rules to manage both point source discharges (such as sewage from towns and waste from factories) and non-point source discharges linked to agriculture allowing for the management of key contaminants identified in the Waikato and Waipa rivers: nitrogen, phosphorus, sediment and bacteria.

Submitters on PC1 have until 5 June 2020 to appeal the decision. However, a request has been made to extend that timeframe a further 20 working days. The decision's version and any updates are available on the Healthy Rivers web page.

Otago Regional Council Plan Change 7

The Otago Regional Council (Council) has notified the Proposed Water Permits Plan Change (PC7) as part of a wide Water Plan review by Council which was recommended by the Minister for the Environment and due to be completed by December 2025.

The PC7 process is slightly different to other plan changes due to it being called in by the Minister. Submissions on the plan change will be collated by Council and sent to the Environmental Protection Authority who will then notify the decision of the Minister to call in the matter and another submission opportunity will open.

A further submission opportunity will be provided and the EPA will provide the Environment Court with all the information

received, including a 'key issues' report from the Council. At this stage, the EPA will step back and the process continues in a similar way to the standard process.

PC7 is intended to provide an interim regulatory framework for freshwater management until new allocation limits are set in accordance with the National Policy Statement for Freshwater Management (NPSFM). The provisions of PC7 will enable the assessment of the application and issuing of resource consents subject to conditions for a short duration, during which a new water plan will be prepared.

Submissions on PC7 closed at 5pm Monday 4 May 2020. The EPA intends to run a submission process after that as noted above.

'Our Freshwater 2020' report

The Ministry for the Environment and Stats NZ has released *Our Freshwater 2020*, a report summarising updates and reporting progress on four priority freshwater issues. Following on from *Our Freshwater 2017*, the new report is the latest state of the environment report required under the Environmental Reporting Act 2015 and focuses on four key issues.

The Report states that the native freshwater species and ecosystems are under threat. The health of many ecosystems continues to decline as a result of converting land that was previously native forest and draining wetlands, changing waterways' natural flow and form, and introducing new species to New Zealand.

The Report then indicates that widespread water pollution is the result of a combination of effects from urban areas, farms and forestry areas. Groundwater quality was found to be varied, although it is improving in some areas. Pesticides were also detected in groundwater at many sites and concentrations of pollutants in freshwater were higher in urban, farming and forestry areas than in natural conditions. Some freshwaters also contained emerging contaminants, although mostly at low levels.

Changes made to water levels, flows and courses in rivers and aquifers were also identified as an issue. The changes are affecting freshwater, including by reducing the habitat for freshwater fish. Artificial structures are also creating barriers to their movement. The effects of climate change was identified by the Report as already resulting in environmental, cultural and economic impacts.

The Report found that climate change is expected to affect when, where and how much rainfall, snowfall and drought occurs, as the frequency of extreme weather events increases. While not specifically defined, the flow-on effects are expected to be wide ranging and the impacts on values such as health and recreation are expected to increase.

The report also discusses where the most significant knowledge gaps are and how they could be addressed, including understanding how the Crown will develop and incorporate a fully integrated Te Ao Maori 'view' into environmental reporting.

However, this led to disappointment among iwi and hapu nationwide as consultation on the matter was not undertaken in the process of the report. *Our Freshwater 2020* is available from the Ministry for the Environment website.

Review Science Advisory panel appointed to review Overseer

In December 2018 the Parliamentary Commissioner for the Environment (PCE) released the report *Overseer and regulatory oversight* that outlined a series of recommendations and steps necessary to enable Overseer to be confidently used in a regulatory context.

A key recommendation was that a comprehensive evaluation of the model be undertaken, and in response to this MPI has initiated a whole-model Peer Review of Overseer.

MPI states that the overall objective of the Peer Review is 'to conduct an independent scientific assessment of the Overseer model in the context of its use as a regulatory tool in specific scenarios'. The Peer Review will be led by a Science Advisory Panel which has been appointed by MPI and the Ministry for the Environment (MfE). This Panel will be supported by a Secretariat of MPI and MfE officials, and by AgResearch staff who will provide technical information on the model.

The Panel will conduct the first phase of the Peer Review, focusing on Overseer's overall modelling approach, with independent experts undertaking specific parts of the second phase. Phase one is expected to be finished in February 2021, and phase two in March 2021.

In phase one the Panel will make the following assessments of:

- Whether Overseer's current modelling approach (including key design principles and assumptions) is fit-for-purpose to model nutrient flows within New Zealand farm systems, in the context of:

- Use of Overseer as a decision support tool for land-users, and;
 - Use of Overseer as a regulatory tool by regional councils following recommended guidelines, across different sectors; and

- Overseer's modelling approach if it was to be used as a nutrient allocation tool in the future thereby providing an indication of whether Overseer is likely to be suitable (in its current state or with specific changes, or in combination with other tools) in different scenarios and for different sectors.

Overseer Limited and AgResearch will be given the opportunity to fact check the work of the Panel and the independent experts.

Review of three waters by Hawke's Bay councils

Hawke's Bay Regional Council, Central Hawke's Bay District Council, Hastings District Council, Napier City Council and Wairoa District Council are working together to review the current

and potential drinking, waste, and storm waters service delivery options for the region. The review will enable the councils to fully evaluate the scale of capital, capacity, capability and operational challenges in the region, and identify opportunities for the councils to work together to determine the best solution for the entire region.

The Government is providing \$1.55 million of funding to assist this review process, money which the councils say will enable: detailed analysis of the potential service delivery options including the flow-on impacts on each council; assessment of regional three waters infrastructure; and assessment of potential service delivery options in anticipation of any future changes to regulation.

This review process is expected to conclude in September 2020.

Drought relief

The Government announced a new drought relief package for drought-hit communities across the North Island in March 2020. The package includes: \$10 million to respond to immediate needs such as delivering water for consumption, sanitation, wastewater systems, stock welfare and horticulture; \$421,000 to extend the reach of Rural Assistance Payments which can be used to buy water; and \$2 million to support farmers and growers following today's large-scale drought classification across the North Island, parts of the South Island and the Chathams.

In response to the pressures on water reservoirs in the Auckland region created by the drought Watercare has launched the 'Water For Life' campaign to raise awareness of the need to conserve water.

The campaign emphasises that since the beginning of 2020 the Auckland region has received less than half the normal rainfall, and shares tips and strategies to support Aucklanders to make choices and actions to reduce their water usage in everyday life.

Taumata Arowai – Water Services Regulator Bill update

The Taumata Arowai – Water Services Regulator Bill is currently in the Select Committee stage. Submissions were heard by the Health Committee from 17 submitters including district and regional councils, and industry experts and groups.

The Bill will create a new regulator, Taumata Arowai, to oversee, administer and enforce the drinking water regulatory system, and is part of a broader package of reforms aimed at the three waters regulatory system as a whole.

Watercare, like many of the submitters, expressed their broad support for the Bill. Nevertheless, three major modifications were highlighted that it believed were necessary. The first was to improve the definitions used in the Bill, with Watercare citing the example of the definition of "drinking water supplier" referring to a "drinking water supply scheme", which has not been defined in the Bill.

Watercare also proposed an additional provision ensuring that one or more of Taumata Arowai's board members has technical expertise and experience in the Three Waters services delivery.

Finally, Watercare believes that the Bill should at least acknowledge emerging challenges in the water sector, including climate change and the need for alternative water supplies (notably desalination).

The Report from the Select Committee is due on 17 June 2020. The larger and complementary Water Services Bill is due to be introduced later this quarter.

Reflections on a career in local politics

Dave Cull has enjoyed an interesting and varied career, ranging from furniture maker to television host to mayor, but with retirement approaching, he spoke to **MARY SEARLE BELL** about his time with local government.

Dave Cull entered local government in 2007 when he was elected to the Dunedin City Council, becoming heavily involved in the local community, sitting on various steering groups and committees covering economic development, technology and the environment. In 2010, he contested and won the mayoral election, serving three terms.

His work at Dunedin City Council introduced him to LGNZ, and he joined its national council in 2010. For the past two years, he has held the role of president, something he describes as “an opportunity to contribute more to the conversations going on”.

“Not long before I joined the council, LGNZ employed a new CEO and had really lifted its credibility. The big issues had been identified and a business plan set, which crystallised what we had to do. LGNZ was much more professional than it had been in the past,” he says.

“I was very fortunate. A tremendous amount of work had been done prior to me taking the role.”

But holding two leadership roles at the same time wasn't without its difficulties, but there were advantages too.

“The fortunate thing about being a mayor is people automatically give you more time and credibility. However, both roles required me to be available 24/7 – they're both time demanding and it has been difficult to give enough time to each.

“Before I took on the presidency, I discussed it with my committee chairs and the council CEO. They agreed to fill in for me in Dunedin when I was on presidential business.

“In fact, the whole council was very supportive, and I knew I could go to Wellington for a day or two knowing things were taken care of back home.”

There have certainly been plenty of challenges local government has faced, and continues to tackle, during Dave's time with the association. The ever-present difficulty seems to be funding.

“Over time, councils have been given more and more to take care of, but not necessarily the funds to do so,” he says.

“Local authorities own nearly half of the public infrastructural assets, yet only get 10 percent of the tax revenue to maintain it.”

Dave says local government has a huge responsibility for all the waters – from drinking water, wastewater and stormwater, to floodwater, freshwater and irrigation and the infrastructure for these and the maintenance required to keep things up to date is significant, and expensive.

“One really big challenge is that council funding largely comes via rates, but we desperately need alternative funding methods as we're



“Local authorities own nearly half of the public infrastructural assets, yet only get 10 percent of the tax revenue to maintain it.”

sometimes in an untenable position.

“There's a disincentive to fund capital projects as these require rates rises, and rates increases affect votes. A council may spend money to get essential infrastructure up to scratch and, by way of thanks, promptly get kicked out of office by the voters.”

One of the things councils have been pushed to address in the past few years is their drinking water treatment systems, and Dave says most councils are responding pretty well, although acknowledges that some councils have a long way to go.

“But again, at the last election, a couple of mayors who were looking for more investment in their infrastructure, and therefore needed higher rates, were turfed out.

“We have also noticed the current Covid-19 crisis has emboldened some elected members, and some issues that had been decided are now being relitigated.

“There is huge pressure for rates to be lowered and essential projects to be cancelled.

“And the pandemic response is not just impacting rates take; on average, about 40 percent of council funding comes from things

like entry fees into council facilities, which we have lost during the lockdown.

“So not just rates are impacted. We've lost other funding as well. “There is definitely a big funding crunch coming for councils and it's going to be a huge financial challenge to overcome.”

Something else that concerns Dave is climate change and its effects on all waters.

“While Covid-19 is taking the spotlight at present, these problems haven't gone away. There are a lot of projects that need to be progressed, and we need the funding to do them. Local government simply can't foot the whole bill on its own.”

Dave believes the country needs a national legislative and regulatory framework for central and local authorities to work to, in addressing climate change issues.

“I'll give you an example. The Kapiti District Council put a hazard line on the LIMs of its coastal properties indicating a predicted rise in sea level.

“The owners were outraged, saying it devalued their properties. They took the council to court and won, and consequently, the hazard line was removed.

“Problem is, if those properties get sold and the new owners find their properties devalued by rising sea levels, they may try to take the council to court for failing to put that information on the LIM.”

He says a nationwide, overarching set of rules and principles, which takes variables into account needs to be implemented.

Privatisation versus public interest

Back in 2008/09, the Dunedin City Council (DCC), under Dave Cull's mayoralty, investigated alternative delivery models for their water services.

This triggered a study tour to visit Scottish Water and the Water Services Commission for Scotland. The findings were published in the October 2010 edition of *Water* in a report by then DCC Water and Waste Services manager, now current Acting Water New Zealand CEO, John Mackie. The report said: *In the process (Scotland has) succeeded in driving down costs and improving service levels sustainably across all aspects of their business, while avoiding the temptation to privatise the sector as their near neighbours in England and Wales had done in 1989,*

Corporatisation, while remaining in public ownership, is a model that Dave supports. These days, he cites Auckland's Watercare as a possible future model for water delivery in New Zealand.

“Watercare is a good example. It provides efficiency of scale, is able to provide volumetric charging, but is still publicly owned.”

But these debates are for the next generation to sort out, he says.

Now aged 70, he is stepping back from much of his work and he chose not to seek re-election for the mayoralty last year and his LGNZ presidency was due to end next month at the organisation's AGM.

However, Covid-19 put a spanner in the works here too, delaying that meeting and the end of Dave's presidency for a few more months at least.

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An opportunity for three waters infrastructure

Cedric Carranceja and Alanya Limmerin from Buddle Finlay discuss the proposed freshwater planning process in the Resource Amendment Bill.

The Government is currently looking to fund projects related to water, transport, clean energy, and buildings that are ready to start, now that the construction industry is operational again.

Infrastructure Minister Shane Jones has identified three waters projects as good candidates for such funding. We think that water storage and augmentation projects have similar qualities and should also be considered as worthy water projects. Water projects are likely to meet at least the first two of the three Government criteria for funding as they will create public or regional benefit and create jobs.

This is a particularly good opportunity to tackle the delivery of three waters services. It has sometimes been difficult for local government to fund the development or upgrading of this crucial infrastructure as several high growth councils have tapped out their balance sheets and face debt limits caused by urban growth. For example, Auckland's growth in the five years up to 2018 has meant that Auckland will use 90 percent of its debt capacity in the next 10 years.

This issue has been amplified, in some instances, by historic under or deferred investment combined with ever increasing expectations and delivery standards.

The Government was already considering the wider affordability challenges facing the three waters sector and had agreed to provide, on a case-by-case basis, financial assistance to eligible regions that are investigating financially sustainable service delivery changes. In particular, funding was to be made available for the voluntary investigation of new water service delivery arrangements.

It is these new delivery arrangements that Minister Jones



Cedric Carranceja



Alanya Limmerin

was particularly interested in. The Minister considers that economic rationalisation is the answer to delivering three waters infrastructure. As an example, he suggested Watercare Services could look to provide water and wastewater to Northland because of its proximity and because it had a good balance sheet.

There are certainly examples of rationalisation of three waters services between councils. For example the Waikato District Council contracted with Watercare Services for the operation and maintenance of its three waters infrastructure, while remaining in ownership of those assets.

This was done to achieve efficiencies and for Waikato District Council to access Watercare's expertise. Buddle Findlay assisted Waikato District Council with negotiating the long-term staged collaborative management agreement with Watercare Services.

Then there's Wellington Water, another council controlled organisation that is owned by Hutt, Porirua, Upper Hutt and Wellington City Councils, as well as South Wairarapa District Council and Greater Wellington Regional Council.

These Councils have aggregated their operations to gain economies of scale to achieve cost savings, merge expertise, and improve their resilience – benefits that individual councils could not achieve on their own. The individual councils continue to own the three waters infrastructure, set policies and control rates and user charges.

However, we suspect that the Minister was suggesting aggregation of ownership of assets and services rather than of services alone. Local government does not see mandatory aggregation of water assets as a panacea for all councils, but

rather considers that it needs to be applied on a case-by-case basis.

The upgrade of Opotiki District Council's drinking water infrastructure would support this latter view.

In its recent report on local government funding and financing (dated November 2019), the New Zealand Productivity Commission recommended that the Government consider providing financial assistance, on a principled basis as part of a broader system of assistance to local government, to help councils achieve minimum performance standards in the three waters sector.

Given the need to restart the economy following lockdown with 'shovel ready' projects, the Government seems likely to act on this recommendation and provide financial assistance to fiscally constrained communities to meet minimum health and environmental standards. However, we expect that such funding is likely to come with conditions relating to aggregation. While there is an opportunity for all local authorities to promote well advanced projects (that are in the design phase and nearing the procurement phase) as candidates for immediate acceleration and Government funding, they will need to be prepared, at the very least, for a discussion about aggregation.

The Select Committee report in relation to the Resource Management Amendment Bill, has recently been released.

The Select Committee recommended most of the changes be adopted with some minor tweaks to definitions or terminology. In other cases, the Select Committee recommended some sections should not be adopted or proposed new sections to aid clarity. The changes can generally be split into procedural and substantive changes.

Procedural changes

Under the Bill, applicants could suspend non-notified consent applications for up to 20 working days. This would sit alongside the current ability of applicants to suspend notified resource consents for up to 130 working days, depending on what other 'breaks' there have been in the process. The Bill would also enable councils to suspend statutory time periods for processing resource consent applications until fixed administration charges are paid.

For both of these changes, it is recommended the regime comes into effect three months after commencement of the Bill, to ensure councils can update their processes and procedures.

The Bill seeks to enable the Environmental Protection Authority (EPA) to take enforcement action, including intervening in cases to become the lead agency. New section 343G(3) would enable a local authority to take its own enforcement action where the EPA ceases intervention. The Select Committee has recommended clarifying that if the EPA ceases intervention, the local authority can resume any enforcement action it had commenced prior to the EPA's intervention.

Substantive changes

The most substantive change under the Bill is the introduction of a freshwater planning process that all freshwater planning instruments will have to be developed under. The intention of this is to assist councils to meet the 2025 deadline for implementing the requirements of the National Policy Statement for Freshwater

Management, which is in the process of being amended. The existing optional collaborative planning process is proposed to be repealed.

Key introductions include:

- Introduction of a Chief Freshwater Commissioner who would convene freshwater hearings panels.
- Empowering freshwater hearings panels to hear submissions and make recommendations to the relevant council on freshwater planning instruments.
- Appointment of a chairperson of freshwater hearings panels. Before appointing a chairperson, the Chief Freshwater Commissioner must consider the desirability of that chairperson having expertise on judicial processes and cross-examination.

The general process involves regional councils preparing, notifying and calling for submissions on their freshwater planning instruments. The matter would then be referred to the Chief Freshwater Commissioner to convene a freshwater hearings panel to make recommendations. Councils will make a decision based on the recommendations. Appeal rights are limited to questions of law to the High Court if the council accepts the panel's recommendations.

However, council decisions rejecting panel recommendations can be appealed to the Environment Court on merit.

The Select Committee endorsed this process at the conceptual level, with its recommendations focusing on amendments to existing definitions or new definitions for clarity (such as a new definition for 'freshwater planning instrument').

Finally, the Select Committee also recommend that statutory barriers on considering the effects of climate change under the RMA should be removed. Key changes include:

- Requiring councils and other decision-makers to have regard to emissions reduction plans and national adaptation plans published by the Minister for Climate Change when making planning documents.
- Repealing section 104E, which currently prevents decision-makers from considering effects on climate change when assessing resource consent applications to discharge greenhouse gases. These barriers will be removed from 31 December 2021 to ensure sufficient time to make policy arrangements, except that large-scale projects may be called in from the date of the Bill's commencement to enable a board or inquiry or Environment Court to consider effects on climate change.

Freshwater report

The Select Committee's report was followed closely by the recent release of the *Our Freshwater 2020* report (by the Ministry for the Environment and Statistics NZ). It is quite possible this report will also influence the amendment process as it proceeds.

On a separate but related matter, the Government has strongly hinted at further changes to the RMA to facilitate economic recovery from the Covid-19 crisis.

In short, we expect to see more developments in this area – with economic recovery amendments taking centre-stage in the immediate future. It may be that the pandemic crisis will raise more pressing issues that the Government may want to address in the RMA.

Industrial stormwater compliance – how does your site measure up?

By Steve McIntosh, Rainpro Industrial solutions.

Property owners have a legal obligation to play their part in minimising the environmental risks and adverse effects of contaminated water by taking appropriate measures to remove sediment and contamination prior to stormwater leaving their site.

Essentially, rainwater must leave a property in the same condition that it arrived.

From an environmental perspective effective stormwater management is vital to protect our waterways and the eco-systems they support. From a business standpoint, failure to be compliant is likely to result in action from regulatory bodies that could directly impact your ability to trade.

Regulations are tightening all around the country and regulatory bodies are actively targeting businesses who are breaching these regulations.

If your business is breaching regulations it is not a matter of if you will be caught, it is a matter of when.

Most councils are conducting random site audits including water quality testing and sampling. Sites found to be breaching regulations are expected to take appropriate steps to rectify the issues found within a set amount of time. Failure to develop a plan and meet these expectations in a timely manner may result in an abatement notice, and eventually lead to fines, business closure and even imprisonment.

Municipal and industrial stormwater

Municipal stormwater is typically lower in contamination and higher in flow volume than industrial stormwater.

Contamination in municipal stormwater is often light and therefore usually relatively easy to treat. Proprietary treatment systems gain compliance from independent authorities and a solution can be specified. Generally little to no post-sampling is required for regulatory bodies to determine if the stormwater treatment systems are effective.

Industrial stormwater is more complex. The range and level of contaminants for industrial stormwater is much higher and the sites themselves vary significantly. This creates a challenge for both the site owners and the regulatory bodies. Treatment needs to be specific



for the contaminants present, and regulatory bodies need to use sampling to determine if the treatment is effective.

Industrial stormwater typically comes from private facilities – light industrial, heavy industrial, manufacturing, for-profit enterprises, with higher pollutant concentrations, and a wide variation of pollutant generating sources.

This requires specific pollutant removal with a focus on fine particle TSS, metals, and with sampling and reporting required. Treatment systems for this task are designed for higher pollutant removal performance, higher pollutant loading, and lower flow rate. Treatment systems can be retrofitted to existing conveyance, aboveground – for easier access, maintenance and long-term operation.

Municipal stormwater in cities and approved developments include strip malls, parking lots, multi-family developments and have lower pollutant concentrations, predominately from roadway pollutant sources. The treatment approach focuses on large particle TSS, nutrients, and sampling is not required. Treatment systems are designed for lower pollutant removal performance and higher flow rate.

Not every industrial or municipal site will encounter the same issues, and hence there is no specific guidelines or treatment solution that will fit all sites.

Industrial sites have different pollutants to municipal stormwater testing programmes (for example, total phosphorus vs metals) and municipal treatment systems are approved on percentage removal and lower influent concentrations, not necessarily meeting benchmarks or limits.

How industrial sites can avoid a breach

It starts with developing your own BMP (best management practices) for your site. This is a critical part to your stormwater management plan required by the council.

Your site may have been an existing operation for some time with little planning made for stormwater at its inception. This may mean you need to add additional treatment measures in order to be compliant.

The best place to start is an audit of your site. This can be done by yourself or by a consultant and will be a starting point for your BMP.

You can also conduct an audit, review drainage plans and use Council GIS to understand the contours, and where your fence line ends. Then during a storm pull on your gumboots and map out the surface flows and where water ponds.

Utilise a CCTV/plumber to map the underground drainage infrastructure, the condition of pipes and depth to invert.

Consider where wastewater and stormwater can mix. If your roof water is clean, then aim to get it to the fence line without mixing with the contaminated water.

Review business operation flows, consider changes to minimise contaminant tracking or to other areas on your site. Sweep the yard and collect the contaminants when they are dry.

Consider structure. A roof will help prevent clean rainwater from being contaminated; and identify pervious and impervious surfaces or minimise traffic flow on these areas or consider treatment options for increased total suspended solids.

Centralise contaminated stormwater to fewer points to treat and thus reduce the capital cost of multiple treatment systems.

Build in a sampling programme. Get advice to be assured you won't waste time and money. Sample for the wrong things.

While having a BMP is only the first step in stormwater treatment, working through this process demonstrates your commitment to working with your local council to meet their regulations and ultimately helps ensure you are an effective custodian of our most precious resource, our water.

Efficient compressed air systems from Kaeser

As social distancing becomes the new norm Kaeser Compressors has launched two new initiatives for compressed air users.

Now more than ever businesses need to be able to rely on their equipment, says the company, and continuing to follow the OEM's (original equipment manufacturers) recommended maintenance schedule will have a large impact on their compressors' ongoing reliability.

This means allowing compressed air service technicians onsite to perform maintenance work. Kaeser Air Service technicians remained available to essential businesses and services throughout Covid-19 Alert Levels 4 and 3 that required on-site compressed air service support with preventive measures for service technicians in the field.

Kaeser introduced a contactless service to further limit physical contact between the end user and the service technician through phoning customers on arrival and departure, taking photos of equipment serviced and emailing all paperwork.



Compressed air assessment 4.0.

Electricity remains a significant cost to industry, and electrical power on average accounts for up to 90 percent of the total costs for compressed air production. With that in mind Kaeser has developed an online compressed air assessment.

Rather than a walk-through and assessment of a compressed air system in person, the end user supplies a video of their compressed air system. Kaeser then follows up with a phone call to gather further information, and through a conference call, provide recommendations and suggested next steps.

"We have developed initiatives to ensure continued support for compressed air end users, not only with the ongoing maintenance of their existing equipment, but also in optimising its efficiency and reliability," says Peter Eckberg, managing director of Kaeser Compressors NZ.

"We remain fully committed to supporting compressed air users through these unprecedented times to the best of our ability and within the scope of Government requirements."



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