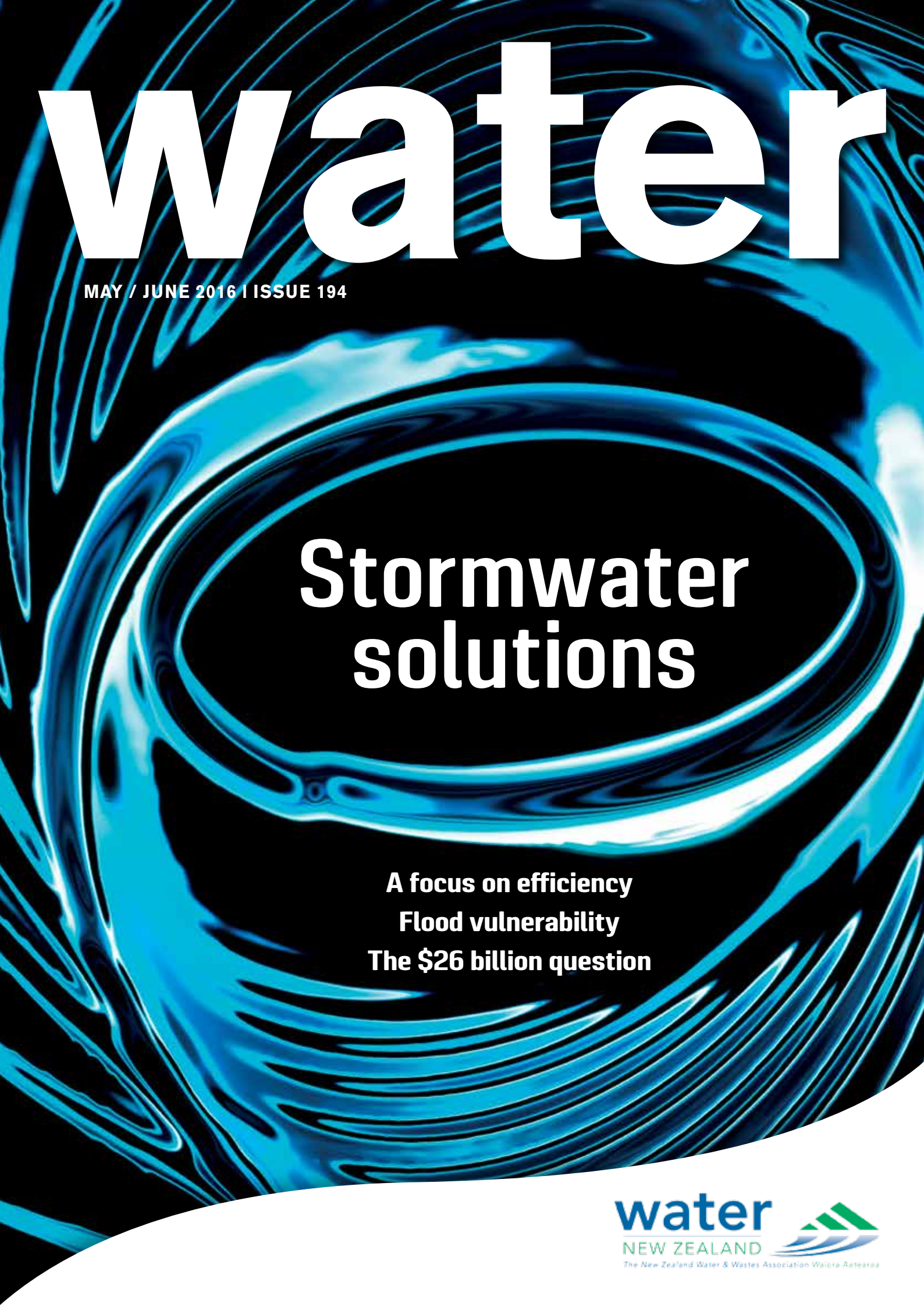
water

MAY / JUNE 2016 | ISSUE 194



Stormwater solutions

A focus on efficiency

Flood vulnerability

The $26 billion question

water NEW ZEALAND
The New Zealand Water & Wastes Association Wai ora Aotearoa

ON TOP DOWN UNDER

Deeco

DEECO SERVICES Ltd

Provider of Water Process Solutions for New Zealand since 1938

METERING

Domestic and Bulk

SENSUS

Electromagnetic Flow Meters

EUROMAG INTERNATIONAL

Automatic Meter Reading Sys-

maddalena

GSM/GPRS Data Loggers

CommCell 4

FILTRATION

Innovative Filtration Solutions

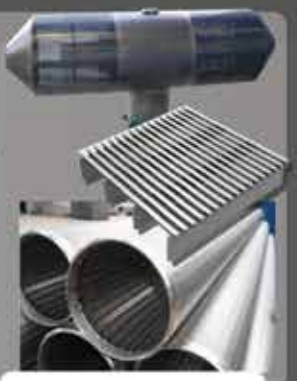
ARKAL

PILTOMAT

AMIAD

amiad WATER SYSTEMS

Vee Wire Screening Solutions



Johnson screens

VALVES

Water Control Solutions

BERMAD

Backflow Preventers

WILKINS a ZURN company

High Performance Air Valves

VENT-O-MAT

Deeco Services Ltd | Water Process Solutions
National Service & Distribution | 21 Regent Street PO, Box 33-226, Petone
Tel: 04 568 5293 | **Fax:** 04 568 5273 | service@deeco.co.nz | **www.deeco.co.nz**
Wellington | Auckland | Tauranga | Christchurch

ISSN 1179-2949 (Print)
ISSN 2382-1906 (Online)

water

Issue 194 MAY / JUNE 2016

INSIDE

FEATURES

REGULARS

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.

Navigating murky waters

Brent Manning, President, Water New Zealand

"How much do our communities really understand the issue of water quality and its measurement?"

The world of water is becoming murky (metaphorically speaking) – recently we have seen a "hikoi" marching on Parliament over their concerns about freshwater quality in New Zealand. The water hikoi received widespread coverage on the mainstream TV network channels and only a week or so later, TV One News tonight (3 April) covered general reported community concerns about water quality plus a recent report stating that "Two thirds of NZ rivers are now deemed unsafe for swimming and people are concerned intensive farming is affecting water quality and quantity".

In response, the Minister for the Environment Nick Smith stated that the expectation to clean up all rivers is unrealistic and that such a clean-up would cost "billions".

He's probably right, but it does beg the question how much do our communities really understand the issue of water quality and its measurement? And how much might "they" be prepared to pay?

Need for debate

Some years ago, Local Government (LG) produced "Know How" guides as a kind of "LG for Newbies" reference akin to the "Windows for Dummies" produced by Microsoft. In the LG publication, much was made of "having the right debate" in respect of community engagement and consultation.

I suspect a lot of townsfolk think the natural water quality decline is simply, and possibly solely, due to farm and agricultural practices and other "up-catchment" effects ie, nothing to do with "us".

It's a fact, however, that urban use of water, and runoff and wastewater discharges from towns and cities also contributes to impacted urban waterways, and the task of cleaning them up will probably ultimately fall on the local council or public water utility.

How many motorists are aware that stormwater runoff from urban roadways often contains significant quantities of metal elements and solids, as well as polycyclic aromatic hydrocarbons?

Reliable and accurate data to begin these conversations is paramount.

Competing water uses

According to Ministry for the Environment (MfE) data, we have over 450,000 kilometres of rivers and streams in this country, around 4000 lakes and over 200 known aquifer sources. Statistics New Zealand attributes 45,000 jobs in the dairy industry, 50,000 jobs in horticulture and around 110,000 jobs in tourism as being reliant on water.

There is an obvious tension between the dairy sector and its use of water versus tourism which relies in turn in a large part on our "clean green image".

At earnings of >$13.7 billion (2014-15), the dairy industry is New Zealand's single biggest primary export earner, accounting for more than 29 percent by value of the country's merchandise exports.

Then consider that tourism is one of New Zealand's biggest export industries, contributing $11.8 billion or 17.4 percent of New Zealand's foreign exchange earnings, with domestic tourism expenditure worth an additional $18.1 billion.

I recently attended a forum run by the Resource Management Law Association (RMLA) at which our changing national approach to natural and other physical hazards (in a planning sense) was discussed.

The concluding point was that, before individuals or parties become aligned on one side or another of a debate, it is most important to first get the facts out and "take a step back" (my words, not theirs) to simply discuss the issue and try to enable everyone involved to understand the physical processes that are taking place. Coastal erosion was cited as an example.

We Can

At last year's Annual Conference, motivated members of Water New Zealand initiated a new Special Interest Group (SIG) – the Water Efficiency and Conservation Network (We Can) to achieve just this. Their aim is to provide a forum for like-minded practitioners and professionals involved in water efficiency and conservation programmes.

Last month, Water New Zealand and the new SIG hosted a workshop to provide a great networking opportunity for practitioners and professionals involved in policy, delivery, communication, research and management of water efficiency and conservation programmes, with particular focus on community education and delivery.

Their task won't be easy – try, for example, explaining to an audience (even a technically minded one) a straightforward definition of the Annual Exceedance Probability (AEP) as it applies to rainfall events and forecasting future floods.

My point is we have to start somewhere, and the time is nigh. So, well done to We Can. **WNZ**

Brent Manning, *Water New Zealand President.*

PATHWAYS TO EXCELLENCE

WATER NEW ZEALAND'S ANNUAL CONFERENCE & EXPO
19-21 OCTOBER 2016, ROTORUA

The Annual Conference & Expo will again be an industry gathering not to be missed. It remains the largest and most broad-ranging conference of its kind held in New Zealand.

The annual conference provides the water industry and, in particular, association members a chance to gather together for three days to catch up with old friends and colleagues, discuss the latest developments and technologies, and debate the issues at the forefront of our sector. It is also a chance to meet new members of the industry and view new tools and technology in the largest water and wastewater trade exhibition in New Zealand.

We look forward to seeing you in Rotorua. Mark the following dates in your diary.

Key Dates:

Wednesday 29 June	Registration **OPENS**
Tuesday 19 July	Earlybird Registration **CLOSES**

Conference Theme

'Pathways to Excellence' is the theme of this year's conference. Demographically, the country faces a number of challenges. While some of our regions are facing significant growth, others have reducing populations, an increasing number of residents on fixed incomes, and aging assets. How then, do we ensure adequate service delivery at an affordable price? Our total population is less than many cities, but it is spread out, meaning that economies of scale can be difficult to achieve. How then can we all get on that pathway to excellence? How best can a larger centre assist a smaller one, and how big, or small, is best?

The conference will explore innovative ways to mitigate the range of challenges we face.

Exhibition

Expo sites are now on sale.

Held for the duration of the conference, the exhibition gives delegates and trade visitors the opportunity to meet with leading equipment manufacturers and service providers and see state-of-the-art equipment, technology and services. Over 100 companies take part and the exhibition sites at this event are extremely popular.

To view further information and to book a site visit www.waternz.org.nz.

Sponsorship Opportunities

Sponsorship opportunities are available to any member of Water New Zealand wishing to maximise their involvement at the Water New Zealand Annual Conference and Expo. There are a range of sponsorship opportunities available to suit all budgets, with benefits of investment dependent on the level of sponsorship commitment and the type of package.

If you have any queries regarding the conference please email waternz@avenues.co.nz

WATER NEW ZEALAND CONFERENCES

Stormwater Conference 2016
18 – 19 May, Nelson
For further information, visit www.waternz.org.nz or contact Amy Aldrich amy.aldrich@waternz.org.nz

Annual Conference & Expo 2016 –'Pathways to Excellence'
19 – 21 October, Rotorua Event Centre, Rotorua
For more information, visit www.waternzconference.org.nz or contact waternz@avenues.co.nz

OTHER CONFERENCES

Australian Water Association Conference 'Ozwater 2016'
9 – 13 May, Melbourne, Australia
www.awa.asn.au

IPWEA
22 – 25 June, Auckland
conferenceteam.co.nz/ipweanz2016

Singapore Water Week
10 – 14 July, Singapore
www.siww.com.sg

PWWA
9 – 12 August
Tonga

WEFTEC
24 – 28 September
New Orleans, USA
weftec.org

IWA Congress
8 – 16 October
Brisbane, Australia
iwa-network.org/event/world-water-congress-exhibition-2016/

You can view upcoming conferences and events through the News & Events / National Calendar section of our website www.waternz.org.nz.

Become a Water New Zealand Member TODAY!

Start engaging now with other members of the water industry. Keep up to date with the latest news, events and trends plus get access to event discounts, industry policies and information, and much more. Join now at www.waternz.org.nz or phone +64 4 472 8925.

Surging into a vulnerable future?

If you're a sea-front dweller, there could be a few waves of misfortune heading your way soon, courtesy of climate change impacts. That's the message from our pre-eminent science experts, the Royal Society of NZ.

A report released last month highlights the vulnerability of populations living in areas already prone to flooding due to rising sea levels. As research in this issue highlights (see page 20), high-value suburbs such as Auckland's Tamaki Drive will be adversely affected by even a moderate sea-level rise. The report notes that, dependent on how greenhouse gas emissions are handled (and time is running out to ensure they stay below critical levels), the sea would rise between 30cm and 1.1 metres before the end of the century.

This would have an exponential impact – making it likely that present one-in-100-year extreme events could occur every year in some places, giving storm surges or king tides a more devastating effect. Areas such as South Dunedin with a high water table are also more vulnerable.

James Renwick, who chairs the panel which produced the report, notes that even small changes in average conditions could be associated with more extreme weather – bringing more severe drought (thus increasing the demand for irrigation) and more intense flooding to regions already prone to those weather patterns.

The full report is available at www.royalsociety.org.nz

Fluoridation to be a health issue

The government has announced legislation that will shift responsibility for fluoridating water from local councils to district health boards.

The move will be welcomed by Local Government NZ which says fluoridation is a health issue rather than a core council responsibility and has been lobbying Central Government for a change.

The issue proved a problem for Whakatane District Council earlier this year when it first voted to discontinue fluoride treatment after public lobbying but then reversed its position just a month later. Health Minister Jonathan Coleman says fluoridation is the most effective method of preventing tooth decay – it is estimated that $1.5 million people do not have access to fluoridated water. He plans to introduce the new legislation later this year.


Irrigation Innovation Winners, Carrfields Irrigation.


Ron Cocks Award recipient Tony Banks.


Ron Cocks Award recipient Robin Murphy.

Irrigators gather in Oamaru

It's been a busy time for irrigators with most farmers winding down their systems as consented supply runs out and autumn rains kick in. There'll be no rest for the sector, however, as end-of-season maintenance and infrastructure planning gets underway. Improving your irrigation system starts now if you want to have a shot at becoming more efficient next summer.

On the national front, irrigators from across the country gathered in Oamaru last month to celebrate success in our industry and come up with solutions to some of the challenges we face. Workshop sessions included the Overseer software (nitrate leaching modelling), the new Financial Markets Conduct Act, hill country irrigation, plus measuring and monitoring data for improved performance.

Keynote speakers covered what irrigation will look like in 2050, how to sell the dream of irrigation and how farmers are dealing with irrigation's impact on nutrient use efficiency. Feedback from the more-than-400-strong crowd was very positive and Irrigation NZ is grateful to the Waitaki Irrigators' Collective for helping host such a tremendous event.

Several awards were presented during the conference to recognise industry achievement. Carrfields Irrigation was awarded IrrigationNZ's Innovation Award in association with Aqualinc for the HydroFix Irrigator Stabiliser. This innovation consists of a series of inflatable water tanks connected to a pulley and counterweight systems along the length of an irrigator, which fill during a wind event securing the machine to the ground. Independent judging panel convenor Terry Heiler said HydroFix holds wide application for New Zealand's irrigation market and was the result of solid research involving several parties.

Two New Zealand irrigation champions were recognised with the awarding of the Ron Cocks Memorial Award to Robin Murphy and Tony Banks. Tony, the former chairman of the Earnscleugh Irrigation Company, was described as an outstanding leader in delivering the benefits of water to Central Otago. Tony has given 31 years of service to the scheme; more than half his working life and all in a voluntary capacity. For much of that period, he has also been a member of the Otago Water Resource Users Group (OWRUG), a director of the Fraser Dam Company and director of the Clutha Pipeline Company which benefits Earnscleugh Irrigation Company and Contact Energy.

The joint recipient of the Ron Cocks Memorial Award is Robin Murphy. The Glenavy dairy farmer has been a driving force behind irrigation development, not only for his scheme, but for the benefit of wider South Canterbury. The long-standing chairman has championed and overseen several projects which have improved the viability and reach of the Morven Glenavy Ikawai Irrigation Scheme. He is particularly proud of the recent commissioning of the $32million Waihao Downs project which opened to much acclaim on the eve of the conference.

Two new honorary members of IrrigationNZ were announced: former board members Dan Bloomer and Ian McIndoe have each contributed more than 15 years' service . For an industry that often faces negative media coverage, the event provided a great opportunity to recognise and celebrate success in the sector.

We Can – new group's first steps

The newly formed Water Efficiency and Conservation Network (We Can) held a very successful first meeting and workshop last month in Auckland.

We Can's aim is to provide a forum for like-minded practitioners and professionals involved in water efficiency and conservation programmes – and the over-subscribed workshop did just that. The six key presentations covered a range of topics.

- Lee Bint, of BRANZ, presented on residential and commercial building water use, the biggest water problems and opportunities for alternative water sources in New Zealand.
- Sally Fraser, the Smart Water co-ordinator for Hamilton City, Waikato and Waipa Districts outlined a simple and affordable schools' poster project that has had very good educational and community outcomes for limited time input.
- Roseline Klein, Sustainability manager for Watercare, presented findings of a recent modelling study exploring rainwater tanks as a water source for Auckland.
- Bruce Franks, of Datacol, overviewed the different entities using data-collection technologies to improve water and energy use efficiency.
- Christine McCormack, from MWH, outlined an end-use approach for modelling water demands and forecasting the potential impact of water demand management initiatives.
- Renée Coutts, demand management officer from Waipa District Council, shared the quirky communication style Waipa takes to water demand management over summer.

The We Can committee were thrilled with the level of attendance and engaged discussions. This marks a milestone towards a co-ordinated approach to water efficiency, water conservation and water demand management. More information on the WNZ website.

New intern at Water New Zealand

Hi there. I am Zac, an intern working at Water New Zealand after finishing my Master of Engineering Studies from Auckland University with First Class Honours. The technical staff here are a dedicated and energetic team assisting me to grow as a team member, innovative problem solver and giving me exposure to a range of 3 waters projects. Currently, I am working on collating data from the National Performance Review and updating the New Zealand Wastewater Treatment Plants Inventory, a job requiring much attention to detail. My experience to date has given me a strong interest and determination to build a professional career in the 3 waters.

If you are hunting for an enthusiastic and devoted young professional to join your team, please contact me at 0226763377 or E-mail at zhenqianxi@gmail.com. I'm looking forward to contributing to the New Zealand water sector.

Research plugs water knowledge gap

Can you imagine your home with no water for one week? Do you just expect water to keep on being available to you in unlimited quantities?

Most people do, and that is because there is a significant and important lack of awareness about water use in the home and, industry-wide, a knowledge gap about residential water use.

Nine New Zealand centres already have residential water metering and volumetric charging in place. However, only two of those have investigated how water is used within the home (Auckland and Kapiti Coast). This has informed charging mechanism and consumer-targeted publications and advice. These studies have provided a baseline for New Zealand literature on residential water use and are highly valued by consumers as well as the building and water industries.

Now, a two-year project investigating water use in a representative sample of households aims to plug the knowledge gap. Funded by the Building Research Levy, it will develop robust figures so the building and water industry can:

- Understand how, when and where water is used – end-use, outdoor and peak water use;
- Explore the influence of demographic and climate variations on patterns of use;
- Investigate where and what water efficiency opportunities exist;
- Engage with councils, service providers and consumers;
- Support engineering calculations, models and forecasts;
- Enable informed discussions on water metering and demand management;
- Provide regional benchmarks for residential per capita consumption;
- Understand just how water conscious New Zealand actually is; and
- Raise awareness of how water is used at home.

Water service providers will be approached over the next few months to discuss collaboration in this work. However, other feedback, questions and suggestions of involvement is invited now.

For more information, please contact Dr Lee Bint of BRANZ: Lee.Bint@branz.co.nz

Welcome to the second issue of WATER for 2016.

WATER is published five times a year, and we welcome contributions of technical and general news items across the spectrum of the water and wastes industry on the following areas:

- Policy and legislation
- Water quality demand management
- Wastewater
- Project news
- Modelling
- Stormwater
- International Training
- Trade waste
- Industry news and Technical topics/papers

The next issue of 'WATER' will be published in July, the themes are Innovation in Wastewater, Mobile Technology and Trade and Industrial Waste.

For all advertising contact Noeline Strange on Ph: +64 9 528 8009; M: 027 207 6511 E: n.strange@xtra.co.nz

The deadline for the July issue of Water is Monday 27 June.

To view the themes for 2016 visit: www.waternz.org.nz

Clean water for Winston victims

The Waves For Water charitable organisation is helping with disaster relief in Fiji by providing clean water systems. After Cyclone Winston hit the island in February, leaving tens of thousands homeless, the company teamed up with Australia-based wastewater treatment specialist For Earth to provide 20L buckets that are fitted with filters to provide drinkable water.

Aid workers have warned that potential outbreaks of viruses carried by mosquitoes could further devastate the nation, with dirty stagnant water remaining in many areas. Waves for Water executive director, Christian Troy is spearheading the effort transporting water filtration supplies to the affected areas. The filters are supplied by Waves for Water and funded by donations from the public and private enterprises. If you wish to get onboard and donate please visit www.wavesforwater.org

Buckets full of relief - Harley Sofield, general manager For Earth and Christian Troy executive director from Waves for Water.

How best to value water?

Protest over the water consent that will give a bottled watered company free access to a local aquifer in drought-prone Ashburton has pushed the issue of how water is valued into public prominence.

The consent, which allows NZ Pure Blue to extract 40 billion litres of pure artesian water over 30 years as part of its lot purchase in the Ashburton Business Estate, prompted a local "bung the bore" petition and well-attended protest rally. Those opposing the lot sale argue that a private company should not be able to profit from a scarce public resource that it is getting for free.

That has prompted wider discussion as to why the creation of a tax or charge on water use is not part of the freshwater management reform process. Proponents of such a charge say that putting a price on water does not imply ownership but it does create an environment in which water use is better regulated and therefore more efficient.

Also heating up is the discussion of water "ownership" with right-wing think tank NZ Centre for Political Research running full-page ads in local newspapers asking whether 'one race' should control freshwater and urging people to make submissions to the "next steps" water reform which recognises Iwi rights in freshwater management.

Submissions to the reform process closed on Friday 22 April.

Tapping in to water news

Asian water shortage warning

A new study warns that the populous and fast growing areas of India and China could face a high risk of severe water stress within three decades. Senior research scientists at the Massachusetts Institute of Technology say climate change impacts will exacerbate the pressures of both economic and population growth and, unless mitigated, will lead to an extra 1 billion people facing severe water stress by 2050.

Papuans lack clean water

The majority of people living in Indonesia's Papua region lack access to clean water – making the region worse off than the country's national average. The Head of Human Settlement and Clean Water at the Papua Public Works office says that just 29 per cent of the local population can access clean water. Regional government failure to prepare technical plans on clean water services for Central Government has been implicated.

Sanitising water with solar power

Clean tech company Watly marked UN Water Day last month by launching a campaign to crowd-fund the next development stage of its award-winning solar technology. The Watly 3.0 thermodynamic computer uses solar energy to sanitise over 5000 litres of water a day as well as generating power and connectivity. Its development follows the successful trial of its Watly 2.0 model in Ghana.

Water equals work says report

An estimated three out of four jobs making up the global workforce are either heavily or moderately dependent on water, says the latest edition of the World Water Development Report. It notes that 1.5 billion people are employed in eight water and natural resource-dependent industries and that water and jobs are inextricably linked. While water shortages could limit growth and reduce work, the opposite is also true. The report estimates that investment in small-scale projects providing access to safe water in Africa could offer an estimated annual economic return of about US$28.4 billion – or nearly five per cent of that continent's GDP.

Damming Asian drought

With much of Southeast Asia suffering severe drought, China has started releasing water from one of its Mekong River dams to help alleviate conditions that have been blamed on El Nino weather patterns. But critics say the 10 hydroelectric dams built on the Mekong over the past decade have served to worsen the region's water and environmental problems.

New market for water in UK

In just a year's time, the world's biggest retail market for water will open for business in the UK – allowing 1.2 million eligible customers (business, charities or public sector) to choose who supplies their water and wastewater services.

The ability to switch water and wastewater retailer means business customers can negotiate a package that best suits their needs – or by applying for a licence, they can also choose to supply themselves with retail services.

The Water Act 2014 established the market framework for a change that will bring new competition into what has largely been the territory of monopoly suppliers. It's expected to deliver an estimated £200 million of overall benefits to customers and the UK economy. More information at www.open-water.org.uk

Sustainable drainage to reduce London's flood risk

The rooftops on London's South Bank are going green as part of a comprehensive new sustainable drainage scheme designed to reduce impact on the city's existing stormwater and sewerage systems.

The Nine Elms project is the outcome of a partnership between Thames Water and the Nine Elms Vauxhall Partnership which includes local councils, the Greater London Authority and local developers. It will see rainfall landing on an area equivalent to 20 football pitches draining into the Thames River rather than into the local sewerage network.

The £14m scheme is part of a major regeneration programme in the area and involves developers incorporating design features such as green roofs, swales and rainwater gardens to generally slow and reduce the volume of rainwater before it goes into a new surface water network that drains directly back into the Thames.

Aid for infrastructure management

Central government is responsible for more than $116b of social infrastructure assets and local authorities have more than $100b of community assets on their balance sheets. Maintaining and improving these assets requires billions of dollars of investment every year, which makes it vitally important that they are fit-for-purpose, managed, and replaced in the optimum way.

Work has been progressing at pace on developing a suite of five proposed metadata standards for 3-waters (storm, waste and potable water) and buildings (residential and light commercial). Land Information New Zealand (LINZ), Ministry of Business, Innovation and Employment (MBIE) and the Opus-led project team (comprising of Opus, Morrison Low and GISSA) have been engaging with key stakeholder representatives from industry, local and central government to develop content and structure of the proposed standards.

The standards will provide the infrastructure data guidance required by public sector agencies to improve the efficiency of asset management decision-making and maximise the contribution that 3-waters and buildings make to the economy. Accordingly, the standard will benefit any 3-waters asset manager who utilises data for analytics to inform funding and investment priorities; research and research investment; policy development and national, regional or local reforms; national, regional or local reporting and benchmarking; shared services and inter-organisational collaborations.

Both the Water Asset Governance Group and Building Housing Asset Governance Group engaged in investment logic mapping workshops in February. The outcome of these workshops was a detailed investment logic map that identified the major problems both investment areas will need to address in the future. The maps will be used in the Better Business Cases for the proposed standards.

Work is also underway to develop content for the proposed standards with technical working group members. The group is made up of stakeholder representatives from industry, local and central government. Members have been working collaboratively in workshops to detail asset schema, attribute categories and measures. To date, work has begun on as-constructed, asset condition and performance, and financial performance and level of service schema. Future workshops will focus on risk, criticality, resilience, operational and maintenance works and costs, utilisation, and demand. Material developed in these workshops is being bought together and further tested with members with a collaborative workspace being utilised to facilitate discussions outside of workshops.

CCO for Waikato?

Waipa District Council has formally agreed to consider a ratepayer-owned company to manage its water operations – but the council's support is still subject to negotiators getting the best deal for ratepayers plus full public consultation.

The Council is in discussion with Hamilton City and Waikato District Councils over forming a joint council-controlled organisation (CCO) to manage water infrastructure. That follows an independent report by consultants Cranleigh which said a CCO would save around $107 million across the three councils over 10 years as well as driving better drinking water and environmental standards – and a stronger regional waters network. Consultation on any formal proposal is unlikely to happen before 2017 – and only if the newly elected council members opted to proceed.

Water New Zealand steps up

In an ambitious new strategy announced on World Water Day, WNZ has set itself some key goals. These are:

- In three years there is a consistent approach across the 3 Waters sector; and
- In five years, WNZ is the national spokesperson and standard setter on water issues.

The organisation plans to deliver these goals through a reinvigorated environment for collegial learning across the sector and leadership in technical excellence; an increased effort on relationship building across the sector to facilitate collaboration; advocacy and promotion of New Zealand best practice; and leadership in 'joining up' the water sector.

Global recognition for Canterbury project

It had to adjust to Christchurch's post-earthquake world, features construction of this country's first municipal solar air-drying hall and is described as a "shining example of triumph through flexibility in the wake of a natural calamity".

The East Selwyn Sewerage Scheme also made it to the finals of this year's Global Water Awards which recognise excellence in the water industry. It was up against some stiff competition from projects in Mexico, Hong Kong and Abu Dhabi in the "Wastewater Project of the Year" category.

The project involved redevelopment of a wastewater treatment plant by adding a sludge gravity thickener, an aerobic digest, a dewatering plant and a solar drying hall. The Selwyn District Council appointed MWH Global to do the work and by early last year, the plant was operating at full capacity. The 2011 quake forced a redraft of the schematics and the team had to overcome a scarcity of structural engineering resources – and maintain its schedule through an environment of major aftershocks.

A key part of meeting project budgets involved the use of renewable energy in the sludge treatment process – its solar drying hall removes about 70 per cent of moisture in the sludge.

At the Awards evening in Abu Dhabi on April 19th, it missed out on the winning place – but even making such prestigious finals is another accolade for a project that has also been recognised in New Zealand. Among other plaudits, a paper outlining the project by Rainer Hoffman (MWH), Stuart Hildreth and Christopher Salkeld (Sicon Ferguson) earned the Ronald Hicks Memorial Award at last year's Water New Zealand conference.

East Selwyn Sewerage Scheme: the solar drying hall.

Put a price on water, speed up reform

Water quality reform needs to be addressed with greater urgency – and a price put on freshwater takes, according to submitters to the "next steps" freshwater management reform programme.

In her submission, the Parliamentary Commissioner for the Environment Jan Wright says that "sooner or later, New Zealanders must have a serious discussion about water pricing". While payment is often muddled with issues of ownership or water pricing confused with paying for the infrastructure that delivers water, she says it makes "economic sense" to price water in catchments where it is scarce or is being used as an input to production.

The Environmental Defence Society (EDS) goes a bit further. In its submission it says it wants a charge put on freshwater takes with revenue from that charge going into the Freshwater Improvement Fund. PCE Jan Wright would also like to see water revenue directed to improving water quality. "After all, over-allocation of freshwater concentrates pollutants by reducing river flows and lowering lake levels".

The EDS is also concerned that the reform process lacks both urgency and speed.

"[It] lacks the commitment to change required for degradation of New Zealand waterways to be halted. Limits and targets for water quality and quantity need to be set and need to be set fast."

Cost overspill on dam

The deadline for farmer signup to the Ruataniwha water storage project passed without comment last month as concerns over the project's soaring costs hit the headlines and prompted calls for it to be abandoned.

The Hawke's Bay regional council's investment arm, HBRIC, must have contracts in place for 45 million cubic metres a year to be taken from the scheme before the council will invest $80 million of ratepayers' money into the $333m project. The signup deadline was April 18 but (at time of publication) HBRIC had not yet released any information as to whether its target had been met.

A Council-commissioned report had earlier shown that the dam's construction costs had jumped by nearly $100m to $333m while the amount farmers are expected to invest has soared $200m to a $556m total. Some of the latter was attributed to higher on-site irrigation costs associated with higher profitability ventures such as apple growing or viticulture. However, experts in both pipfruit and viticulture have publicly questioned the region's viability for such ventures.

The regional council has already put $16m into the project and the Green Party joined calls from locals opposed to the scheme that enough is enough – however bodies such as Irrigation NZ are confident it should proceed with chairwoman Nicky Hislop citing the multiple benefits of large water storage projects.

If the project does go ahead, the Council-commissioned Butcher report predicts economic activity around the dam will create 3500 jobs and contribute $380 million to Hawke's Bay GDP.

LEE BINT

A focus on water efficiency

At a time when the question of who uses how much water is gaining a higher public profile, Lee Bint talks to **Vicki Jayne** about her focus on research that is designed to improve water efficiency.

One of the "nerdy" things Lee Bint did as a youngster was create 3D cardboard building models using pre-drawn plans from a local building company – so it's maybe not surprising her career path led her into building science which, in turn, led to a focus on water efficiency.

It was, she notes, a knowledge gap waiting to be filled. That her doctoral studies focused on water efficiency was, in part, because very little research had been done in the area. And that, she says, is symptomatic of New Zealanders' laissez-faire attitude toward water use.

"There is such a lack of awareness. Everybody seems to think we have lots of water – but then there are droughts and water contamination... In my research for BRANZ, I talk to a lot of people and to councils who are exploring water metering options.

"Some people think water should be free for all and don't want to have a conversation about metering. Then there are those like me who say, so how much are you using and how much impact are you having on the environment? How do you know if you are not actually measuring it?

"We understand the impact of switching on a light – but what about the impact of leaving the tap running while you clean your teeth? There is a huge amount of awareness to be raised."

As part of her doctoral studies, she pioneered a Water Efficiency Rating Tool (WERT) and in her role as Sustainable Building Scientist at BRANZ, Lee has spent the last couple of years undertaking a feasibility study on the use of rainwater and greywater in urban environments.

Her research focus has now turned toward residential water use.

"As part of the project, we're working with councils and water service providers to install water meters on sample buildings to understand how water is being used. The next step would be to look at efficiency options and then alternative water sources (such as rainwater catchment). So this is the first step in a wider programme of potential water research."

Lee is also on the newly established Water Efficiency and Conservation Network (We Can). Set up under the umbrella of Water New Zealand, We Can provides a forum for water demand practitioners to share existing knowledge, look where it needs to be extended, facilitate capabilities and help establish practice standards for water efficiency and conservation.

She was a key presenter at the group's first (fully subscribed) get together in Auckland last month and thinks the level of interest at its inaugural event marks a positive move toward lifting awareness.

"It's really a first step towards a more coordinated approach and involves those interested in water efficiency and conservation coming together for the first time. So, yes, awareness is definitely picking up."

Water efficiency is not her sole strand of research – Lee is also deeply involved in mapping out potential career paths within the construction and infrastructure industry so that both school leavers and those already in the industry are aware of their options.

In many ways, it's a natural development from her 2013 nomination into the Sustainable Building Council's future leadership programme (FLP).

"As a cohort, we were tasked with understanding how business can support youth into employment. Because we have one of highest youth unemployment rates in the OECD, it was a matter of taking it on as a business issue.

"In terms of the construction and infrastructure industry, we need to look at where we are at and how can we best attract and retain skills. We have created a map of all the roles that exist and how people get between them – to give clear lines of sight from high school right through to CEO."

That career mapping project is still being developed.

"We're now in discussion with a second party about digitising the map and turning it into an online interactive tool for a range of people – from school leavers to career advisers or those already in the industry – to use."

There's a personal element in the project. Her own path to a PhD was hardly typical. Her innovative bent was primarily fostered by out-of-school

activities and an academic career was not in her sights at all during secondary school years.

A rural background contributed to her practical bent – and then there were the building models.

"Mum and I used to go to GJ Gardner for their pre-drawn plans. We would cut them up, put them how we wanted and build cardboard models where you could take the roof off."

An enthusiastic sports person, she applied more energy to playing representative basketball and netball than to academic pursuits and left school at the end of the fifth form, picking up casual work and doing a bit of travelling.

"I worked in a fish factory, did fruit picking – seasonal stuff."

Then, at 19, she decided this was not what she wanted to do for the rest of her life. So she enrolled in a diploma of construction technology at WelTec with an architecture degree in mind. Instead, she was convinced by one of her lecturers to go into the Building Science Programme.

That led to a Bachelors degree, then honours and then the doctorate. In retrospect, Lee appreciates the value of the years away from school.

"It really solidified what I was interested in – and what I didn't want to do. I think a lot of students fluff around in their first university year. Some fail before they find a direction."

The fact that her partner's family came from an academic background helped her realise what options were available – which is why she wants to ensure others just starting their career track can more clearly see what is on offer.

Her studies helped hone her own solutions-oriented approach. That led to the creation of the WERT which earned a Wellington Regional Council Award through the Bright Ideas Challenge. Following completion of Grow Wellington's "Activate" business course, she launched the Water & Resource Innovation (WARI) as a start-up company to build on her water efficiency work, and to develop the WERT further.

At the moment, it's taking a back seat to her BRANZ role, says Lee.

"I do have a long-term vision for WARI. Eventually, there will be some software development around it."

Meanwhile, Lee's profile within the water industry is on the rise and her We Can involvement is only part of that. Last year, she picked up the Mott MacDonald Poster of the Year award for her *Commercial Rainwater & Greywater Feasibility: preliminary findings* at Water New Zealand's annual conference. It's actually the third time she's won that particular award.

"I wasn't expecting to win – but it's great to know that my communications strategy is getting the message across."

Communication is a large part of her current role – including regular articles in the BRANZ magazine.

"I enjoy the variety of what I'm doing – and working in an organisation that really promotes stakeholder engagement. I love the research aspect, but I really love getting out and talking to people and taking a project from the strategy aspect to actually creating an impact in the industry. It's great to follow through and ensure it is a worthwhile piece of work."

In terms of future development, she is particularly interested in sustainable enterprise – and how sustainability can best be incorporated in a 'business-as-usual' framework (as well as driving New Zealand to become a water conscious country!).

"As a follow through from the Future Leaders Programme, I now get to sit on the advisory board for the Sustainable Business Council along with the CEOs of some big companies, representing the voice of the Future Leaders alumni. That's a real eye opener and a huge opportunity for personal development."

There is little doubt that her focus on the most efficient use of water will form a big part of a more sustainable building future. **WNZ**

Precious.

Excelling in the provision of electronic data capture systems, meter reading technologies and accurate metering solutions. Ensuring the sustainability of our most important resource.

Because Every Drop is Precious.

www.adriley.co.nz

Arthur D. Riley & Co. Ltd.

fieldsmart technology

Auckland: (09) 444 2350
Wellington: (04) 472 7614
Christchurch: (03) 379 2628

Swale servicing an industrial yard.

Quality solutions for small systems

Cameron Mars puts the focus on small-scale stormwater treatment options – and asks if they are as good as they could be

The treatment of stormwater run-off is a prescribed requirement for many small developments within New Zealand cities. However, questions need to be asked as to whether the correct treatment technologies are always being employed.

Should we be looking at greener solutions and are councils requiring water quality issues associated with such developments to be adequately addressed? Many small residential, commercial or industrial developments do not have the luxury of being serviced by downstream treatment facilities, nor do they have large available land areas within which treatment facilities can be sited. It is these smaller developments that are the focus of this article.

Generally, larger subdivisions are required to adopt a treatment train approach involving primary (pollutant trap), secondary and potentially tertiary treatment. In contrast, smaller developments usually have the option of utilising primary pollutant traps or filter devices as the only means of treatment and such systems are generally accepted and approved by councils I have had experience with.

However, it could be argued that primary treatment, as the only means, is not acceptable (for new developments) and that more stringent measures should be enforced. It could also be argued that this can be achieved at minimal additional cost to the developer by using sound engineering design judgement at the start of the project and making the best use of landscaping.

Multiple stormwater treatment technologies are available to the design engineer such as “natural” or “green” systems that rely on plant and soil removal mechanisms, proprietary “off-the-shelf” devices utilising gravitational settling or cartridge filtration and proprietary package plant bio-filtration systems.

Selection of a treatment technology will, to a large extent, be determined by factors such as site constraints, land use, land availability, maintenance requirements and capital expenditure (to name but a few).

However, too often the treatment outcome of each device is overlooked. Given that many developments fall

under various council global consents, little in the way of an assessment of environmental effects is required. While some councils are enforcing treatment, there appears to be little to no incentive to install devices with potentially high treatment outcomes, resulting in the installation of devices (at some sites) that only provide the bare minimum or even lesser contaminant removal.

Ease or effectiveness?

On the whole, the realm of stormwater treatment falls within the civil and environmental engineering professions. However, suppliers, developers, drainlayers, structural engineers and architects can also make recommendations and do have opinions. Of these professions, how many have the science or technology backgrounds to define the nature of potential contaminants, the treatment mechanism and the likely treatment outcome?

Therefore, is there not a tendency amongst some professions to design or select treatment systems based on ease of installation (eg, package systems) and hydraulic requirements, rather than the actual treatment effectiveness?

The installation of proprietary (filter cartridge or gravity settling) primary treatment systems is common – due to their design simplicity, small size, perceived cost, ease of installation, hydraulic performance or simply due to familiarisation (past experience) with a certain device. When comparing the varying proprietary filters available and their treatment outcomes, it is not a case of comparing apples with apples because many use different media, have differing design/operating principles and hydraulic requirements.

Whilst manufacturers' literature generally states high TSS removal, often around the 80 percent realm, very rarely are Biochemical Oxygen Demand (BOD), pH, pathogen, nutrient and heavy metal efficiencies stated. Field evaluation studies from within New Zealand and overseas suggest a less simplistic picture when considering proprietary device removal efficiencies, with treatment outcomes being dependent on site rainfall and contaminant loadings, with removal rates ranging from negative (contaminant export) values up to 80 percent (usually less) for TSS, depending on device selection and the design sizing. Some devices have poor to no copper or zinc removal, whilst others provide "acceptable" removal ranges.

While off-the-shelf primary treatment devices are an easy option for many sites, they must be installed with sound engineering knowledge and judgement based on the known rainfall patterns, land use and expected contaminant concentrations. It could be questioned whether this due diligence is lacking in many instances.

Secondary considerations

That said, this article is not against the use of proprietary devices. They are an important part of the treatment train – but consideration does need to be given to their standalone benefit and whether secondary treatment should also be employed within new developments. The exception to this would be existing, already developed, inner city sites and roading infrastructure, from a time before treatment was a requirement. The proprietary devices are a good retrofit and will remove gross pollutants and potentially some heavy metals which, in a nutshell, is better than no treatment. However, when considering new developments should not more be expected (with the changing environmental times) and could a combination of proprietary systems and/or "green" landscaped treatment technologies provide a higher level of contaminant removal, without utilising excessive land area?

Design, build and operational capital expenditure is an interesting factor and often misleading. While proprietary devices are marketed as being cost effective, this is a point that could be debated (not in this article, however). When considering "green" systems, rain gardens are generally considered to be at the higher end of the cost scale, given they can be around $1000 per square metre. However, when the fact that around 10 percent of a development area is usually set aside for landscaping is taken into account, the effective rain garden detention capacity coupled with a reduction and lag in post-development peak flow rates (effectively reducing detention requirements), the capital expenditure becomes less inhibitive as well as providing a visually pleasing amenity.

The green edge

The treatment outcome of rain gardens and other such systems needs to be considered; a well designed and constructed rain garden will provide not only solids removal but also a reduction in BOD, heavy metals, nutrients, pathogens and pH stabilisation, within a sustainable system in which plant uptake is also a factor.

Rain garden servicing a residential unit development.

Many of the "green" treatment solutions utilising plant and soil removal mechanisms have flexible design constraints that can be adjusted to match hydraulic requirements and can reduce the need for piped reticulation.

Another advantage with "green" systems is that they can alleviate the issues around varying flow and contaminant concentrations that are prohibitive for some proprietary devices, thereby operating as standalone systems or alongside a pollutant trap or cartridge filter. Rain gardens are designed with a standing water volume, effectively storing variable inflows on the surface prior to infiltration and unless poorly designed or maintained, will restrict contaminant export.

Swales as a standalone feature can incorporate bio-retention, with an adequately designed outlet and planting to reduce contaminant export, or swales can be designed in tandem with a proprietary device allowing for primary treatment or polishing prior to discharge. Only swales and rain gardens have been discussed, however small vegetated soakage basins and many other engineered solutions are also viable options.

The maintenance factor

Whilst the selection of a treatment device (or devices) is an important consideration, so is the maintenance requirement. Without ongoing maintenance, treatment outcomes may be significantly impaired and contaminant export could result in higher loadings discharging from a system. This is an area in which I believe far more council input is required.

Two options are available; either (1) council maintains the treatment systems and passes the cost on to the site proprietor; or (2) the proprietor is responsible for maintenance. Many councils have opted for the second approach; however, enforcement of maintenance is necessary and it is in this realm that councils are yet to provide assistance or take responsibility.

Councils could have a register of treatment devices and could notify proprietors when maintenance is due and request notification from an accredited supplier or maintenance provider that the work is complete.

To date, this has been ignored by many councils and considered cost prohibitive both in time and manpower. However, there is little point in installing treatment systems if they are not maintained. Such systems could even potentially have an adverse effect on the environment they were originally designed to protect (periodic high discharge loadings due to contaminant export).

Some proprietary suppliers are aware of this issue and are including a short-term maintenance package within their cost estimates. However, this is not solving the longer-term issue. If maintenance is a foreseeable concern, green systems could be the more viable option, as swales tend to be mowed and litter picked up with little cost, whereas rain gardens require care of vegetation and removal of litter. However, low maintenance hardy plant species can be used.

Green landscaped stormwater treatment devices are visible and therefore more likely to be maintained. Furthermore, poor or no maintenance will eventually lead to treatment system failure; this will generally be visibly evident within green systems, while, in contrast, underground contained proprietary devices will allow inflows to bypass.

Overall, many councils are taking steps to ensure cleaner waterways via the treatment of stormwater discharges from small development sites. However, the approach needs to be clearer and firmer with regards to acceptable treatment standards and should incorporate more "green" bio-filtration systems working alone or in tandem with proprietary pollutant traps and cartridge filter devices, rather than the latter being used as the sole device.

Suppliers are providing package plant bio-filtration technologies, which appear to be good systems incorporating plant and soils attenuation and require limited land availability. However, these systems, as with all others, also have the issue of maintenance, and this is an issue that will be ongoing unless councils stop placing the emphasis solely on the developer or proprietor and take some responsibility.

The engineering community needs to take responsibility for providing adequate treatment designs and this requires a collaborative approach between the civil and environmental professions to ensure acceptable treatment outcomes are provided within a realistic design and civil engineered platform.

Councils also need to provide a clear and firm guideline or standard for minimum expectation. Within New Zealand, there are well designed and functioning stormwater treatment systems which are a credit to the engineering community and the associated developers. But not all treatment systems achieve the same high standard. **WNZ**

Runoff: rules plus reason

Why attenuate, retain or detain?

When it comes to mitigating stormwater runoff, the real purpose risks being lost in rules and their application, says Angela Pratt, senior environmental engineer at Beca.

Urban development typically increases imperviousness, resulting in hydrological and environmental effects, particularly increased volumes and rates of runoff. Governments and local authorities nationally and internationally recognise this and have for some time addressed these effects by requiring stormwater attenuation, detention or retention, usually specified through development rules and technical guidelines. The standards vary across these authorities, as do the specific effects that they need to address, and sometimes the real purpose gets lost in the rules and their application.

This article briefly describes "attenuation" and the various types of council standards, as well as suggesting how we can better address the full range of effects of urban development.

- An increase in stormwater volume and flow rate as a result of development can have a range of effects including:
- Increases in flood risk to downstream infrastructure due to increased peak flow rate or volume in larger storms;
- Increased stream erosion as a result of more frequent storms and increased discharge volumes;
- Effects on stream ecology eg, increased sediment discharges, reductions in base flows, as well as changes to habitat resulting from erosion or flow increases;
- Reduced groundwater recharge.

Achieving hydrological neutrality

To manage some of these effects, authorities often require new developments to achieve "hydrological neutrality", although their guidelines often then apply a narrower interpretation than true neutrality, which would require no change in discharge volume or peak flow rate in all events, of all durations.

Hydrological neutrality is generally achieved by providing some form of stormwater storage (attenuation/detention/retention) and by controlling the discharge rate from that storage system by way of an orifice or weir, or by the discharging of some runoff to ground. The following are examples of council standards that have a narrower interpretation:

- Whangarei District Council – "… attenuation of the developed peak flow from the developed portion of the site to be limited to 80 percent of the pre-developed flow for the design events." (80 percent required as there are often existing flooding issues and potential cumulative effects) (WDC, 2010).
- Tauranga City (Papamoa East) – "Development … shall provide storage equal to the difference in runoff volume between the undeveloped and developed state for a 100-year ARI 48-hour rainfall event." (Consent 63636)
- Porirua and Upper Hutt City Councils – For any new development "Retention or attenuation/detention facilites … shall be designed to limit the design peak discharge from the development (post-construction) to no greater than the existing peak discharge (pre-development) already entering the public network, for a 1-in-10 year, 20-minute duration storm." (CISL, 2012)
- Christchurch City Council – "All detention facilities upstream of the Cashmere Stream/Heathcote River confluence should be sized for the 36-hour, two percent AEP design storm event." (CCC, 2003)

Broken run detention infiltration.

- Dunedin City Council – "Stormwater systems shall be provided so that any new development results in an insignificant increase in runoff into the receiving body up to the 1-in-10 year event wherever possible, or, if not possible, results in a minimal increase for which adverse effects are no more than minor." (DCC, 2010)

The above standards only seek to mitigate peak flow increases, not volume increases (although the Papamoa requirement is volume-related) and are aimed at managing primary system capacity and flood risk.

None robustly address more frequent nuisance flooding, and none address ecological, base flow or groundwater effects.

The Auckland Region started to address stream erosion with TP10 (ARC, 2003), which introduced extended detention for runoff from 34.5mm of rainfall. Extended detention (with runoff discharged slowly over 24 hours or more) is a significantly different form of attenuation/detention to the traditional methods for flood peak flow management.

More recently, Auckland City Council's new Land and Water Regional Plan goes further, requiring that in certain parts of the city Stormwater Management Areas (SMAF), new developments must provide detention (temporary storage) with a volume equal to the runoff volume from the 90th (SMAF1) or 95th (SMAF2) percentile, 24-hour rainfall event, as well as provide retention (volume reduction) of a 10mm (SMAF1) or 8mm (SMAF2), 24-hour rainfall event.

"However, in working to the rules, understanding of the basis behind the rules and what they are there for can be missed, compromising the environmental outcomes."

This more modern standard recognises volume increases in addition to peak flow increases, and also the return of some of the rainfall on impervious surfaces to the ground (retention / soakage). This potentially assists in maintaining stream base flow.

When designing stormwater attenuation, there is a strong tendency to design strictly in accordance with the rules in order to obtain a discharge consent or council approval, without necessarily considering the real effects of development on the hydrological cycle and the receiving environment.

However, in working to the rules, understanding of the basis behind the rules and what they are there for can be missed, compromising the environmental outcomes.

Wider implications

The following are some matters to consider when designing a development, or when writing rules for stormwater management:

- Will increased runoff volume coupled with flow peak attenuation cause increased coincidence of peaks from different subcatchments? It may be that the post-development peak from a subcatchment needs to be set lower than the pre-development peak.
- Will increased frequency and volume of runoff result in increased energy expended on the downstream waterways, increasing erosion? This might need retention/soakage

and extended detention, plus peak-flow attenuation throughout the full range of storm events. Channel form downstream (eg, a small permanent channel with a wide floodplain) can also assist in addressing erosion risk.

- Will increased impervious area and reduced discharge to ground result in reduced stream base flow, affecting stream ecology? Some form of retention and discharge to ground is likely needed.
- Understanding these implications is an important aspect of effects mitigation that is sometimes not explicitly or easily addressed by following council guidelines. So how do we make sure that the full range of potential effects is mitigated?

The best way to understand and mitigate the effects would be a wider catchment analysis involving the following:

- Understanding the full hydrological cycle for the catchment, from base flows through frequent storms to major floods. Identify (perhaps through continuous times series modelling) how development would change flows in each part of that cycle.
- When looking at flood effects, don't forget to consider cumulative effects of multiple developments, and also more frequent nuisance flooding as well as the more extreme events.
- Understand shallow groundwater and how this might be affected by increased imperviousness, or conversely by localised retention and soakage (which might affect land stability in steeper areas).
- Understand the stream environment, including instream and riparian ecology, and also erosion potential at a range of locations in the catchment (downstream of the development).

This helps to define what mitigation measures are needed, whether that be peak flow attenuation, extended detention, retention and soakage, or a combination of these. **WNZ**

References

Auckland Regional Council (ARC) (2003) Technical Publication 10 (TP10) Design Guideline Manual Stormwater Treatment Devices.

Christchurch City Council (CCC) (2003) Waterways, Wetlands and Drainage Guide, Part B, amended May 2012.

Dunedin City Council (DCC) (2010), Dunedin Code of Subdivision and Development, August 2010.

Whangarei District Council (2010), Environmental Engineering Standards, July 2010.

Capacity Infrastructure Services Ltd (CISL) (2012), Regional Standards for Water Services, November 2012.

NO MORE THE POOR COUSIN

A Christchurch stormwater story

The collaborative Land Drainage Recovery Programme may have taken place in a post-earthquake world but it highlights why stormwater should not be treated as the poor cousin -**Jules Scott-Hansen** of Opus International Consultants explains.

The latest position paper from Local Government New Zealand (LGNZ) on improving the water, wastewater and stormwater (3 Waters) sector in New Zealand recognises that knowledge about stormwater networks is in many cases incomplete and requires more attention. The paper also highlights the unique challenges that face the stormwater sector, including stricter standards for water quality and increased risks associated with climate change.

It is often the case that stormwater, the 'poor cousin' of the water sector, is not prioritised when balancing the many challenges that confront water service providers' budget restrictions for managing extensive asset portfolios. However, these assets have a large potential to cause extensive damage to the communities they serve and need to be adequately managed to mitigate this risk.

Christchurch City Council (the Council)who manage the majority of Christchurch's SWD network, have a proactive

approach to management of their SWD assets involving a good knowledge base of their assets and a maintenance regime undertaken by their service contractor. Following the Canterbury Earthquakes, and subsequent flooding events caused by damage combined with widespread land subsidence, it was recognised that the condition and performance of the network was not fully understood. As a result of this, the Council initiated the Land Drainage Recovery Programme (LDRP) to assess damage and subsequently identify areas in need of repair to restore the flood carrying capacity of the network.

In this article, experiences are shared from Opus' involvement in condition assessment projects carried out under the LDRP. The article gives examples of how a collaborative approach between consultant and client resulted in innovative approaches and valuable project outputs. The article also highlights why a nationally consistent approach for managing SWD assets should be introduced – in order to increase efficiency and consistency, and ultimately save money.

Stormwater Drainage – Why bother?

SWD networks are vital assets in our communities but their existence is often overlooked; piped underground or running in open channels through back sections – out of sight, out of mind. However, when the flows they carry no longer follow their intended path and make their way into our homes and across our roads, these forgotten assets make an appearance in our lives we cannot ignore.

Natural disasters have a tendency to exacerbate existing problems and this became particularly evident following the Canterbury Earthquakes; earthquake damage to Christchurch's SWD network, combined with other problems such as widespread land subsidence and lateral spreading, resulted in flooding in areas where this had previously not been an issue.

Natural disasters set aside, other parts of New Zealand also experience problems with more frequent and severe flooding events; declining asset performance and the expectation of more severe and frequent storm events with climate change means our SWD networks will require some attention in order to minimise potential damage and harm to our communities.

Christchurch in focus

Opus, as the consultant for a major part of the LDRP data collection, focused on a strong collaborative approach to the project methodology. As the overall programme was split into several distinct work packages, and some projects would be undertaken by other consultants, the need for

a common specification was recognised in order to ensure consistency in the data collection. A specification document for condition assessment of open channels was developed by Opus in conjunction with the Council to establish common procedures for the field assessments. The specification was developed through an iterative process driven by pilot studies and experiences from the field assessments. Refinement of the collected data was a major focus in order to ensure a balance was struck between efficiency and comprehensiveness – it was important to collect extensive but also targeted data that was relevant to the overall purpose of the recovery programme.

Another major focus for Opus was efficiency of data collection and management given the inevitably large amount of data that would be collected. Opus developed custom-made interfaces on tablets that combined several functionalities into one device and allowed field assessors to easily collect all the required data (standardised text and number entries, photographs and GPS coordinates etc.) on one platform. The tablets also increased the efficiency and quality of data management by enabling direct uploading to different storage solutions, thus eliminating the need for manual entry that carries with it an additional risk of introducing errors to the data.

Visual records are important to properly understand the condition of assets, and photographs provide this information to a certain degree. However for long, linear assets such as stormwater channels, they only provide snapshot views of the full picture. In response to this, a geo-referenced video survey method was developed by Opus and undertaken for sections of high-vulnerability channels such as concrete and timber lined drains. The idea behind the videos, which are analogous to CCTV for pipes, is that they can capture valuable information that can be easily shared and viewed, thus providing benefit to several people within an organisation. The videos can also be used as a historical benchmark for asset condition that enables assessment of deterioration over time or following significant events such as earthquakes or floods.

The ongoing collaboration between Opus and the Council on the LDRP projects ensured a successful project process and high quality outputs. The track record throughout the initial projects encouraged the selection of Opus as the consultant to deliver the important final phase of the LDRP data collection and collation of over 600 km of waterways information into one consistent master database. Once complete, the database will provide a comprehensive picture of the attributes and condition of the SWD network and facilitate better decision-making to develop a strategic maintenance and renewals programme.

The call for a consistent approach

Asset management is a sector that is growing in importance as the amount of assets in our societies steadily increases. Asset management involves a constant process of maintenance and renewals – it is not a one-off exercise but rather an on-going system that has to be sufficiently prioritised and resourced in order to produce benefits.

Currently there are no nationally consistent best-practice guidelines for management of SWD assets in New Zealand; an increased focus on asset management in this sector calls for best-practice guidelines to be developed and applied across the whole country.

This call for a consistent approach is echoed by the current development of metadata standards for the 3 Waters and buildings sectors. The anticipation is that the metadata standards will help to achieve the vision of the Thirty Year New Zealand Infrastructure Plan 2015 of having infrastructure that is resilient, coordinated and contributes to a strong economy as well as high living standards for New Zealanders by 2045.

Case studies from across the globe have shown that there are several direct benefits to developing nationally consistent best-practice guidelines, including:

- Cost savings through increased efficiency and better decision-making
- Better implementation of capital and operational investment programmes
- Benchmarking of infrastructure networks
- Easier integration of new technologies and improved adaptation
- Better life-cycle management of assets

It is clear that a more efficient and nationally consistent SWD asset management approach can produce significant benefits; water service providers can save time and money and improve their strategic decision-making, and our communities are kept safer through proactive risk mitigation. And with increased needs as a result of stricter water quality standards and more volatile climate conditions, as well as keeping up with on-going maintenance of aging infrastructure, there really is no better time to start than now. **WNZ**

GROUNDHOG DAY – AGAIN

How to break the disaster-response cycle

It's not just the floods that keep happening – the post-event conversations also have a familiar ring. **Iain White** and **Graham Haughton** suggest ways to change the 'groundhog day' nature of disaster response.

Flooding is the most frequent natural hazard in New Zealand. Within the past year, we have seen major events occur from Northland to Otago, with the most recent being the March 2016 Franz Josef flood. This devastated the small town and reignited debates about the causes of flooding and how we should respond.

The political and public conversation in this case ranged from the establishment of a relief fund, to fears that the town was 'too expensive' to protect, to an editorial suggesting that the entire town could be moved to a safer spot a few kilometres away[1,2].

Similarly, after the severe June 2015 floods in Whanganui, Rangitikei and Manawatu, the public debate ranged from the rise in global temperatures affecting weather patterns, to the need for more infrastructure investment, to Prime Minister John Key acknowledging that the Government will 'need to act' to mitigate the effects of extreme weather events[3].

These examples are typical of the aftermath of many floods, and emphasise how high-profile events such as these provide an important opportunity to reflect on what went wrong, consider how future risk may be increasing due to factors such as climate change or urbanisation, and focus the attention of politicians.

These brief 'policy windows' are vital

Graham Haughton is a professor of urban and environment planning at the University of Manchester, England.

Iain White is a professor of environmental planning at the University of Waikato, New Zealand.

for galvanising diverse stakeholders into action and providing the political momentum needed to attract new investment or implement more effective policies. But to what extent are these opportunities taken? How often do events stimulate any more than a brief press spotlight before political priorities change along with the news agenda?

Our research into repeated major flood events in the UK over recent years, provides a salutary warning that not only do these calls for action fail to lead to significant policy change for many vulnerable places, but that the public responses mooted follow an all too predictable pattern. After the Somerset floods in the winter of 2014, an academic article[4] suggested, in somewhat tongue-in-cheek fashion, a 'checklist' for how the media and politicians respond to new major flood events – and in the case of the most recent December 2015 floods in North West England, Yorkshire and Scotland, sadly, virtually all of the boxes had been ticked within a week.

Calls for a major review of policy, tick.[5] Doubts about existing flood risk assumptions and forecasting models, tick.[6] Concerns about whether cities and prosperous regions have benefited more from flood investments while poorer areas are left behind, tick.[7] Questions about whether planners should do more to prevent development on floodplains, tick.[8] Debates about whether the floods are related to climate change, tick. Calls for international solutions, tick.[9] Calls for officials to listen to local knowledge, which might have helped prevent the most recent floods, tick.[10] Major figures in flood policy vilified for not being present on site quickly enough, tick; followed by visits from leading national politicians and royalty, double tick.[11] Government money promised to help out affected householders and businesses, tick.[12] Gesture politics, tick. In 2014 a UKIP politician linked gay marriage policy to floods; in 2015, some MPs claimed money to help English flood-affected communities should be diverted from the overseas aid budget.

In short, while the precise nature of flooding might not be predictable, the immediate political and journalistic response certainly has been.

Call to act – no action

Despite repeated calls in both New Zealand and the UK from scientists and the public in recent years for a fundamental rethink of flood policy in the light of increasing events, it remains essentially unchanged; an acknowledged need to act but with little action. The radio wakes us all up with the same awful song and 'groundhog day' begins anew. So what do we need to do to help break this trend and design much more effective flood management policies?

The first step is to recognise both the recurring nature of the disaster-response cycle and the need to design steps that have the potential to engender real change. While policy windows are critical opportunities to do this, they are all too brief and rely too heavily on capricious press interest – the need to act should be initiated in a strategic manner at the national scale in partnership with scientists and designed to enable long-term change.

As part of this approach, we also need to recognise that floods occur due to a very dynamic and multi-scalar combination of human and natural factors, from uncertainty over global emissions to inappropriate developments on the floodplain. This provides a challenging policy context that demands flexibility and responsiveness, factors which may currently be in short supply.

There are alternative approaches, however. At the local and regional scale, policies can be designed to be automatically re-examined after events of a certain scale are measured. Early warning signals with built-in triggers can enable appropriate responses to be initiated and funded in order to take some of the politics out of flooding.

But local policy on its own will not be enough, given that flood policies in one area will almost always require integrated policy interventions in surrounding upstream and downstream areas. To address this issue, we need more effective regional and catchment-scale thinking, which can provide an overarching governance and strategic approach that has the authority to bring stakeholders together.

Joined-up conversations

'Flood proofing' does not have to apply to a building, rather we can apply the principle to other plans, practices and policies, to ensure that we are not incentivising run off within related policy silos, such as not overstocking land where soil compaction is a concern. Similarly, we may include reconsideration of the management and usage of upland areas, which will require a national conversation to ensure that the public, landowners, and visitors appreciate why landscapes will change, as more shrub and tree cover is brought in as a means of improving water retention at source.

At the global level, we will need to make tackling global warming a central part of a multi-scalar approach to flood policy. Extreme weather events have become the new 'normal' – there will be no reversion to earlier climate patterns even if we address global warming due to the lag in the system and the high development pressures in New Zealand. The majority of climate scientists tend to agree on two things: that recent extreme weather events are unprecedented; and that we will continue to experience more of them.

As a matter of urgency, we need to find ways of integrating policy at all scales. But in isolation these measures do not break out of the silo approach to flood policy and its governance. The repeated events lend weight to the argument that we are in need of serious, integrated reform that integrates across scales

and sectors rather than a small-scale tinkering or an incremental rise in flood defence funding.

These proposals accept that, while flood protection measures are helpful, we need to take a systemic perspective to engender real change. None of these proposals will be without their detractors. Vested interests will endeavour to ensure that there is minimal change to existing policy or lobby against stronger powers for national, regional and territorial governments to resist development or change agricultural practices.

Measures which require strong state direction and change the status quo routinely run the risk of being simplistically pigeon-holed as 'red-tape' on business efficiency.

Flooding is too important to be constrained by such ideological blinkers – governments will always have a role in seeking to reduce the impacts of flood events and in helping with recovery where there are major impacts. The alternative to our proposals is that we continue with our 'groundhog day' approach to flood policy, but with the unpleasant twist that with each repeated failure to understand the consequence of our actions, things get worse. **WNZ**

- A version of this article first appeared in the academic journal Town and Country Planning[13].

(Endnotes)

1 See: http://www.stuff.co.nz/national/78266363/state-of-emergency-lifted-as-mop-up-begins-on-flooded-west-coast

2 See: http://www.stuff.co.nz/the-press/opinion/78347521/editorial-franz-josef-floods-a-reminder-of-townships-vulnerability-to-hazards

3 See: http://www.radionz.co.nz/news/national/276840/govt-to-discuss-flood-response

4 G. Haughton, T. Coulthard and G. Bankoff: 'The murky waters of flood policy'. Town & Country Planning, 2014, Vol. 83, Aug., 336-40

5 M. Tran and D. Gayle: 'Cameron defends flood defence spending amid calls for 'complete rethink' – as it happened'. The Guardian, 28 Dec. 2015. www.theguardian.com/environment/live/2015/dec/28/uk-floods-thousands-evacuated-after-unprecedentedcrisis

6 M. Tran and D. Gayle: 'Flood defences need complete rethink, says Environment Agency'. The Guardian, 28 Dec. 2015. www.theguardian.com/environment/2015/dec/28/uk-floods-complete-rethink-thousands-evacuatednorth-england

7 J. Groves and T.Cohen: 'Uninsured victims face £1billion bill as total cost of floods soars to £5.8 billion: Exactly the amount we are giving to the fight against global warming abroad'. Daily Mail, 29 Dec. 2015. www.dailymail.co.uk/news/article-3376935/Putsuffering-Britons-PM-Floods-cost-5-8bn-exactly-givingfight-global-warming-overseas.html; and M. Tran: 'North-south divide cited as factor in Yorkshire flooding devastation'. The Guardian, 28 Dec. 2015. www.theguardian.com/uk-news/2015/dec/28/yorkshireflooding-north-south-divide-york-leeds-london-southeast

8 D. Foster: 'As Cumbria struggles, Osborne plots to build homes on floodplains'. The Guardian, 11 Dec. 2015. www.theguardian.com/housing-network/2015/dec/11/cumbria-george-osborne-build-homes-floods

9 H. van Klaveren: 'We need a Dutch-style Delta plan to stem the tide of floods'. The Guardian, 27 Dec. 2015. www.theguardian.com/commentisfree/2015/dec/27/dutch-style-delta-plan-floods-uk-netherlands

10 G. Monbiot: 'This flood was not only foretold – it was publicly subsidised'. The Guardian, 29 Dec. 2015. www.theguardian.com/commentisfree/2015/dec/29/deluge-farmers-flood-grouse-moor-drain-land

11 D. Gayle: 'Environment Agency chair heads to flood-hit areas after Barbados break'. The Guardian, 30 Dec. 2015. www.theguardian.com/environment/2015/dec/30/environment-agency-sir-philip-dilley-flood-hit-areasbarbados-break; K. Rawlinson: 'Minister visits Tadcaster as Yorkshire town braces for more flooding'. The Guardian, 30 Dec. 2015. www.theguardian.com/uknews/2015/dec/30/tadcaster-more-flooding-liz-truss; and 'Storm Desmond: Prince Charles visits clean-up operation in Cumbria'. BBC News, 21 Dec. 2015. www.bbc.co.uk/news/uk-35151414

12 'Winter 2015 to 2016 floods: Government response'. News Story. Department for Environment, Food and Rural Affairs et al., 8 Dec. 2015. www.gov.uk/government/news/north-west-englandfloods-2015-government-response

13 Haughton, G. and White, I. 92016) Groundhog Day – the great floods of 2015, Town and Country Planning, March: 134-137.

Flood vulnerability

Testing sea level rise effects

Even a small sea level rise can have major impacts, according to a physical model investigation of wave overtopping at Tamaki Drive carried out by Matthew McQueen, Aaron Falconer, Tom Shand and Heide Friedrich.

Tamaki Drive is a key arterial route, running along the coastline of Auckland's Eastern suburbs. The road is, however, exposed to the Hauraki Gulf, with the seawall vulnerable to wave overtopping during storm events. In recent years this has occurred on a number of occasions when strong northeast winds coincide with high tides.

A significant example of this occurred during ex-Tropical Cyclone Ita on 17 April 2014. That morning, strong northeast winds (>30 knots) generated large waves (>1 metre) which, combined with a moderate high tide and a storm surge, resulted in severe wave overtopping (Figure 1).

The overtopping flows caused flooding of the road and adjacent properties. Consequently, there were significant hazards to pedestrians and vehicles, with commitment of resources from emergency management and time delay to commuters as the road was closed. This event put the issue of coastal inundation into the spotlight and also raised questions around whether sea level rise would lead to this becoming a more common occurrence.

In order to accurately forecast such hazardous conditions and assess current and future vulnerability of roading infrastructure, better information on the precise combination of parameters likely to result in significant overtopping is required. While empirical modelling can provide general approximations of overtopping for generic seawall types, physical model testing enables inclusion of site-specific conditions, such as seawall shape and material.

A collaborative research project between the University of Auckland, Tonkin + Taylor, and Auckland Civil Defence was undertaken to better understand the mechanism responsible for overtopping events along Tamaki Drive and test the effect of future sea level rise.

A physical model was constructed in the University of Auckland's Hydraulic Engineering Laboratory, using a 25-metre wave flume, with a scale of 1:10. The model represented a typical cross section based on a site survey of the Tamaki Drive seawall at the western end of Kohimarama. This was the site of the worst observed wave inundation. The model replicated the sloping rock face, vertical seawall that protects the road and the shallow seabed offshore of the wall (Figure 2).

Wave conditions occurring along Tamaki Drive during ex-Tropical Cyclone Ita were determined using Tonkin + Taylor's inner Hauraki Gulf numerical wave model. Waves

were found to reach a significant height of 1.4 metres with a mean period of 3.2 seconds and wavelength of 15 metres. The maximum water level was recorded at the Port of Auckland at 2.06 metres above Auckland Vertical Datum 1946 (AVD46, approximately mean sea level), comprising a 1.66 metre AVD-46 high tide and 0.4 metre storm surge.

A mechanical wave paddle position at the end of the flume was calibrated to produce a scaled irregular wave series representative of modelled conditions offshore of the wall. Incident photos and reports from the time validated this modelled wave height as a fair representation, with the choppy irregular waves being driven by the onshore wind channelled between the offshore islands in the Hauraki Gulf. These very steep waves would have been on the verge of breaking as they reached the Tamaki Drive wall.

Each laboratory test lasted 10 minutes, representing 30 minutes in full scale. The irregular waves produced by the paddle in 'deep water' conditions travelled over the 'shallow water' false floor to impact squarely the scaled seawall model. The interaction with the seawall was recorded using a high speed camera, allowing for qualitative classification of wave overtopping. Overtopping flows were collected in a catch tray behind the model to enable the measurement of overtopping volume.

Tests were completed for five different water level scenarios; the first was at 2.06 metre AVD46, representing the conditions during Cyclone Ita. The second water level tested was 2.13 metre AVD46, corresponding to a one percent Annual Exceedance Probability (AEP) storm level for that part of the Auckland region (Stephens et al., 2013). Additional testing was then undertaken adding 0.2 metres, 0.5 metres and 1.0 metres to this one percent AEP level to test three different future sea level rise (SLR) scenarios. Under the highest SLR scenario, the seawall crest had a freeboard of just 10 centimetres.

Wave overtopping can be classified as both 'white water', when an aerated splash from a wave impacting the seawall is carried over the wall, and 'green water', when a constant stream of denser water flows over the seawall. Both types were recorded by observers during Cyclone Ita and testing found that both were present across all scenarios. Interestingly, the ratio of 'white water' to 'green water' overtopping waves was roughly 40:60, and remained constant even as the total number of overtopping incidents increased with the increase in sea level.

This is a reflection of the irregular nature of the wave heights and therefore variations in the relative freeboard for each wave, with a positive freeboard leading to 'white water' overtopping, as the wave impacts the wall compared to a negative freeboard where the wave peak is higher than the seawall and therefore flows over it (Figure 3).

While the increase in the number of overtopping waves

followed a generally linear trend, discharge volumes at higher sea levels increased in a more exponential manner. To allow for comparability of the results, overtopping flows were converted into average litres per second per linear metre (L/s/m). This is the unit used in the *Coastal Engineering Manual* (USACE, 2006) and *EurOtop Overtopping Manual* (Pullen et al., 2007) which provide guidance on tolerable and intolerable overtopping flows.

For the modelled five-metre wide section (scaled to 0.5 metre), mean overtopping flows were 5.1 L/s/m for Cyclone Ita compared to 7.0 L/s/m for one percent AEP storm tide level. Flows increased to 17.9 L/s/m with 0.2 metres of sea level rise above the one percent AEP level and 46.3 L/s/m with 0.5 metres sea level rise (Figure 4). All results therefore were well above the 0.4 L/s/m value which is considered unsafe for vehicles at any speed and 1.0 L/s/m value above which it is considered very dangerous for pedestrians (USACE, 2006).

For the 0.5 metre sea level rise scenario, discharge is approaching the 50 L/s/m threshold value above which the *Coastal Engineering Manual* suggests that damage to the seawall and the pavement behind is likely.

Overtopping flows during one metre sea level rise would far exceed these critical values and would likely result in significant damage to the current seawall and/or pavement. In our tests we could not accurately record discharge results due to the very high volume of overtopping caused by the very small relative freeboard of the seawall. Additionally, due to the gaps in the crest wall that allow access to a number of stairwells along Tamaki Drive, inundation at higher sea levels will occur regardless of the wave conditions.

As a result of testing, a number of conclusions can be reached:

1. Wave overtopping is potentially hazardous to pedestrians and vehicles at relatively low mean overtopping rates. This is critical for locations such as Tamaki Drive that are both major arterial routes and popular recreational spaces.
2. The volume of overtopping is very sensitive to small changes in the water level. Even 0.2 metres of sea level rise

Figure 1: Overtopping along Tamaki Drive during ex-Tropical Cyclone Ita.

Figure 2: Scale model data collection and development within the University of Auckland wave flume.

Figure 3: Examples of the 'white water' (above) and 'green water' (below) overtopping wave impacts.

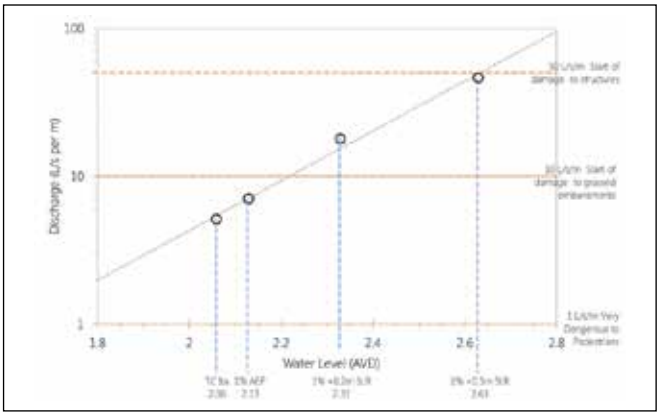


Figure 4: Modelled mean overtopping flows relative to water level and compared to tolerable flows

would lead to at least double the volume of overtopping discharge for similar wave events.

3. Hazardous events would become more frequent under future sea level rise and the magnitude of large events would increase, potentially leading to damage of seawalls and pavement surfaces.
4. Areas not currently susceptible to hazardous wave overtopping could become hazardous with future sea level rise.

For this study physical modelling has improved the understanding of the mechanisms responsible for wave overtopping. Results can be used to calibrate empirical models and allow predictions of overtopping frequency at this and nearby locations, thus enabling asset managers to make informed decisions on future maintenance and upgrade.

The results will allow development of improved early warning systems protecting the public from exposure to hazards and minimising transport network delays. Finally, such research serves to educate the public to the risks of coastal inundation and the potential impacts of future sea level rise. Education and engagement of the public is critical to developing resilient and sustainable communities. **WNZ**

Acknowledgments

The authors would like to acknowledge and thank Dr Rob Bell from NIWA, David Bate and Bruce Wallen at Port of Auckland and Richard Woods and Brodie Rafferty from Auckland Civil Defence and Emergency Management for supplying event data, Paul Klinac, Branko Veljanovski and Alan Tresadern from Auckland Council Coastal Management Services, Geoff Kirby and Jim Luo from the University of Auckland Fluids Laboratory and Dr Katherine Heays and Dr Tim Fisher from Tonkin + Taylor for technical advice and assistance.

References

Pullen, T., Allsop, N. W. H., Bruce, T., Korenhaus, A., Schüttrumpf, H., & van der Meer, J. W. (2007). EurOtop - Wave Overtopping of Sea Defences and Related Structures: Assessment Manual. Boyens Medien GmbH & Co. KG. Stephens, S., Wadhwa, S., Gorman, R., Goodhue, N., Pritchard, M., Ovenden, R., & Reeve, G. (2013). Coastal inundation by storm-tides and waves in the Auckland region. (Technical Report No. HAM2013-059). Hamilton: National Institute of Water & Atmospheric Research Ltd. United States Army Corps of Engineers. (2006). Coastal engineering manual. Washington D.C.: U.S. Army Corps of Engineers.

This study was undertaken by Matthew McQueen and Aaron Falconer as a final year Engineering honours project at the Department of Civil and Environmental Engineering (DCEE), University of Auckland with supervision from Heide Friedrich (DCEE) and Tom Shand, Tonkin + Taylor, Civil and Environmental Engineers.

What state our national water assets?

The $26 billion question

Around the country, the 3 water services involve $26 billion worth of assets. Water New Zealand's annual performance review aims to benchmark their performance – as **Lesley Smith** reports.

The National Performance Review (The Review) is an annual review of the provision of New Zealand's drinking water, wastewater and stormwater services. The Review collates data from 41 council and council owned organisations responsible for jurisdictions covering 85 percent of New Zealand's population.

Participants manage over 79,000 kilometres of pipeline, 295 water and 190 wastewater treatment plants, 3512 pump stations and 1426 water supply reservoirs, with total assets valued at over $26 billion.

The Review benchmarks social, environmental and financial aspects of services delivered using these assets. What the report can tell us about two important aspects of these services, the condition of our pipes and how we are managing the demand for water, is covered here. A full list of data and findings is included in an annual report and summarised in a snap shot for decision makers, downloadable from: www.waternz.org.nz/NationalPerformanceReview.

What condition are our pipes in?

Pipeline condition is indicated by condition grading and pipeline age information. Median age of pipelines for water is 32 years, wastewater 39 years, and stormwater 34 years – comparable with the European average of 37 years. However, only limited inferences can be made from age information, as the remaining life of pipelines depends on material, surrounding soil and other factors. It is for this reason that pipeline condition assessments are conducted.

Participants used seven different standardised guidelines and numerous in-house methods for determining pipeline condition. The approaches that participants listed are shown in Figure 1. Condition assessments inform remaining asset life determination and prioritise renewals.

The majority of participants in The Review measure asset condition on a 1-to-5 scale, however the variety of approaches used to make these assessments limits the ability to make comparisons across jurisdictions. Comparable data could be used to improve pipe deterioration assessments – ensuring assets renewals are optimally timed.

Guidance documents are produced by Water New Zealand, the Institute of Public Works Engineers Australia (IPWEA) and New Zealand Asset Management Support. Water New Zealand is collaborating with IPWEA and the UC Quake Centre to scope a project on pipeline guidance that would harmonise existing approaches and fill gaps in knowledge to enable the optimal asset management of pipelines.

How are we managing water demand?

Water restrictions are a commonly employed demand management approach tool for reducing pressure on urban water supplies. Two thirds of participants in The Review issued water restrictions in 2014/15 indicating water demand management is important in a number of regions (Figure 2).

Water metering is increasingly being adopted to manage water demand and is now used by all but five participants in The Review for non-residential customers. Urban water metering is less common in a residential setting, with 22 participants having no or very low levels of residential metering.

With a number of councils moving to full-scale metering, there are many lessons to be shared. The previous issue of *Water* reviewed how recent water metering installations in Kapiti have been used to improve its tariff system. Waipa and Selwyn are among other councils now commencing roll out of residential meters across their districts.

Residential water use is also high relative to other available international benchmarks. Review participants use on average 275 litres per person per day, while other benchmarked averages range from 119 to 195. Context is important here. Per capita freshwater availability in parts of New Zealand is amongst the highest in the world which

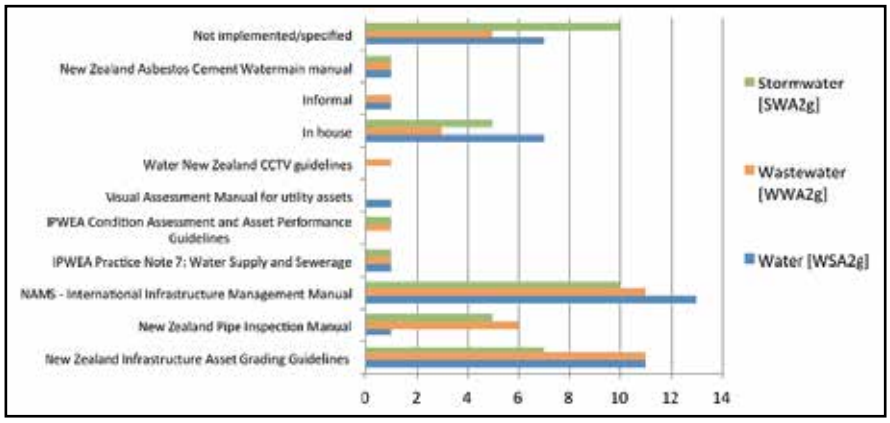


Figure 1: Approaches used for pipeline condition assessments.

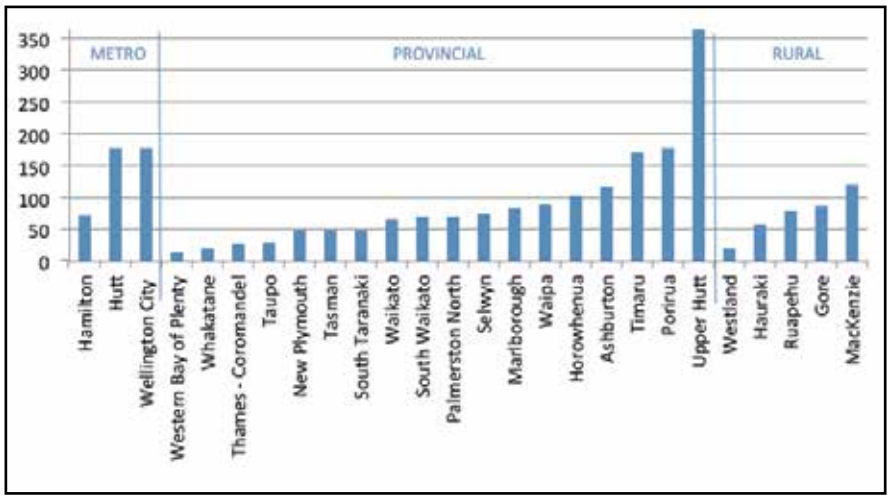


Figure 2: Regions issuing water restrictions and the number of days a year these were applied.

means that water scarcity is not always a driver for water efficiency.

Conversely, operational expenditure correlates with water use in all jurisdictions. In 2014-15, more than $90 million was spent by participants on operational expense categories that correlate with water supply volumes – energy, chemical and consumables and sludge disposal.

To facilitate knowledge transfer on best practice water efficiency Water New Zealand administers We Can, the Water Efficiency and Conservation Network. Details on the group and membership are available at www.waternz.org.nz.

There are opportunities to reduce water loss. Nearly one third of participants in the National Performance Review have yet to undertake a water loss efficiency assessment. Where assessments have been undertaken, the overall average values of current annual real losses show local water loss is high relative to international benchmarks. Infrastructure leakage index assessments suggest specific regions could reduce water loss, with 20 percent of participants who have undertaken an infrastructure leakage assessment having water loss considered 'high'.

Water loss efficiency assessments can be conducted using Benchloss Software and Water Loss Guidelines, both freely available for download from the Water New Zealand website: www.waternz.org.nz/library. Training on conducting an assessment is run from time to time and advertised through the website also.

Differences and similarities between regions

In the words of Alfred Nobel: "One can state, without exaggeration, that the observation of and the search for similarities and differences are the basis of all human knowledge."

Benchmarks teach us about our similarities and also our differences.

Similarities in water and wastewater networks enable us to identify common performance indicators. Differences in performance indicators are derived in three ways: though differences in service area characteristics, data definition interpretations, and performance variations.

Where possible, The Review provides data that benchmarks service area characteristics that influence performance. This includes the density of connections and types of customers served. However, other geographic and climatic characteristics cannot so easily be benchmarked; topography or rainfall for example. These factors will nonetheless affect benchmarked performance and are important lenses to apply when interpreting differences across regions.

Consistently applied data definitions are also essential for enabling meaningful performance comparisons. To this end, The Review process includes a participant workshop to align data definitions.

Concurrently, we are participating in a LINZ-led project to develop national metadata standards for the 3 waters infrastructure. Both these initiatives support the development of comparable national data on water, wastewater and stormwater infrastructure.

Beneath differences in data and innate differences in service area characteristics are differences in performance. These can derive from differences in operational practices, governance models, or staff skills.

The aim of The Review is to identify best practices in these areas and disseminate their adoption amongst participating councils. We welcome stakeholder input into this process. Enquiries or suggestions can be directed to: technical@waternz.org.nz. **WNZ**

Smart meters + smart thinking

What problem will the data solve?

Before you make an investment in smart metering, it's best to ask just why you want the data – what problem are you trying to solve, asks Datacol CEO **Bruce Franks**.

Left: A meter reader using AMR at Auckland's Victoria Park Markets.

So you've made the decision to deploy smart meters; to have 30-minute data arriving from all of your end points filling up your data base and then to invoice once a month. But just what is the point of collecting all this data and what are you going to do with it?

Perhaps examine it from a different angle. Why not ask before committing considerable sums of ratepayer's funds to a smart meter deployment, "What is the problem we are trying to solve?" While this may seem to be an incredibly simple question, in reality it can be quite difficult to answer. But asking can lead to a number of other questions around strategy, customer service, customer benefits and cost/benefits for the community.

There is a place for smart metering and the associated collected data – but the place may differ from council to council depending on 'what problem' is to be solved.

For example, one council in the South Island had high demand on its water infrastructure during the Summer periods (through an influx of tourists and holiday makers) and low demand through the off season. This placed tremendous pressure on the Water Network Infrastructure with a potential rates increase to pay for improvements. However, the council made a smart decision.

They installed 'non-smart' water meters on property connections. This meant water usage was charged fairly, i.e. a holiday home with the swimming pool filled two or three times during the summer period paid a higher proportion of water charges than the dwelling with a retired couple.

The result of the change meant peak demand was reduced which meant a less immediate requirement to invest in additional water treatment facilities. No smart metering, no vast reservoirs of collected data – just

good old pragmatic thinking and implementation.

However, there is a place for smart metering. A mix of smart and 'vanilla' meters with some smart monitoring/ analytics can provide Councils with the best of both worlds at a pragmatic cost.

Placing smart meters on high-value customers serves two purposes. Firstly, it allows the Council to gather a fair revenue from consumers (this generally makes up a significant proportion of water revenue) and consumers are empowered to view their data in near real time. This means high-value customers can make pragmatic management decisions around their water usage and potentially adjust their usage to reduce overall demand on the network.

It could be that, with smart data, high users could be incentivised to draw water at off peak times, store it on their premises and use this water at peak times during the day thus reducing load on the network. This would only work with clear visible data – however the benefits to the Council could be deferred capital expenditure for additional water plant.

Another example of how data can be used smartly is in Victoria Park Market in Auckland. Retailers had water meters in each shop, but they were installed high in the ceilings. Meter readers entering the shops had to bring ladders, move equipment around in an effort to read the meters. This was unsatisfactory for the retailers, so AMR (Automatic Meter Reading) meters were installed in each shop. Now it takes around three minutes to read around 65 meters from two locations. In addition, the Gate Meter is also read at the same time. When overlaid with the collected consumption reads, a quick water balance can be calculated and show any leakages requiring further investigation.

This is an example of smart metering implemented to solve a clearly identifiable problem that provided clear benefits for the water retailer and its customers. So this is smart thinking applied in a pragmatic way.

The last challenge with collecting 'Big Data' is around the organisation.

Councils have to be prepared to change their operations to allow all stakeholders visibility, access and use of data. However, as some staff could see this as threatening, (perhaps opens up visibility on their operations) it will require careful planning and change management implementation.

So the question that needs asking is "What problem are we trying to solve"? Before launching into a smart meter deployment, and muddling through the volume of data coming arriving daily, consider the question and once the answer is clearly understood, only then should any smart meter implementation go ahead. **WNZ**

Sourcing pollution at Paekakariki
Wainui Stream Study

Stan Abbott, School of Public Health and Barry R Palmer with Margaret McNeill, School of Food and Nutrition, Massey University, Wellington.

INTRODUCTION

The Wainui Stream flows through the Queen Elizabeth Park (QEP) and along the banks of the Caravan Holiday Park in Paekakariki. It is popular with children of all ages who can be seen playing, wading and occasionally swimming at many sites along the stream (figure 1).

However, Wainui Stream water quality is not monitored routinely by the Greater Wellington Regional Council (GWRC) because it is not regarded as a river swimming spot (http://www.gw.govt.nz/summer-check/).

In February 2013, when Environmental Health students from Massey University collected and analysed five water samples from sites below the QEP road bridge in February 2013, for compliance testing with the New Zealand Microbiological Water Quality Guidelines for Freshwater Recreational Areas (MfE / MOH 2003). Surprisingly, extremely high levels of Escherichia coli (E.coli) counts were found. Subsequent analyses of 17 more samples taken from sites along the entire stream two days later showed that the water quality at all the sites breached the action red mode of the guidelines of greater than 550 E. coli per 100 ml. The stream was not therefore suitable for recreational activities as counts above 550 E.coli per 100 ml pose an unacceptable health risk from contact recreation.

We informed the Environmental Health Officers at the Kapiti Coast District Council (KCDC) who responded immediately by erecting temporary health warning signs. Regular health warning alerts were also published in the news media, as well as on KCDC's website.

Despite KCDC staff walking the entire length of the Wainui Stream, a definitive source of pollution could not be found (Haxton 2013). The probable causes were thought to be low rainfall, high temperatures that resulted in low flows in the stream, plus agricultural runoff from further upstream. Although the GWRC removed all the rotting logs and other debris which impeded flows from the stream, our March 2013 testing at many sites along the Wainui Stream showed that the extremely high bacterial levels persisted and that these were even higher (many sites above 2,419 E. coli per 100 ml) after heavy rainfall (Table 1).

Figure 1: Wainui stream is popular with children.

	1/03/2013	5/03/2013	19/03/2013
	Rainfall (0.0 mm)	Rainfall (0.0 mm)	Rainfall (65.0 mm)
Site	*E.coli* (per 100ml)	*E.coli* (per 100ml)	*E.coli* (per 100ml)
Site 1A	> 2419.6	> 2419.6	> 2419.6
Site 1B	> 2419.6	> 2419.6	> 2419.6
Site 1	> 2419.6	1732.9	> 2419.6
Site 2	> 2419.6		> 2419.6
Site 3	1553.1		
Site 4	1553.1	1986.3	> 2419.6
Site 5	1986.3	1986.3	> 2419.6
Site 6	1553.6		> 2419.6
Site 6A	1553.6	1413.6	
Site 7	689.3	1046.2	> 2419.6
Site 8	1046.2	1229.7	
Site 9	920.8	1413.6	> 2419.6
Site 10	816.4	1046.2	> 2419.6
Site 10A	1119.9		
Site 10B	1299.7	816.4	
Site 11	1203.3	980.4	> 2419.6
Site 12	1299.7	920.8	

Table 1: March 2013 Wainui Stream sample results

In this article, we present the results of an extensive two-year water quality monitoring study of Wainui Stream and its tributaries in order to establish the dominant faecal pollution sources of the stream.

WAINUI STREAM CATCHMENT

The Wainui Stream catchment lies to the north of the Paekakariki township and drains the coastal hills on the southern side of the Tararua Ranges. The Te Puka Stream (Smith Creek) is the only major tributary of the Wainui Stream. Depending on rainfall the flow rates and depths of the Wainui Stream can vary considerably at sampling locations – usually from as little as 20 cm to as much 160 cm in places (Figure 2). Towards the lower end of the Wainui Stream in QEP debris and logs often impede the flow of the stream.

Two large KCDC storm water pipes, from Haumia Street and

Figure 2

Figure 3

Figure 4: Most frequently sampled stream sites.

Horomona Road, run under the Caravan Holiday Park. These drain urban rainfall runoff from impervious road surfaces into the Wainui Stream in the caravan park (Figure 3). There are also two 100mm PVC pipes that drain stormwater from the roads, car parks, and roofs of buildings in the caravan park into the stream. Kerb-side stormwater drains on the road at the entrance to the caravan park drain storm water to the stream via soak pits.

SAMPLING

From February 2013 to January 2015, we collected and tested 317 water samples from 51 different sites along the entire length of the Wainui and Te Puka streams including stream samples taken in farm land above and below SH1. Upstream and downstream stormwater samples of the four outlets discharging into the Wainui Stream at the Caravan Holiday Park were also collected and rainfall depth (mm), 24 hours prior to and at the time of each sampling event was recorded (http://www.weatheronline.co.nz). Some of the most frequently sampled stream sites are shown in figure 4.

Samples were collected aseptically in daylight hours in sterile 250 ml plastic bottles using the Mighty Gripper bottle clamp (Bolton, Whangarei) at approximately 15-30cm below the surface. All samples were placed in a chilly bin containing ice and transported to the laboratory and processed within six hours of sampling. The samples were analysed for *Total coliforms* and *E.coli* using the Colilert™ / 97 Well Quanti-tray system (IDEXX Laboratories, USA). After 24 hours incubation the number *E.coli* per 100 ml, based on the number of positive wells counted, was determined by referring to a 97-well MPN table. As an MPN value for 97 positive wells is > 2419.6 *E.coli* per 100 ml (95 per cent confidence limits are 1439.5 to infinity), for data analysis each > 2419.6 result was recorded as 2500 *E.coli* per 100 ml. Results were compared with the NZ Microbiological Water Quality Guidelines for Freshwater Recreational Areas (MfE / MOH 2003) to determine compliance and which stream sites breached the guidelines (Table 2).

Mode	E.coli per 100 ml	Required management response
Green surveillance	Single sample < 260	Routine monitoring
Amber alert	Single sample 260 - 550	Increase monitoring Identify sources of contamination Conduct health risk assessment
Action red	Single > 550	Public health warnings Increase monitoring Identify sources of contamination Conduct health risk assessment

Table 2: MfE/MOH (2003): Surveillance, alert and action levels for fresh waters.

RESULTS

From 27 February to 21 August 2013, 98 per cent of samples exceeded the MfE/MoH (2003) action red mode. The exceedances occurred in samples taken along the entire length of the Te Puka and Wainui Streams. Of these samples, 36 per cent yielded counts of greater than 2419.6 E.coli per 100 ml and 38 per cent of samples results were above 1553.1 E.coli per 100 ml. These E.coli counts ranged from 689.3 to > 2419.6 with a median of 1732.9. The results of the most frequently taken samples in 2013 are shown in figure 5. Significantly, all the very high E.coli bacterial levels were found at same time that cattle, sheep and horses grazing in the two paddocks had access to unfenced Wainui and Te Puka streams in the farm land (Figure 6).

From 18 September to 22 December 2013 only 23 per cent of samples exceeded the MfE/MoH (2003) action red mode. However, 27 per cent of samples exceeded the amber alert mode and 50 per cent of samples complied with the green (acceptable) surveillance mode. These E.coli counts ranged from 62.8 to 1553.1 with a median of 435.5. Most of the non-compliant samples were from stormwater discharge sites and downstream of these (below the road bridge in QEP) that were low flow and sites that were colonised by ducks.

From 27 January to 14 December 2014, 74 per cent of samples complied with the green (acceptable) surveillance mode, 15 per cent exceeded the amber alert mode while only 11 per cent exceeded the action red mode. These E.coli counts ranged from 10.1 to >2419.6 with a median of 203.6. The results of the most frequently taken samples in 2014 are shown in figure 7. These 2014 results also revealed that stormwater discharges and ducks were responsible for most of the non-compliant results. For example, the December 2014 wet-weather counts ranged from 344.8 to > 2,419 E. coli per 100 with a median of 691.6 (13 samples above the action red mode of

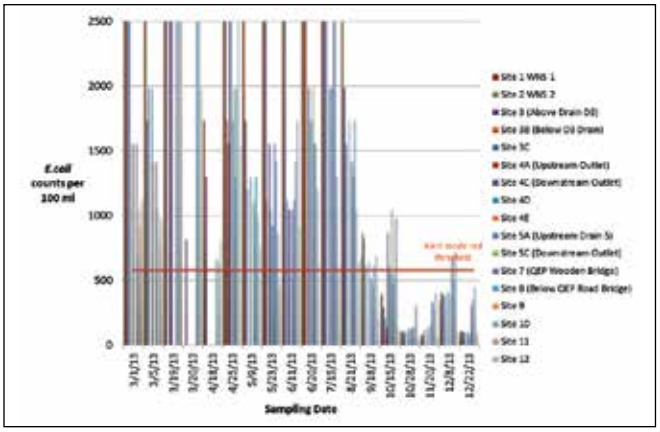


Figure 5: Wainui Stream sample results (2013).

Figure 6: Stock near the unfenced stream.

> 550 E.coli per 100 ml Mode). Wainui Stream stormwater outlet discharge sample results for 2013 and 2014 are shown in figure 8.

CONCLUSIONS

The results of this two-year water quality monitoring study clearly show that the massive faecal pollution of the Wainui Stream was caused by non-point pollution:

- Primarily from agricultural run-off when livestock had unrestricted to unfenced streams in the farm-land;
- Diffuse and non-diffuse storm water run-off sources, especially after heavy rainfall; and
- Direct deposition of water fowl faeces.

Livestock were excluded from the farm-land at the end of August 2013 and our results strongly suggest that the dominant faecal pollution sources were from agricultural runoff, exacerbated by heavy rainfall especially when cattle, sheep and horses were in those paddocks. These results are in keeping with the faecal source tracking (DNA profiles) sample analyses commissioned by the GWRC (Personal communication Summer Greenfield, – GWRC, 4 April 2013). These samples

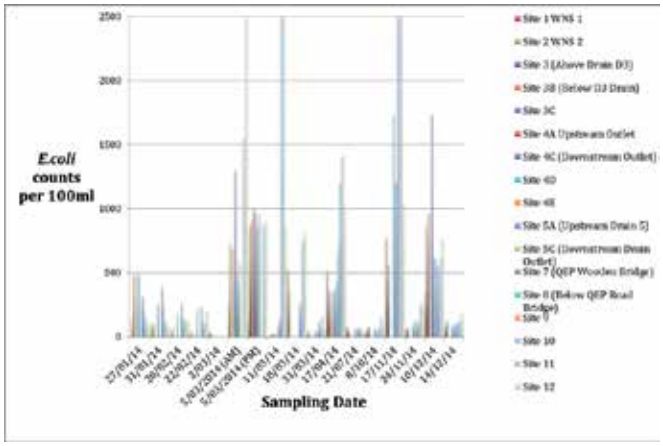


Figure 7: Wainui Stream sample results (2014)

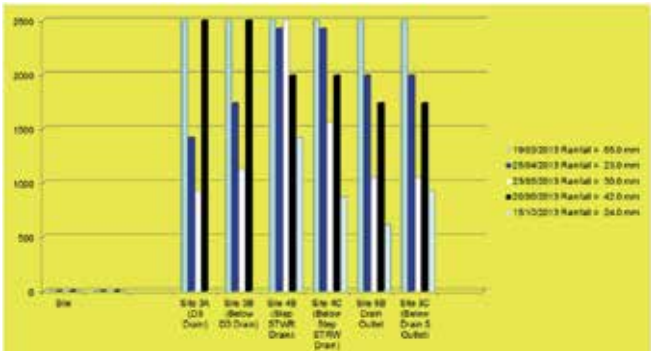


Figure 8: Wainui Stream water quality at three stormwater outlet sites (2013)

for DNA analysis were taken upstream of the Haumia Street storm water outlet and showed that the dominant faecal pollution sources were ruminant and that there was no evidence of human faecal pollution. This outcome highlights the effectiveness of using faecal source tracking methods to assist in confirming contamination sources of waterways in which high concentrations of faecal indicator bacteria are found (Kirs et. al 2011)

In October 2014, prior to restocking the farmland, all the paddocks bordering Te Puka and Wainui streams below the highway were fenced off. Excluding stock from a water body can improve water quality, improving its suitability for recreation, harvesting food, and as a habitat for fish. The Government proposes to regulate to exclude dairy cattle on milking platforms from water bodies by 1 July 2017. This will be extended to land used for dairy support, beef cattle and deer at a later date (MfE 2016). The dairy industry has made progress in voluntarily keeping stock out of water bodies. The Sustainable Dairying Water Accord has resulted in over 24,000 kilometres of fencing to keep dairy cattle on milking platforms out of more than 94 per cent of streams over one metre wide and 30cm deep (Scarsbrook and Melland 2015).

While stormwater outlets discharge directly into Wainui Stream during heavy rainfall events, we have found no evidence of any malfunctioning or poorly sited septic tanks in the Paekakariki Holiday Park that could have affected the water quality of the stream. Similarly, we have also found no evidence of any septic tank pollution emanating from nearby houses.

Regardless of the apparent "improved" overall water quality of the Wainui Stream, we doubt whether the stream is (even now) entirely safe for recreational use. That's because we have found that stream water quality will always fluctuate due to the following.

- Heavy rainfall events discharging contaminated storm water run-off into the stream.
- Persistent low flows at some sites because of the build-up of debris, vegetation and logs impeding stream water flows.
- Possible faecal pollution from agricultural runoff from animals that may gain access to any unfenced streams higher up in the farmlands or animals breaching the recently fenced off streams in farmland below the highway.
- Duck faecal pollution, especially at sites below the road bridge in QEP. A freshwater microbiology research project involving 25 sites in New Zealand found that catchments with waterfowl were the most contaminated across nearly all micro-organisms surveyed and that the critical value for E. coli as an indicator of increased Campylobacter infection was in the range of 200-500 E. coli per 100 ml (McBride et al. 2002). Using data from all sites, these authors estimated that four per cent of notified campylobacteriosis in New Zealand could be attributable to recreational water contact.

Site	Value	E.coli (per 100 ml)
Upstream from outlet	Median Range	1050 120 - 93000
Haumia street outlet	Median Range	5150 220 - 56000
Downstream from outlet	Median Range	2700 100 - 80000

Table 3: KCDC Haumia Street storm water outlet water quality results

DISCUSSION

Previous GWRC monitoring results indicate that there is significant microbiological stormwater contamination present in many urban streams (GWRC 2005).

The purpose of most existing stormwater systems is to collect stormwater and discharge it quickly to natural water bodies. Apart from a sump, there is usually no treatment of stormwater before it is discharged. The effectiveness of sumps is directly related to their design and maintenance regime and even then their efficiency is limited during heavy rainfall events (GWRC 2005). The KCDC's Haumia Street stormwater discharge water quality results for 2006 to 2013 (54 samples) are summarised in table 3 (KCDC 2014).

The risk of gastrointestinal illness following incidental recreational water contact can be reduced by efforts to decrease exposure such as public education about the hazards of capsizing and swallowing water and promoting frequent hand washing (Dorevitch et. al 2015). A recent health impact assessment of urban waterway decisions demonstrated that the impacts of water quality on health are often modified by users' behaviours and perceptions (Korfmacher et. al 2015).

A study of waterborne pathogens and associated health risks associated with exposure in urban waterways found that while E. coli concentrations were variable, high concentrations of Campylobacter were found that revealed risks above the annual disease incidence of campylobacteriosis in The Netherlands (Sales-Ortells et. al 2015). Recommended measures to reduce the gastrointestinal health risks included informing the public that waterways may have elevated levels of contamination after rainfall events and water contact should be avoided.

Given that the QEP and the Paekakariki Caravan Holiday Park is so hugely popular with families – especially in the summer – vigorous efforts to prevent the public from acquiring waterborne infections from the Wainui Stream during recreational activities that could involve water immersion and ingestion are appropriate. To this end we are happy to report that KCDC have now erected public health warning signs about stream contact after heavy rainfall.

In New Zealand, the National Policy Statement for Freshwater Management (NPS–FM) requires all regional councils to set limits for water quality in all waterways by 2025 (New Zealand Government (2014). For each identified value, specific water quality attributes must be set (e.g. for *E. coli* levels that indicate suitability for contact recreation) and every regional council must ensure that the values are set at or above the national bottom lines. Given that high concentrations *E.coli* that continue to occur in the Wainui Stream from storm water outlet discharges after heavy rainfall, it remains problematic if the GWRC will consider it appropriate to set values for the Wainui Stream below the national bottom line because the annual median is already below the national bottom line. The Paekakariki community, interest groups and environmental scientists alike await with expectation what this will mean for fresh water quality on the Kapiti Coast and potentially beyond in the wider region.

For a copy of the full report on this study (including all relevant references) contact Stan Abbott.

Email: S.E.Abbott@massey.ac.nz **WNZ**

- *Dedication: This article is dedicated to the memory of Margaret McNeill, who passed away recently, during the preparation of this article for publication. Margaret's co-authors wish to acknowledge her high standards of professionalism and commitment in her role as a Senior Technician at Massey University and in providing technical support for the investigations described in this article.*

Acknowledgements

Special thanks to IDEXX Laboratories (USA) and Environmental Diagnostics (Auckland), manufacturers and distributors of Colilert and QuantiTrays, for providing all the reagents, materials and equipment for this project.

UMA OYA MULTI-PURPOSE DEVELOPMENT PROJECT

Sri Lanka flood management and social impacts

By Upaka Rathnayake, Senior Lecturer in Civil Engineering, Sri Lanka Institute of Information Technology and D M Suratissa, Senior Lecturer, Department of Zoology, University of Colombo, Sri Lanka.

This is an edited version of the paper submitted for journal publication. It highlights conflicts of interest arising from a multi-purpose dam-construction project in Sri Lanka.

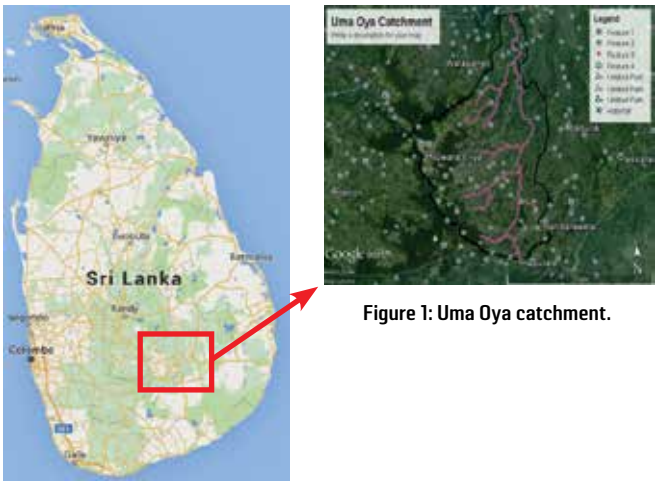


Figure 1: Uma Oya catchment.

INTRODUCTION

River basin management is not new to Sri Lanka. The accelerated Mahaweli development project, probably the largest multi-purpose hydro project in Sri Lanka, is one of the better examples for this river basin management among others such as the Kalu River and Walawe River development projects and Goloya Valley development project.

Uma Oya is one of the major tributaries of Mahaweli River, the longest river in Sri Lanka. Uma Oya starts from Pidurutalagala (Sri Lanka's highest mountain) and reaches Mahaweli River at Rantambe reservoir. Therefore, it has a significant elevation difference ranging from 2500 metres to 152 metres over the length of the river. Uma Oya catchment covers an area of around 720km^2 (Environmental Impact Assessment [EIA] supplement report, 2010). The Uma Oya multi-purpose project is proposed to divert 145MCM (million cubic metres) of water annually to Kirindi Oya basin (south-east dry zone). However, 231GWh of hydroelectricity (annually) is expected to add to the national electricity grid of Sri Lanka as an indirect outcome (120MW hydropower station).

The ongoing Uma Oya multi-purpose project is subject to many environmental concerns. Environmental organisations and local people believe that the damage from the project outweighs the gain from it to the country. However, the authorities have a controversial idea on the project's deliveries. A critical analysis from an engineering point of view has not been conducted in literature and it is therefore timely to conduct such an analysis to identify whether the benefits the project delivers outweigh the adverse impacts or vice versa. This paper therefore presents the primary overview details of what is an ongoing multi-purpose project from an engineering point of view and looks at the project's role in flood management.

ABSTRACT

The Uma Oya multi-purpose development project (UOMDP) in Sri Lanka has been under the eagle eye not only of local environmental organisations but also the general public. UOMDP is expected to deliver many outcomes. These include enhancement of the country's hydropower generation, provision of drinking water for dwellers in dry areas of southern Sri Lanka, provision of water for proposed industrial zones in Hambanthota and enhancement of agricultural lands south of Sri Lanka. However, there is doubt whether these objectives outweigh the adverse environmental concerns related to the project. The UOMDP involves two new reservoirs and a tunnel to divert water to the southern area of Sri Lanka. It was initially drafted by Central Engineering Consultancy Bureau (CECB), Sri Lanka in 1991. However, it was rejected by the Asian Development Bank because of the violation of the water rights of the people. Therefore, a mix of advantages and disadvantages can be identified from our initial review of the project. In addition, indirect benefits and losses can be discussed in the context of floods and social impact.

HISTORY OF UMA OYA DEVELOPMENT PROJECT

The Uma Oya project has a long history dating as far back as the 1950s. Uma Oya catchment was analysed in 1959 by the United States Operations Mission (USOM) and Canadian Hunting Survey Corporation (CHSC) for the potential development of hydropower. Under the United Nations Development Program – Food and Agriculture Organization (UNDP FAO) has proposed a master plan to develop the Uma Oya basin by constructing two dams to create the Upper and Lower Uma Oya reservoirs. This proposal was tabled during the years of 1968–1969. It was further discussed during 1988-1989 by the Lahmeyer International Company as part of a master plan to supply electricity in Sri Lanka. It proposed a three-stage development program to Uma Oya basin. This was later revised to a two-stage project. However, all these proposals were abandoned for various reasons, including funding issues and environmental concerns. In addition, these proposals were never planned to include or extend the project benefits to areas such as Hambanthota, Monaragala and Ampara where there is a significant amount of irrigable lands lacking adequate water for irrigation. However, in 1991, the Central Engineering Consultancy Bureau Sri Lanka (CECB) carried out a pre-feasibility study for Uma Oya Trans-basin project. This Trans-basin project proposed to divert the Uma Oya water to southern Sri Lanka. However, it was rejected by the Asian Development Bank due to water rights violations of the people. Nevertheless, CECB, in connection with Lavalin Inc, Canada, re-posed this Uma Oya Trans-basin project in 2000. Now the project is under construction with help from the Republic of Iran.

ADVANTAGES OF THE PROJECT

Southeast Sri Lanka has a dry weather pattern and scarcity of water. The proposed multi-purpose Uma Oya project aims to divert an annual 145MCM of water to the area. The supplementary document to the EIA reveals that there would not be any potential adverse impact downstream of Uma Oya, if this 145MCM were diverted to southeastern Sri Lanka. The diverted water is intended to enhance the area's irrigation capacity. In addition, it is expected that a total of 231GWh of electricity will be generated annually from this project due to the head difference of water from Uma Oya to down south. Apart from the proposed hydropower development from the Uma Oya multi-purpose project, Sri Lanka is looking to develop two other major hydropower development projects – Moragahakanda and Broadlands. These are the only major potential hydropower development projects in Sri Lanka. However, they can generate only 25MW and 35MW, respectively. Therefore, the Uma Oya project can be considered the last major hydropower development project in Sri Lanka.

In addition to the above stated advantages, the project has many other indirect advantages to the society. The development work is expected to last for several months – good news for the local construction industry, economy and retailers. Small businesses, for example, temporary small cafeterias (tea shops) are a very common feature in Sri Lanka around construction sites.

UMA OYA PROJECT AND FLOOD MANAGEMENT

Uma Oya catchment area is a green catchment. It has a significant annual rainfall (2000–2500mm/annum) (Peris et al, 2006) and therefore, rain-fed agriculture is the common income source for local people. Among many other cash crops, the area is famous for its potatoes. However, bad agricultural practices have led to significant sediment flow to the Uma Oya. This can be easily reckoned from the capacity of Rantambe reservoir (Revel et al, 2015; Ratnayesuraj et al, 2015). Rantambe water data provides the best proof for this capacity reduction. It was supposed to be at 11MCM level when it was constructed and it was reduced to 7MCM. Those experienced in the field suggest this capacity is likely to reduce further. Therefore, spills in Rantambe reservoir are frequent even during low rainfall events upstream.

Hydrological data from Rantambe reservoir show that the number of spills per year has increased over time. This is not because of an increase of the annual rainfall volume but due to the capacity reduction of the reservoir itself. That spillage is wasteful as the water could be put to use elsewhere. Diverting some of this water – as proposed in the Uma Oya project – would reduce the stress of flooding downstream of Rantambe dam as well as in the upper catchment of Uma Oya. It could therefore be viewed as a downstream flood protection project.

Figure 2. The muddy water flow from Uma Oya.

PROJECT DISADVANTAGES

1. Damage to the eco system

The damage to the eco-system in Uma Oya catchment is considered a significant threat – as can clearly be found from the EIA report.

Molluscs (land snails), amphibians, reptiles, birds and mammals were found to be common in the concerned area. Among these, three species of land snails, 13 species of amphibians (one endemic), 10 species of reptiles (one endemic), 150 species of birds (six endemic, one endangered), and 17 species of mammals (one endemic, five endangered) have been identified. This biodiversity list highlights the importance of the eco system in the affected Uma Oya catchment which can be negatively impacted by the project.

As in any other development project, the Uma Oya

catchment is under pressure from land clearance, dredging, excavations, cut-and-fill and rock blasting. In addition, construction of access roads, resettlement of local people and establishment of new agricultural lands is being practised. These major activities will directly affect the ecosystem diversity of the catchment.

As an outcome of such impacts, some of the habitats will be fragmented and species isolation will result which in turn can result in in-breeding and potential species extinction.

Furthermore, the groundwater table will be changed due to the proposed two reservoirs which could lead to water-logging and landslides. In other words, the project has many environmental drawbacks.

2. Damage to the infrastructure

Our field visits also noted the damage to local people's properties which has been blamed on the Uma Oya project and tunneling activities. However, an engineering analysis was not conducted to substantiate this – and it is recommended that a detailed engineering analysis should be carried out to ascertain the reasons for this damage.

In addition, we were able to see evidence of the adverse impacts on water wells which are used by local people. They claim these wells no longer have water – even during the rainy season (refer Figure 4).

Figure 3. Observed property damage during field visits.

Figure 4.

SUMMARY AND CONCLUSIONS

While the Uma Oya multi-purpose project has many advantages to the society, it also has many disadvantages to the Uma Oya catchment. These disadvantages are evidenced from the field visits. However, counter measures have not yet been taken to mitigate the disadvantages of the project. It is therefore recommended that the authorities reconsider the project in a way that it can be conducted with the least amount of disadvantages as it is not in a position to abolish the project.

Acknowledgements

The authors would like to thank Mr S Wanniarachchi (Assistant Lecturer in Sri Lanka Institute of Information Technology), Mr B Khaniya and Miss D Senadeera (1st year Engineering undergraduates) for their effort in field visits. Mr Samantha Widyarathna (a member of provincial council) also provided support.

References

Peris T. U. S., Samita S. and Kumari W. M. R., (2006). *Variability in Rainfall Pattern and Its Impact on Tea in Uva Region of Sri Lanka. Sri Lankan Journal of Tea Science*, 71(1), 8-23. Supplementary EIA Final report for the Proposed Uma Oya Multipurpose Development Project (2012) Volume 1, University of Sri Jayewardenepura, Nugegoda, Sri Lanka.

Ratnayesuraj C.R., Rifas K.M, Risly S. and Weerakoon S.B. (2015) Model study of sediment flushing in Rantambe reservoir. 3rd International Symposium on Advances in Civil and Environmental Engineering Practices for Sustainable Development (ACEPS – 2015), University of Ruhuna, Sri Lanka.

Revel N.M.T.K., Ranasiri L.P.G.R, Rathnayake R.M.C.R.K and Pathirana K.P.P. (2015) Estimation of sediment trap efficiency in reservoirs – an experimental study. *Engineer*, 48(2), 43-49. **WNZ**

Water sector improvements
Progress along the journey

While the water sector faces challenges from aging infrastructure to fragmented data, progress is being made in several areas – as Water New Zealand's technical manager **Nick Walmsley** outlines.

The 3 waters sector (drinking water, wastewater and stormwater) can no longer afford to do business as usual, with an ever-increasing capital gap for water infrastructure due to aging systems and increasing demand for water coupled with stricter environmental controls.

Recent reports from central government, local government and Water New Zealand (representing the water industry) all recognise that there is both room and need for improvement. This recognition has led to both initiated and planned improvements. Where might it lead we ask?

Where are we now?

The New Zealand water industry has many similar challenges to other developed countries, with increased demands, aging infrastructure plus variable and fragmented data. As the old adage goes: good decisions rely on good data – decisions without data are guesses. The NZ National Infrastructure Unit has promoted evidence-based solutions for infrastructure and the support for this is increasing. However good decisions do not only require good data, they also require good data analysis.

In addition to our ongoing programme of creating and updating national guidance documents, a number of projects have been recently initiated that feed into evidence-based infrastructure solutions. For full project information see www.waternz.org.nz/library:

- Water New Zealand has undertaken an annual National Performance Review of the 3 waters since the initial pilot survey in 2008. This is a voluntary survey allowing performance assessments leading to performance improvements. This year's survey contains information from 41 council-owned utilities covering the services they provide to 85 percent of the country's population. This contains standardised qualitative and quantitative data and internationally recognised performance indicators that are cross compared both nationally and internationally. This is excellent evidence that allows utilities to prioritise their business improvements and to learn from and help their peers. Each year one aspect that can provide national improvement is picked as a training topic with tools available for participants.
- LINZ is managing a metadata project which will detail and standardise which attributes should be measured and how they should be measured to give consistent information on both material and performance attributes across similar pipeline-related assets. There is active contribution and support from across the water sector throughout this work. How this will be implemented in a nationally cohesive way is under discussion.
- Two additional Water New Zealand specialist interest groups have recently started, focused on water data and water efficiency.
- A new pipeline tools project is planned through collaboration between the UC Quake Centre, IPWEA and Water New Zealand to provide guidance and tools to enable water organisations to implement advanced asset management processes that can be used to inform improved pipe renewals decision making. The first phase has just started, comprising a literature search to inform a future programme of work, developing and implementing the proposed NZ Pipeline Renewals Guidelines and Tools. This will also reference the metadata project. The focus is initially on pipework assets – as they make up the largest proportion of water systems – but over time the scope will be extended to other assets.
- The 2001 asbestos cement water main manual and lifetime prediction model is currently being updated.

Data analytics

The term "analytics" is a new buzzword in the water industry. Many industry analysts predict that data analytics will transform operational decision-making at water and wastewater utilities over the next five to 10 years. In the here and now, industry trends are driving improved asset management. Aging infrastructure and an aging workforce, limited capital to fund new equipment and replace assets, and efficiency demands place escalating pressure on the water industry to optimise decision-making to improve performance, reduce costs and minimise risk.

Smart integrated infrastructure is changing the management of assets, which translates to smarter operations. The water industry needs to embrace these techniques, including both learning from and contributing to the worldwide experiences that are starting to be shared. The key to this is to standardise data and the platforms used to analyse it. This will ultimately include using similar platforms for financial, customer and asset data so that they can all be used to inform operational decisions.

Where might this lead?

In the short term it is clear that this increase in data consistency and standardisation will lead to:

- A clearer and more accurate understanding of the status quo;
- Improved tools for asset management; and
- Improved abilities to predict future requirements and plan for them in a cost-effective way.

In the long term, the picture is less clear regarding operational decision-making but has many positives. We have 67 councils managing utilities and each has a rich history of how they have worked with their communities to provide services. Each has complex data collection systems and decision processes that relate to provision of services, costs, charging and policy compliance.

Unfortunately many of these services and systems have been developed in isolation and while based on good intentions and local historical need, there is much of a unique nature that is inefficient in today's internet-filled world. Organisational changes take time and complex organisations rarely have the ability to undertake many changes at the same time, while maintaining customer service.

The fact that the water industry collectively is participating in projects based on improvements is a very positive sign and each year there are tangible improvements.

Like most countries, reaching infrastructure utopia will take time. It is a long road and, given that community demands, environmental conditions and regulatory controls all change over time, there may be no end.

However, excellent progress is being made – and will continue to be made. **WNZ**

Oxfam Water Challenge: Making a splash for Melanesia

On 20 February, over 50 people from the water industry gathered at Saint Kentigern Boys' School in Remuera to compete in the Oxfam Water Challenge 2016. With supporters cheering them on and a keen bunch of the school's students there to help, 13 teams faced off against each other with the collective goal of raising $50,000 to fund a water, sanitation and hygiene education (WASH) project in Papua New Guinea.

The task was to deliver 100 litres of water as quickly as possible from a paddling pool to a reservoir at the end of a 27-metre long lane, using only milk bottles and a structure the team designed and built out of wood, plastic sheeting, pipe and twine. The tasks simulated the kind of challenges faced by Oxfam staff working in developing countries.

Clearly, teamwork, engineering, building skills and speed were all crucial. Points were awarded for speed, teamwork, quality of the design and build of their structure – even outfits. A lot of fun was had while everyone worked toward the ultimate goal of raising crucial funds to help people in Melanesia with clean water and basic sanitation.

All of the Oxfam Water Challenge teams successfully completed the task.The three prizewinning teams on the day were from Downer New Zealand, Morphum Environmental and MWH Global. They each took home great prize hampers donated by generous sponsors including the University of Auckland Short Courses, Sileni Estate wines, Trade Aid and many more.

PHOTO: HAKAN NEDJAT PHOTOGRAPHY

In addition, the team that ends up with the top fundraising total will get the chance to visit Oxfam projects in Vanuatu later in the year.

By working together, New Zealand companies can make a real difference to the lives of communities that are forced to drink dirty water every day. Throughout much of Melanesia, ill-health from poor quality water and sanitation is one of the most serious threats to human life. Shockingly, in Papua New Guinea just 33 per cent of rural people have access to safe water.

Following Cyclone Winston, many people in Fiji also face challenges accessing clean water. You can help communities that have lost everything by contributing to Oxfam's Cyclone Winston appeal at oxfam.org.nz or on 0800 600 700. **WNZ**

UNITED WE STAND, DIVIDED WE FALL

A shortage of skilled people is threatening both the safety and ongoing sustainability of our water infrastructure, says Connexis CEO **Helmut Modlik**.

The water industry is struggling to find the qualified and experienced people it needs. This is placing increased pressure on workers, increasing operating risks and potentially compromising standards and safety.

This is not acceptable for any infrastructure operation, and definitely not for water. What is going on? How has an industry with a long and proud history of attracting, training and retaining a high quality workforce got to this point? A point where there are not enough competent people available to do the work required, or to fill the vacancies being created by an aging workforce and natural attrition.

Asset owners have, for some time, been under pressure to prolong the operating life of aging infrastructure, while concurrently minimising rate burdens and lowering debt levels. As a consequence, they have asked operators to deliver more and more for less and less. This has intensified competition between operators – not only for available business but also for the skilled people who can construct, maintain and operate water assets. This in turn has placed downward pressure on operators' prices and revenues, and upward pressure on personnel costs chasing increasingly scarce resources.

The net result? Reduced financial capacity in the industry to invest in hiring and training the next generation of operators, instead chasing a smaller and smaller group of competent people – looking for them overseas or poaching from each other. This 'win-lose' situation is clearly unsustainable.

To have a sustainable industry, investment is required in building the capability and capacity needed both today and tomorrow. A pipeline of increasingly competent people must exist if future needs are to be met. Sadly, current financial pressures are causing many to lose sight of the need for this investment. All of this has serious implications for everyone in the short, medium and long term.

At present, individual companies are responding to the situation by focusing on their proprietary interests. This is understandable, but will not change the overall situation facing the industry. By taking steps to protect their own interests, operators may win the competitive battle, but lose the war against diminishing profitability and increasing operating risks.

So what can be done?

Most importantly, we must recognise that these are industry issues that need an industry answer. For that to emerge, we need to talk and collaborate around options. While this may fly in the face of competitive pressures, the underlying macro issues are industry-wide and cannot be tackled unless we work together. Whilst easier said than done, the importance of collaborating at this time cannot be overstated.

We also need to be honest with ourselves. By poaching each other's workers or bringing in internationally trained people who are unfamiliar with local and national standards, we are only easing proximate pain while actually prolonging the underlying malady.

Part of the problem is that the water industry is competing for available talent with every other industry struggling to attract high calibre people. We need to improve both the attractiveness and awareness of our industry to ensure we are getting 'our fair share'.

The whole industry will benefit if we can raise awareness of various career options and demonstrate to young people and career changers that we can offer them income potential, transferable skills, and an attractive career and development pathway in a progressive industry.

Part of increasing industry attractiveness lies in strengthening its professional nature. Indeed, this is an excellent example of collaboration for the benefit of the industry as a whole. Connexis has been involved with recent industry discussions around increased professionalism, and while the form this might take is still emerging, it is certain to include continuing professional development, and possibly further recognition beyond current qualifications to strengthen demonstrable competence. The civil industry recently launched a Civil Trades regime, which combines a Level 4 trade qualification with certified hours of practical experience, for similar reasons.

Whatever options we decide to pursue, we need to stand together.

Working collaboratively will best ensure the water industry is able to meet the provision of supply and demand for increasingly scarce people and become the industry of choice for career seekers. Let's put our heads together and see what we can do – the benefits for the whole industry will be huge. Failure to do so will also be huge. *For further information, go to www.connexis.org.nz or call 0800 486 626.* **WNZ**

Water training JV disbanded

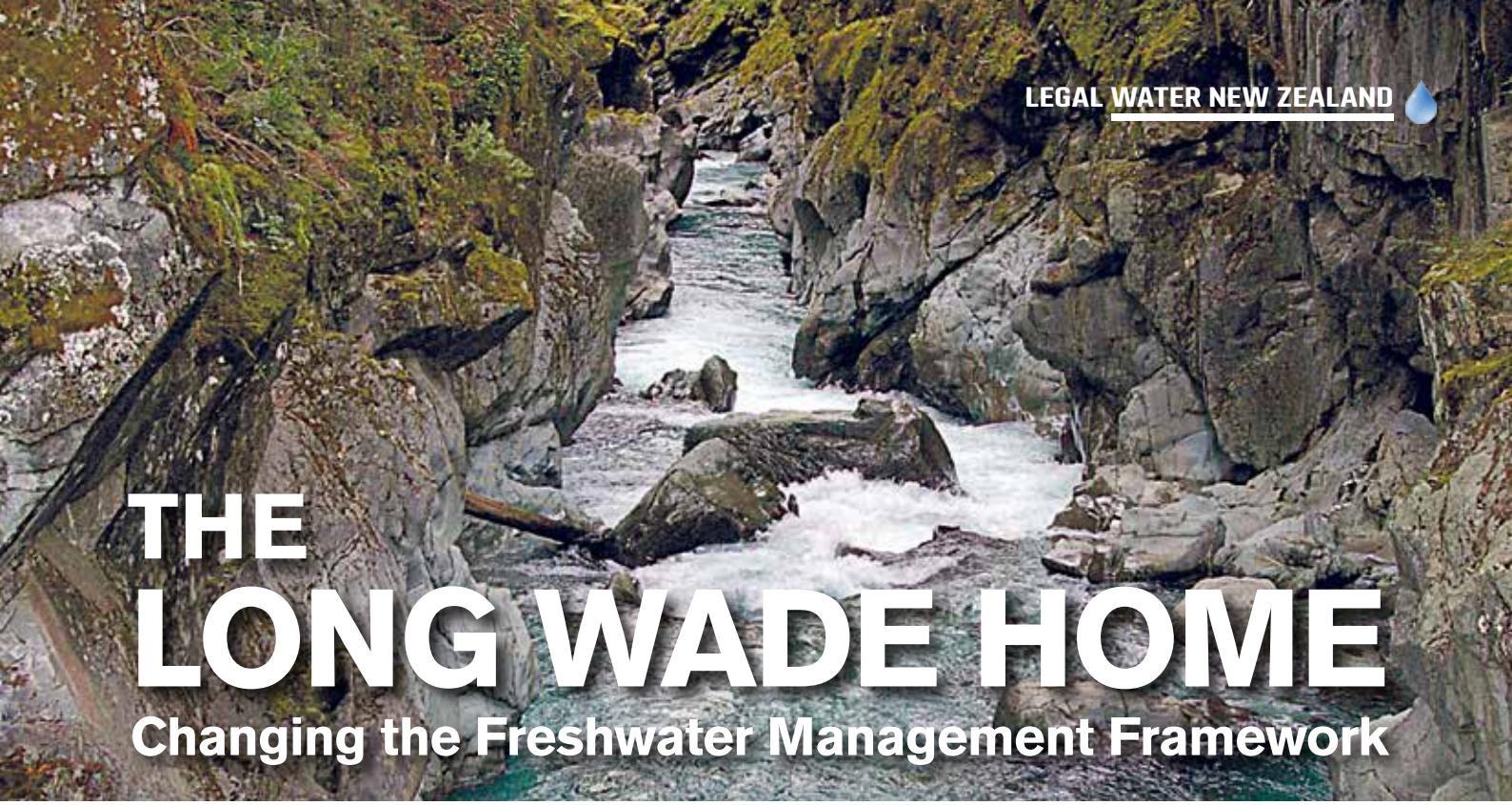
After 14 years of successfully delivering water training programmes, the NZ Water and Environment Training Academy JV between Water New Zealand and Opus Training Academy was disbanded at the end of March.

A recent review of the JV determined that each party can better service the water sector and fulfil their specialist roles independently of a formalised JV structure. However, the two parties will retain a strong working partnership for the benefit of the water industry and will continue to work collaboratively to maintain a high-performing water training market and quality water training providers.

Water New Zealand chief executive John Pfahlert says the change in structure will not impact course delivery in 2016.

Opus will continue to deliver specialist water training through the Opus Environment Training Centre (ETC) as well as developing and delivering future training ideas in collaboration with industry and providers. Water New Zealand will continue to promote and enable the sustainable management and development of the water environment, recognising that the effective delivery of workplace learning and of new skills is critical. They will continue to support Opus as the industry vehicle for the delivery of specialist water sector training.

The move has been taken in the context of other changes in the training sector including the recent transfer of Water Qualifcations to Connexis Infrastructure ITO last July. It is seen as a proactive and positive move that will enable both Opus and Water New Zealand to focus on their core strengths to better deliver overall benefit and meet the needs of a changing water environment. **WNZ**



THE LONG WADE HOME

Changing the Freshwater Management Framework

By **Helen Atkins,** partner, **Vicki Morrison-Shaw,** senior associate; and **Phoebe Mason,** solicitor – Atkins Holm Majurey

Freshwater management is a 'long game' project. Even when uninfluenced by human activities and consumption, nature dictates the rate at which water is filtered through subterranean systems, and depleted water bodies recharged. Each drop has a long wade home through the cycle back to where it began.

Freshwater advocates for swimmable rivers seek aspirational targets, on the basis that lenient transition periods will cause irreparable cumulative damage. Industry groups and councils can focus closely on the present day bottom line, to the detriment of future generations and the lag in effects of pollution and overconsumption on the environment. The balance is a careful one, and one which deserves New Zealand's attention and input.

The Government has released the next phase of its freshwater management 'long game', in the form of a consultation document entitled *Next Steps for Freshwater*. The document is another step in a process which began in earnest with the creation of the Land and Water Forum in 2009. This article provides an overview of the discussion document and some of the key questions posed in that document. We then move on to discuss a recent commissioners' decision on the Land and Water Plan for Canterbury – another matter (at least in terms of the Plan itself) that has been a fairly long time in the making.

FRESHWATER CONSULTATION; NEXT STEPS

In February, the Minister for the Environment, Hon Dr Nick Smith, and the Minister for Primary Industries, Hon Nathan Guy, jointly produced a consultation document called *Next Steps for Freshwater*. The document sets out the Government's proposed next steps toward improving freshwater management in New Zealand, and seeks feedback on its proposals.

The document recognises that pressure on freshwater systems, from land use changes and population growth, is becoming increasingly evident. The sources of this pressure vary. Pollution from diffuse sources includes agricultural land use, urban sewerage plants and pipes, and increased run-off from impermeable roofs and roads. Consumptive water takes have also increased due to factors such as irrigation and denser urban populations.

In some places, water take limits are met or exceeded and water quality is declining. These matters together not only limit the availability of water both for industry and community consumptive uses, but also threaten Te Mana o te Wai – the ability of water to sustain life and biodiversity and in turn to meet our recreational and cultural needs.

The document seeks a more sophisticated approach to water quality aspirations, accounting for natural fluctuations in water quality (such as those arising from high rainfall events), as well as the time, costs and impacts of making changes toward improved water quality on communities, councils, iwi and businesses. The document seeks to spread costs evenly over sectors and generations.

The key proposals are as follows:

- Amend the National Policy Statement for Freshwater Management 2014 (NPSFM) to improve direction on:
  - Exceptions to national bottom lines for catchments with significant infrastructure;
  - Using the Macroinvertebrate Community Index as a mandatory monitoring method;
  - Applying water quality attributes to the intermittent closing and opening of lakes and lagoons;
  - What it means to 'maintain or improve overall water quality'.
- Exclude stock from water bodies through regulation.
- Require more efficient economic use of freshwater and good management practice.
- Strengthen Te Mana o te Wai as the underpinning platform for community discussions on fresh water.
- Improve iwi/hapu participation in freshwater governance and management.
- Better integrate water conservation orders (WCOs) with regional water planning and allow for increased iwi participation and decision-making on WCOs.
- Set up the 'Next Steps for Freshwater Improvement Fund'.

We comment on a few of these in more detail below.

MAINTAIN OR IMPROVE OVERALL WATER QUALITY

The matter of what Objective A2's aspiration to 'maintain or improve overall water quality' actually means has been exercising minds in the legal world since 2014, including cases which we have discussed in previous articles. In recognition of the lack of clarity on the meaning of the objective, Next Steps seeks to clarify two matters of concern.

Firstly, that the 'overall' relates to a freshwater management unit (FMU), not a region or the whole nation. Secondly, that fluctuation of an FMU within an attribute band fulfils the requirement to 'maintain'.

In the past, councils have looked to specific numerical values rather than the applicable attribute band in measuring whether water quality had declined. This proposal clarifies the Government's intended geographical scope of the 'maintain or improve' objective, and the purpose of attribute bands. It is noted however that cross-boundary issues (such as the approach to water bodies that extend beyond regional boundaries) are not as yet addressed.

IWI RIGHTS AND INTERESTS IN FRESHWATER

A significant portion of the consultation document relates to assessing iwi rights and interests in fresh water. The proposals include:

- Including a purpose statement in the NPSFM to provide context about the meaning of 'Te Mana o Te Wai' and its status as the underpinning platform for community discussions on freshwater values, objectives, and limits;
- Requiring regional councils to reflect Te Mana o Te Wai in their implementation of the NPSFM;
- Amending the RMA to establish provisions for a new form of rohe (region or catchment) based agreement between iwi and councils for natural resource management, called a 'mana whakahono a rohe' agreement. The agreement would set out how iwi and councils are to work together in relation to all natural resource related matters. Essentially this is a potential alternative to the iwi participation agreements proposed in the Resource Legislation Amendment Bill 2015; and
- Amending the RMA to require WCOs to more fulsomely address iwi concerns.

STOCK EXCLUSION

This proposes a national regulation to exclude dairy cattle on milking platforms from waterbodies by 1 July 2017, and other stock types at later dates. Exclusion must occur on dairy support land owned by dairy farmers by 2020, but land grazed by third parties has an extra five years to 2025. This proposal is echoed in the Resource Legislation Amendment Bill 2015, and so may see the light of day sooner than other proposals.

FRESHWATER IMPROVEMENT FUND

The Freshwater Improvement Fund takes the $100 million over 10 years (2014-2024) committed by the Government to buy and retire riparian margins of farmland to create environmental buffers for waterways, and broadens the focus of the funding.

The new fund focuses on supporting projects which will help water users' move to managing use within water quality and quantity limits to deliver clear environmental benefits. For example, the economic benefits of irrigation projects will not be funded, but where irrigation schemes are designed to provide significant environmental benefits, they may receive funding to support the positive environmental outcomes.

The proposal sets 10 criteria for funding. The environmental focus of the funding is clear in one of the criteria particularly – that "if comparable projects achieve similar economic and environmental objectives cost-efficiently, preference will be given to projects that achieve co-benefits, such as improvements in ecosystem health, conservation and climate change".

CROWN IRRIGATION INVESTMENTS LIMITED

The Freshwater Improvement Fund is complemented by government funding to Crown Irrigation Investments Limited, which has a mandate and $400 million equity funding to invest in irrigation schemes which are environmentally sustainable and will provide economic benefits to New Zealand.

HAVE YOUR SAY

As *Next Steps* is a consultation document, the Government is seeking responses from all interested parties. Appendix 2 of the document is a set of 18 questions which relate to the decision at the heart of each proposal, and can be seen as a guide for submissions on the proposals. Submissions are due by 5pm Friday 22 April 2016, and can be made at www.mfe.govt.nz/consultation/next-steps-fresh-water.

RECENT CASES

REPORT AND RECOMMENDATIONS OF THE HEARING COMMISSIONERS, PROPOSED PLAN CHANGE 2 TO THE CANTERBURY LAND AND WATER REGIONAL PLAN

On 4 February 2016, Environment Canterbury announced that it was accepting the recommendations of the independent commissioners on Plan Change 2 (PC2) to the Canterbury Land and Water Regional Plan (LWRP), and published its decision online.

PC2 applies to the catchment of the Hinds River and the plains between the Rangitata and Ashburton Rivers. It is an area of 1380km^2, and is in the Ashburton District.

We do not attempt to summarise PC2 in its entirety here, but encourage you to read the decision if you are interested.

Here we discuss some legal determinations made in the decision which will be of relevance to future plan changes, including other Environment Canterbury Plan Changes which are progressing through the hearing process.

National Policy Statement for Freshwater Management 2014

PC2 was prepared before the NPSFM 2014 came into effect, but was notified after it came into effect. The commissioners considered the 2014 NPSFM to the extent that submissions had focused on that version, but noted that PC2 did not give complete effect to the 2014 NPSFM, and the council would need to review the LWRP in accordance with its staged implementation plan, prepared under Policy E1 of the 2014 NPSFM.

Part 2 of the Resource Management Act 1991

Following the decision of the Supreme Court in *Environmental Defence Society Inc v The New Zealand King Salmon Company [2014]* NZSC 38, the panel made its decisions on PC2 in the context of the applicable superior planning documents (such as the Regional Policy Statement and the NPSFM), but without making direct reference to the purposive sections of Part 2, RMA. This is likely to be the manner in which plan changes are decided from now and is the process recommended by the Environment Court in the recent Appealing Wanaka case.[1]

'Overs and unders' in water management

Much like the question posed in the consultation document discussed above, the panel considered whether Objective A2 of the NPSFM allowed a council to manage 'overall water quality' on a regional basis, permitting water quality to drop in some catchments, so long as it was improved elsewhere. The panel reviewed two recent decisions of the Environment Court (Ngati Kahungunu and Puke Coal) and one recent decision of the High Court (on the Tukituki plan change).

Interestingly, the panel did not strictly follow the decision of the Environment Court in Ngati Kahungunu, which had stated that the 'unders and overs' approach was "fatally flawed".

The panel considered that, given the wording had not changed between the 2011 and 2014 versions of the NPSFM, and given the 'pragmatic' approach taken by the Environment Court in Puke Coal, there was no inherent conflict between providing for further land use intensification while still giving effect to Objective A2 of the NPSFM.

Prohibited Activity Status for Water Transfers

Some submitters argued that it was legally impermissible to assign a prohibited activity status to the transfer of water permits.

The panel concluded that as the transfer of water permits is to be treated like an application for resource consent, then assigning one of the full range of activity statuses permissible for resource consents, including prohibited, was appropriate and permissible.

The transfer of water permits (both surface water and groundwater) within the over-allocated 'Valletta Groundwater Allocation Zone' is prohibited under PC2 while limits are not being met.

Economic Viability Considerations

Interestingly, the panel held that there is a distinction between physical viability of rules and economic viability of rules:

[296] We can accept that a rule constraining farming activity that is physically incapable of being obeyed might well be ineffective and should be revised. But a constraint that is physically capable of being complied with, though at an economic cost that may contribute to imperilling the viability or profitability of the business, is not similarly open to challenge.

Appeals

Three appeals have been filed in the High Court against the PC2 decision, by Barrhill Chertsey Irrigation Limited (2 March 2016), Combined Canterbury Provinces Federated Farmers (4 March 2016), and Rangitata Diversion Race Management (3 March 2016). **WNZ**

[1] *Appealing Wanaka Inc v Queenstown Lakes District Council* [2015] NZEnvC 139 at paragraphs [53] and [54].

Downer earns Taupo water contract

Taupo District Council has awarded Downer New Zealand Limited its three waters maintenance contract. The $11.4 million contract is for a five year period with rights to two, two-year renewals subject to performance and council approval. It also includes electrical maintenance work at the council's treatment plants and pump stations.

Mayor David Trewavas said the council had undertaken a robust process to select the successful tender. Of the 10 companies who expressed an interest, four were shortlisted and evaluated by a team of five including an independent moderator. Each company was assessed against a weighted attribute system and a score given. Sixty per cent of the score was based on attributes and 40 per cent was based on price. Downer had the highest score.

The original engineers' estimate for the merged contracts was $12.5 million. Trewavas said the weighted attribute tender process reflects that this is a high-value, long-term service delivery contract. It took into account a number of factors including methodology, experience, company capability and health and safety.

"Our procurement policy acknowledges that value for money does not necessarily mean selecting the lowest price but rather the best outcome for the district.

"Downer is well established in the Taupo District with roading teams based in Taupo and Turangi. It is proposed that the delivery team for the contract will be split between its Taupo and Turangi offices so they will be well positioned to attend urgent jobs at both ends of the lake," he says.

"The merging of the maintenance and electrical contracts is also expected to deliver some cost savings through the efficiencies gained." Chris Jobson, National Water Manger for Downer sees the opportunity for a long term partnership with Taupo District Council as beneficial to the local community.

"Downer designs, builds, maintains and delivers water services throughout New Zealand and we are delighted to be working closely with the Taupo District Council on this contract. Our focus is on a smooth transition at the start of the contract and integrated service delivery for the local community to showcase our expertise in water, wastewater and stormwater systems."

"Communities are at the heart of everything we do. We believe in the future growth of the Taupo District and our commitment to providing quality three water services goes beyond our contractual obligations. We will employ a local team dedicated to the three waters maintenance contract and we also intend to support the local area with support for the voluntary fire service."

The contract begins on July 1. **WNZ**

Christchurch infrastructure leader appointed


Sina Cotter Tait

Harrison Grierson, a leading locally owned engineering and design consultancy, has appointed a senior Christchurch engineer as Infrastructure Team Leader.

Sina Cotter Tait is a chartered professional engineer and senior design manager.

She specialises in project management of civil engineering design and construction; and engineering investigation and design of infrastructure including stormwater, roading, sewer, water and services.

Her construction expertise includes investigations, assessment and design reports, cost estimates, contract documentation, and tendering and contract management. Sina has been actively involved in the rebuild of Christchurch. Her experience in leading delivery of multi-disciplinary projects includes new schools and site redevelopments.

Sina is based in Christchurch where she leads the South Island infrastructure team. Her qualifications include a Bachelor of Engineering (Civil), CPEng (Civil), and an MBA (conferred in January). She is a member of IPENZ. **WNZ**

Stepping up

Seven senior staff at Harrison Grierson, have been appointed as principals and five others promoted to Associate.

Appointed to Principal: Ioannis Prionas (Structural Engineering Team Leader, Auckland); Clare Covington (Senior Planner, Auckland); Darryl Martin (Senior Surveyor/Project Manager, Auckland); Grant Rae (Land Development Team Leader, Tauranga); Andrew McCarthy (Senior Planner, Auckland Airport); Daniel Scott (Senior Engineer, Auckland); and Mike Chapman (Senior Hydrologist, Auckland).

Promoted to Associate: Neil Black (Senior Planner, Auckland); Sam Coles (Senior Urban Designer, Auckland); Simon Xie (Senior Engineer, Auckland Airport); Loren Abraham (Engineer, Auckland Airport); and Mark Andrews (Senior Civil Engineer, Christchurch).

Harrison Grierson managing director, Glen Cornelius, said the promotions reflected each person's technical expertise and commitment to the company and their clients. **WNZ**

CLASSIFIEDS

ACUFLO®

NZ OWNED & NZ MARKET COMMITTED
PROVEN PRODUCTS & PERFORMANCE

MANIFOLDS

New Zealand 20 year industry favourite.
Meter, Backflow, Flow Control, Strainer.
Full range. DR Brass or Composite Materials

WATER METERS

Full range of models and sizes.
OIML R49 and ISO 4064 listed
Sensus - Maddalena - Acuflo models

BOXES

Full range of sizes. Superior polypropylene material. Customised lids, boxes and bases.

BACKFLOW

Full range of models and sizes.
AS/NZ 2845 and ICNZ listed.
Febco - Wilkins - Acuflo models

PERFORMANCE TESTED

All Acuflo products are performance tested against pressure loss and accuracy.

NEW ZEALAND MADE

ACUFLO INDUSTRIES LTD

31 Reeve Street, Levin, New Zealand | Phone 06 368 4996 | Fax 06 367 9201
PO Box 660 | sales@acuflo.co.nz | www.acuflo.co.nz

ISO 9001 CERTIFIED GCS

Technology for efficient water quality management & control

Amiad EBS Filters

The largest automatic self-cleaning filter for fine filtration

Amiad SAF Filters

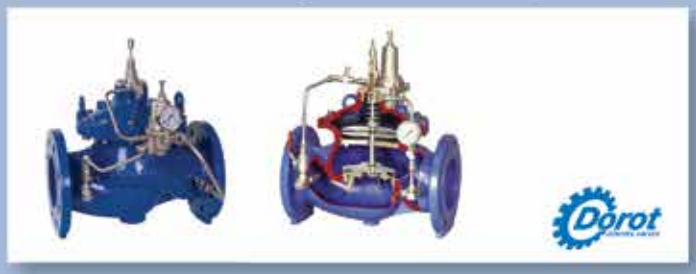
The automatic self-cleaning filter – suitable for more applications than ever

Krohne Electromagnetic Flow Meters

Precision German engineering from the pioneers of electromagnetic flow measurement

Dorot control valves

State-of the-art automatic control valves designed for the most demanding water control requirements



Arkal Spin-Klin filters

Reliable, effective self-cleaning SpinKlin® disc technology for clean water

Apollo Backflow Prevention

Easy to maintain, Watermark approved and made in the USA

Arad Bulk Water Meters

Advanced mechanical and ultrasonic technology for maximising water measurement efficiency

Dorot air release valves

Optimised design for air release even at very high air flow velocities

WSP
Water Supply Products

For further information contact our industrial sales manager:
Mike Stapleton | P: 09 916 0094 | M: 021 475 601 | mstapleton@watersupply.co.nz