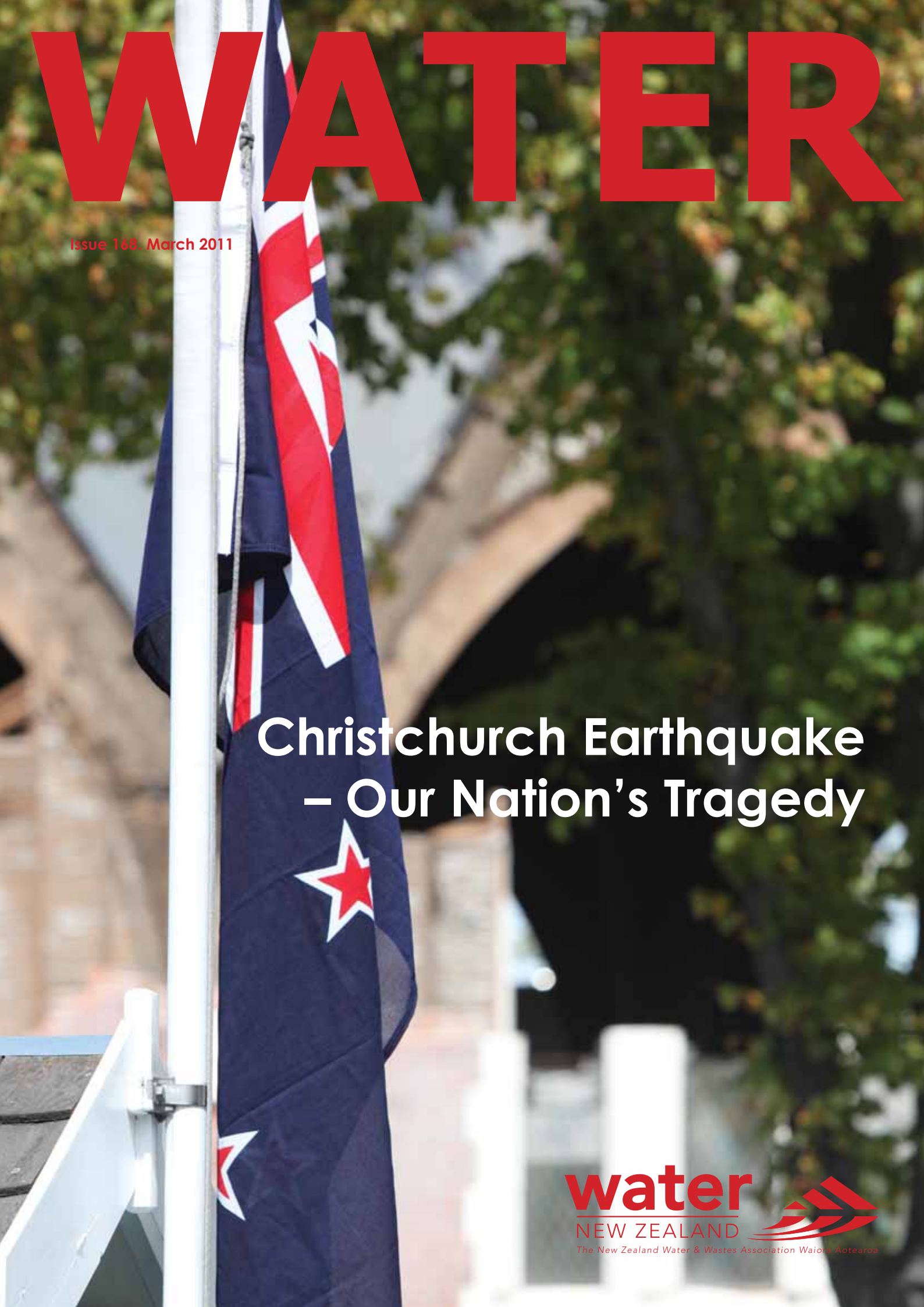
WATER

Issue 168. March 2011



Christchurch Earthquake – Our Nation's Tragedy

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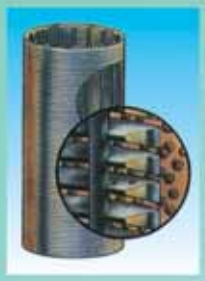

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The next issue of *WATER* will be published in May 2011.

On the Cover

Water New Zealand News

Features and Articles

Cover photo: Supplied by Julian Laplanche
More photos taken by Julian in Christchurch feature on pages 6 and 7
***Water New Zealand's* logo appears in red on the cover to show our support for Canterbury**

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.

Communications

Clive Rundle

Effective communication has always been vital to success, be it in the commercial, not for profit, regulatory or political arenas. *Water New Zealand* is no different and the Board has been giving considerable attention to the ways in which it communicates with our members and external stakeholders.

Two years ago *Water New Zealand's* Board ratified a communications strategy. It had several elements:

- An audit of key influencers to gauge the level of awareness and influence of the organisation
- An ongoing programme of media engagement
- The use of fora and speaking engagements to promote our organisational objectives
- Rebranding the organisation as *Water New Zealand*

How is it working? The initial audit indicated that we had some way to go to achieve our organisational purpose of being the pre-eminent organisation in New Zealand for promoting and enabling sustainable management and development of the water environment. We were consistently ranked second or third in response to questions around influence in the water space.

For benchmarking purposes this exercise was recently repeated, albeit on a more limited scale. The questions used in the previous audit were put to respondents again. While not top of mind in response to all questions our ranking has improved. This is encouraging but there is still work to do. Pleasingly there is a high level of recognition of the new name and we can conclude that the rebranding exercise has worked.

> "There was a fairly clear message that you greatly value the opportunities for interaction afforded by Water New Zealand's functions and conferences and wanted more opportunities for networking. Accordingly, this year we are stepping up the frequency of regional meetings."

A revised communications strategy has recently been endorsed by the Board which builds upon our previous work. Members will notice some changes. There will be more activity in the news media. The website will be divided into public and members' zones. Our electronic publications will be refreshed.

You may recall that we also sought your views as members via a survey late last year. There was a fairly clear message that you greatly value the opportunities for interaction afforded by *Water New Zealand's* functions and conferences and wanted more opportunities for networking. Accordingly, this year we are stepping up the frequency of regional meetings.

Our strong desire is also to engage members in the development of our formal policy positions. Late last year the Board reviewed and reaffirmed its process for development and formal adoption of policies. Once developed, draft policy statements go through a consultation process whereby members are notified in *Pipeline* and draft policies are posted on the website for a minimum of six weeks depending on the level of interest and sensitivity. This provides a cost effective and efficient way for us to communicate with all members, but its success relies on active participation by you all. Please take these opportunities so that we can take full advantage of the depth of our collective knowledge. Communication is after all intended to be a two way process. ■

Clive Rundle
President, Water New Zealand

To Canterbury

The *Water New Zealand* Board, staff and members would like to extend their sincere support for all members and associates who have been affected by the Christchurch earthquake of 22 February 2011.

In particular to members who live and work in Christchurch, our thoughts are with you in the efforts to recover the bodies of people who died tragically that day, as you work to secure and stabilise buildings and infrastructure and as you rebuild your city to once again be a thriving commercial centre.

To our members working in Christchurch temporarily to help restore vital infrastructure; we wish you well for this much needed assistance.

Water New Zealand, along with the Senior Executives' Forum and the Water Services Managers' Group, are co-ordinating the many offers of help from members and sister organisations overseas. Senior water managers in Christchurch advise that they have adequate resource at present to manage the immediate response period. However, if you wish to be of assistance to the Christchurch earthquake recovery efforts at some stage, please send your contact details and confirmation of your three waters competency to jan.lang@waternz.org.nz

If you should ask me what is most important in this world, I would say – it is people, it is people, it is people.
He aha te mea nui o te ao, he tangata, he tangata, he tangata.
– Maori Proverb

new members

Water New Zealand welcomes the following new members:

ANDREW DUNCAN
JUSTIN DEMPSEY
DAVID JAMES
FAWZI GHORIEB
HELEN DAVIES
ROSS REMNANT
LOGAN MACDONALD
CARRON BLOM
ANTHONIE LAMBERT
NEIL RANFORD
DAN MITCHELL
ADAM DUNCAN
JOHN MALE
PETER LIU
JEREMY HOLMAN

CEO Comment

Murray Gibb

This column was going to be entitled 'Cities, Water and Sanitation,' picking up on the theme for World Water Day on the 22 March this year, which is 'Water for Cities.' My messages were based round the urbanisation of society, growth of large metropolitan centres, and the necessity of engineered reticulated water and sanitary services in order for megacities to survive.

The second major earthquake in Canterbury on 22 February and attendant tragic consequences has reinforced this theme. We take reticulated water services for granted but shouldn't. Much of these network systems are buried out of sight underground. It is perhaps only when they are cut off, as they have been across much of Christchurch at the time of writing (24 February), that the true extent on our reliance on these systems is fully appreciated.

When Malthus wrote his Essay on the Principle of Population in 1798, only 2% or 20 million of the world's human population, lived in urban centres. London was reputed to be the biggest city on earth with a population of 1 million.

It was probably also the world's most important financial and political centre. Its emerging middle classes, major beneficiaries of the nascent industrial revolution, gave impetus to the political reforms which, amongst other things eventually led to universal enfranchisement and the democratic institutions we take for granted today.

Before all this could happen though, engineers had to work out how large cities could be sanitary, quite literally, in order for their citizens to survive.

London's population would expand more than six-fold over the next 100 years. By the middle of the century its water supply and sewage management was failing, apparently as a consequence of the widespread installation of flush toilets.

These discharged large quantities of sewage into cesspits not designed to cope with such volumes. These in turn overflowed into the stormwater systems draining into the waterways connected to the Thames, which effectively became a festering cesspit.

Much of London's drinking water was extracted from the Thames downstream from the sewage discharge points. Improved domestic sanitary arrangements unaccompanied by improvements in the sewerage system brought London to the verge of disaster by the middle of the 19th Century.

Outbreaks of cholera regularly killed thousands, as did typhoid when it arrived in England in 1832. Over a 20 year period numerous commissions sat achieving very little. Events came to a head with the 'great stink' of 1858 when the combination of an unusually warm summer and an extraordinarily polluted Thames finally pushed Victorian regulators into taking action.

By this time rationalisation of separate drainage local bodies had led to the formation of the Metropolitan Board of Works. Unlike its predecessors it was able to take a whole of London approach to the problem. In 1859 it accepted a large and expensive sewerage scheme proposed by its young and visionary chief engineer, Joseph Bazalgette.

Built over the next six years, Bazalgette's infrastructure carried sewage downstream to the Thames estuary, and the stench disappeared along with the annual epidemics of cholera. As an unintended consequence the water supply ceased to be contaminated, resolving the recurrent cholera epidemics.

With no knowledge of bacteriology, or the epidemiology of cholera epidemics, engineers solved London's sanitation and polluted water supply problems and saved the city.

These same engineered solutions underpin urban communities today, but three new challenges stand out.

The first is rates of growth. Rapid urbanisation, particularly in less developed countries in Asia and Africa, has resulted in an estimated one billion people, or 15% of the world's population now living in shanty towns, often serviced by inadequate infrastructure. High rates of disease are an inevitable consequence.

"Lastly, this growth puts increasing stress on available water which megacities devour. They are estimated to import as much virtual water as crosses international boundaries in the international food trade."

Over 90% of the urban population of Ethiopia, Malawi and Uganda, three of the world's most rural countries, already live in slums.

By 2025, according to the Far Eastern Economic Review, Asia alone will have at least 10 megacities, including Mumbai (33 million), Shanghai (27 million), Karachi (26.5 million), Dhaka (26 million) and Jakarta (24.9 million people).

Unlike London, which took a century for its population to expand six-fold, growth in these new megacities has been far more explosive. Albeit belatedly, London was able to develop the water infrastructure to service its burgeoning population over a much longer time span than these emerging giants. Mexico City by contrast grew by over 400% in just 30 years.

The second challenge is that the rates of growth in many of these cities are not supported by economic growth. London and New York grew concomitantly on the back of expanded economic activity associated with the industrial revolution. By contrast rates of urbanisation over the past few decades have often far exceeded the capacities of national and local governments in developing countries to plan and manage the demographic transitions.

Lastly, this growth puts increasing stress on available water which megacities devour. They are estimated to import as much virtual water as crosses international boundaries in the international food trade.

Thirty one countries are currently deemed to be water stressed. The UNFPA estimates that by 2050 the number of countries facing water stress or scarcity could rise to 54; with a combined population of four billion people – about 40% of the projected global population of 9.4 billion.

The challenges are clear. Solutions to these sorts of seemingly insoluble problems have been found before. Hopefully they will again. Whatever the case more efficient use of water will need to be part of the mix across the globe, and New Zealand's economic position as a sustainable virtual water exporter looks bright. ■

Murray Gibb
Chief Executive, Water New Zealand

"In a small country such as New Zealand it is inevitable that when tragedy strikes on this scale much of the community is touched by the human dimensions that follow."

Canterbury Once Again Experiences Major Earthquake

As this issue of *WATER* goes to press, the immediate priority in Christchurch and surrounding environs is on the human dimension of the earthquake that occurred on Tuesday 22 February. With the passage of time hope has faded that missing family members, friends and colleagues might have miraculously survived in pockets between the debris.

The recovery of bodies from wrecked and damaged buildings is still underway, welfare agencies are ramping up services to meet the urgent needs of those who have lost their homes.

Electricity supplies are being restored across parts of the city as are reticulated water services. Telecommunications are in better shape, and once more cellular networks have proven to be resilient. Social infrastructure has been wrenched and schools remain closed.

As with the September 4 earthquake, liquifaction has once again caused much damage, and the centre of the city bounded by Christchurch's four grand avenues remains cordoned off. Christchurch's iconic cathedral has lost its spire with attendant tragic loss of life and its tallest building is broken, perhaps beyond repair.

In a small country such as New Zealand it is inevitable that when tragedy strikes on this scale much of the community is touched by the human dimensions that follow. Most of us have extended social networks involving Cantabrians.

The magnitude of the physical damage is far greater than the earthquake that occurred in September last year. Its shallowness, closer proximity to Christchurch and the nature of the soils on which much of the city is built has meant that a smaller earthquake caused destruction on a scale not seen since the Napier event in 1931.

Of the utility services once again it is the water and wastewater infrastructure that has suffered the greatest damage and will take the longest time to repair. Once again it has demonstrated the vital role it plays in the workability of built environments. It is only when it ceases to work that we fully appreciate its value. For many Cantabrians the most appreciated experience after the event was being able to take a simple shower when services became available.

In the immediate post event response period *Water New Zealand* has used its databases, networks and communications channels to collate and pass on information with the aim of matching offers of assistance with demand.

"In the immediate post event response period *Water New Zealand* has used its databases, networks and communications channels to collate and pass on information with the aim of matching offers of assistance with demand."

The effects of this event have required a very significant response from both within and outside of the region, and will continue to do so over a long period. It is also clear that it will take considerable time to completely recover these services, that the cost of doing so will be several times higher than the September 4 event, and that ongoing supply of outside resource will be required this end.

Offers of assistance have been co-ordinated with government agencies, the Senior Executives' Forum (including the Service Providers' Forum) and the Water Services Managers' Group networks.

It is becoming clear that this was an unusual seismological event. Initial estimates are that the Building Code did work. Most modern buildings built to the standard designed for a 1 in a 500 year event have apparently stood up to pressures and movement beyond estimates in that standard. Older structures including sadly, many iconic heritage buildings are beyond repair and will need to be levelled.

We acknowledge and appreciate the very generous offers of support from members and sister organisations both locally and overseas. ■

Top – NZ Army Engineers repair water mains at Burwood Hospital after Christchurch Earthquake, Middle and Bottom – NZ Army Engineers distribute water at New Brighton Beach after Christchurch Earthquake – Photos supplied courtesy of NZDF

Water New Zealand would like to thank Metropol for generously donating the Christchurch Earthquake photos (see the following fullpage spread) for this issue of *WATER*.

Metropol is an independently owned National Award winning Christchurch gloss lifestyle magazine distributed to 112,000 Canterbury readers every fortnight.

Covering city events and entertainment, business, fashion, health and beauty, cuisine, wine, homes, architecture and much more, Metropol delivers local news and information in a hard copy format locally, and online at www.metropol.co.nz

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Army Engineers Assist with Water Supply in Christchurch

Army Engineers have established two water production facilities in Christchurch to support people effected by the earthquake that occurred on Tuesday 22 February.

The water points have been in operation since Friday 25 February and members of the public have begun to receive fresh water.

The New Zealand Army equipment in New Brighton is a reverse osmosis system that can produce potable water from saltwater sources.

"The New Zealand Army equipment in New Brighton is a reverse osmosis system that can produce potable water from saltwater sources."

The Engineers' water treatment capability can be deployed at short notice and can be used in many different operational environments.

The plant can produce 2000 litres of freshwater per hour. ■

Army Engineers assisting with water supply in Christchurch – Photos supplied courtesy of NZDF

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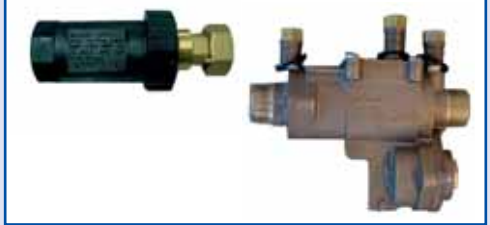

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Water New Zealand Annual Conference & Expo 2011

Water New Zealand's Annual Conference & Expo is an event not to be missed! It is the largest and broadest conference of its kind held in New Zealand. The Annual Conference provides the water industry with an excellent forum for discussion of the latest technologies, issues and debates, an opportunity for networking and meeting new people in the industry, the largest water and wastewater trade exhibition in New Zealand, a wide range of social events, and much more.

The 2011 Conference & Expo will be held from 9 – 11 November in Rotorua. We look forward to seeing you there.

Key Dates

Monday 28 March	Call for abstracts
Wednesday 27 April	Exhibition sales open
Friday 22 July	Registration opens
Wednesday 21 September	Earlybird registration closes

Exhibition

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 exhibition stands at this event are extremely popular.

Sponsorship

Sponsorship opportunities are available to members of *Water New Zealand* for the Annual Conference & Expo. Any enquiries regarding sponsorship packages available for the 2011 event should be directed to Rachael Bidwell at Avenues Event Management, rachael@avenues.co.nz

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BACKFLOW CONFERENCE 2011

Backflow Conference 2011
3-4 June, Rutherford Hotel, Nelson

The Backflow Group of *Water New Zealand* invites you to come to the Backflow Conference 2011 to be held on the 3 – 4 June at the Rutherford Hotel, Nelson. The Group runs a conference every second year.

The aim of the 2011 Backflow Conference is to provide delegates with an opportunity to increase their knowledge and understanding of backflow, network with peers and hear new and cutting edge backflow information.

The conference preparations are well underway with an exciting and innovative programme being developed with stimulating keynote addresses from several industry leaders.

For information on the programme, sponsorship, exhibition and registration details check out the Backflow Conference on the *Water New Zealand* website!
www.waternz.org.nz/backflowconference.html

AUCKLAND 4-6 MAY
STORMWATER:2011
7TH SOUTH PACIFIC STORMWATER CONFERENCE

Preparations for the 7th South Pacific Stormwater Conference are well underway!

The Stormwater Special Interest Group of *Water New Zealand* invites you to attend the 7th South Pacific Stormwater Conference. The SIG runs an annual stormwater conference each year with the conference being larger with a more significant international component every two years. The 2011 conference will be held 4 – 6 May at the SKYCITY Convention Centre, Auckland, New Zealand.

The 2011 conference will have three streams, and will include sections devoted to stormwater modelling and Rivers Management. *Water New Zealand's* Stormwater SIG has teamed up with the Modelling SIG and the Rivers Group which is a joint technical interest group of IPENZ and *Water New Zealand*.

An exciting and innovative programme has been developed with stimulating keynote addresses from several industry leaders.

Professor Tony Wong

Tony is Chief Executive and Director of the Centre for Water Sensitive Cities, Monash University, Melbourne, Australia. He is internationally recognised for his research and practice in sustainable urban water management, particularly in water sensitive urban design. His expertise has been gained through national and international consulting, research, and academia and he has led a large number of award-winning urban design projects in Australia and overseas. In October 2010 the Institution of Engineers Australia presented Tony with the prestigious Sir John Holland Award as Australia's 2010 Civil Engineer of the Year. In presenting the award, the Chair of the Civil College Board described Professor Wong as, 'a visionary, who throughout his career, has been an effective thought leader who continues to encourage his colleagues and clients through his passion and dedication to building sustainable environments'. Professor Wong is a member of the Urban Water Advisory Panel of the National Water Commission of Australia since its inception and served on the Prime Minister's Science Engineering and Innovation Council's working group on Water for Cities in 2006 and 2007. Tony currently advises the Public Utility Board of Singapore on institutionalising water sensitive urban design in the City of Singapore.

Dr William (Bill) Hunt

Bill is Associate Professor, Extension Specialist, and leader of the Stormwater Engineering Group at North Carolina State University in the Southeast USA. An active researcher in stormwater practice performance and establishing stormwater metrics, Dr Hunt and his team have published 21 journal articles on these subjects since 2009. He has conducted applied research on a variety of stormwater practices and low impact design including stormwater wetlands, rain gardens, permeable pavements, pervious friction courses, level spreader-vegetated filter strips, swales, and green roofs. His many clients include transport agencies, state environmental departments, various cities and counties, private businesses, and environmental advocacy groups. As Extension Specialist, Dr Hunt conducts between 25 and 35 stormwater-related workshops for designers, contractors, maintenance professionals across North Carolina, the USA, and overseas. He and his colleagues pioneered certification courses in stormwater practice maintenance and rain garden construction that remain among the few of their kind world-wide. Bill is a registered professional engineer and most recently served as Honorary Research Fellow at the University of Auckland, working with Dr Elizabeth Fassman. Dr Hunt considers New Zealand and the United States the two most beautiful countries in the world, but New Zealand has an edge in "beauty per hectare."

REGISTRATION IS NOW OPEN

Get in quick for the Earlybird Special closing on 19 March!

Grant Ockleston

Grant is the Manager Stormwater for the newly established Auckland Council. In this capacity Grant has budget and operational accountability for the $2.5 billion dollar network that provides a stormwater service to the whole of Auckland.

With an annual budget of $120 million, the 136-member team undertakes network and asset management planning, operation and maintenance, network upgrades and renewals, technical research and publication, review of development consents and public education.

Grant has extensive knowledge of the water industry and a wide range of skills in environmental work. For the past 10 years he has led Auckland City Council's stormwater department and has received many awards for his contribution to the management of stormwater.

Each day of the conference three streams are on offer. They will cover wide-ranging stormwater topics including stormwater design, modelling, management, harvesting, monitoring, river management and much more. Site visits will also venture out around the Auckland region to northern, western and southern regions. There are three pre-conference workshops that will be held on 3 May – check out the website for more information on these.

For more information and details check out the Stormwater Conference programme on the *Water New Zealand* website.
www.waternz.org.nz/stormwaterconference.html

Water New Zealand Bookshop

Water New Zealand's bookshop boasts a wide variety of manuals and guidelines, specialising in a range of water and wastewater issues. The manuals are packed with current and relevant information with input from many specialist organisations. Copies are available for free download from www.waternz.org.nz. Full papers from the Annual Conference and other *Water New Zealand* conferences are published on CD and are also available. For more information contact: Jan Lang, Ph: +64 4 472 8925, enquires@waternz.org.nz

The Water Challenge

Tauranga City Council's City Waters Team are taking part in the Water Challenge being organised by BECA/Oxfam at Mount Maunganui on 27 March.

To raise money for the event the City Water's Team are having a Friday morning tea every week until the end of March. Each week two team members bake something yummy for their colleagues with a gold coin donation in return. Baking is taking on a world flavour – with Dutch, English, South African, German, and of course Kiwi nationals in the team, they're catering for diverse tastes! So far the team has raised $120.

NEXT ISSUE OF *WATER*

The next issue of *WATER* will be in mailboxes mid-May. The topics for the May issue will be **STORMWATER, FLOOD MANAGEMENT AND SMALL WATER SYSTEMS.**

If you wish to contribute an article or photos please contact the editor, Simone Olsen, on +64 4 473 8047 or email simone@avenues.co.nz

Water New Zealand Staff News

Hannah Dawson

Hannah resigned recently after two years with *Water New Zealand* to travel overseas. She was a key member of the staff and her involvement with the Special Interest Groups and project work was much appreciated. We wish Hannah well in her travels.

We are currently interviewing for her replacement and an announcement will be made soon.

Changes to Timing of Annual Subscription Billing

Currently, members are invoiced for their annual subscription each year on the anniversary of their joining the Association. This has lead to a lot of confusion, especially with our Corporate members who also hold Corporate Additional memberships.

The *Water New Zealand* Board agreed at its April 2010 Board meeting to change the billing cycle for all annual subscription invoices to 1 July from the 2011/12 financial year.

To facilitate this, during this current financial year, you will receive an invoice on a pro-rata basis up to 30 June 2011. For example, if your membership comes due in April 2011, you will be invoiced in April for the 3 months to 30 June 2011, and invoiced in July 2011 for the following 12 months.

If you have any queries relating to this change, please contact Linda Whatmough, Manager Finance on Ph: +64 4 495 0898 or accounts@waternz.org.nz

Water New Zealand Notifications

Member Contact Details

Please advise us if you changed contact details recently. An accurate database depends on the supply of timely and accurate information. Contact: Jan Lang, P: +64 4 472 8925. Or to update details on line visit the *Water New Zealand* website: www.waternz.org.nz/forms/changeofdetails/changeofdetails.html

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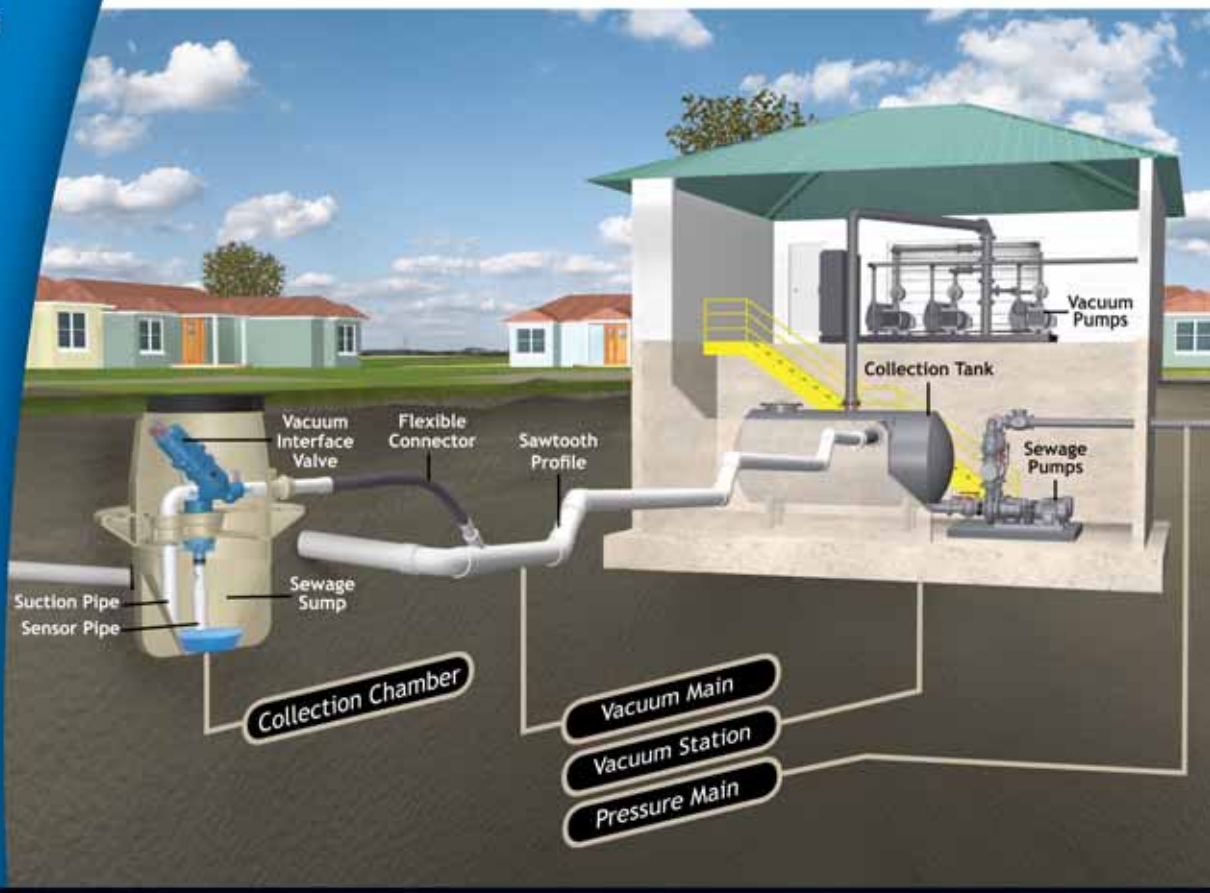

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Appointment of EPA Establishment Board

Minister for the Environment, Nick Smith earlier this month, announced the members of a four-strong Establishment Board tasked with ensuring the new Environmental Protection Authority is ready for business on 1 July.

"The Environmental Protection Authority has been established to strengthen and improve New Zealand's environmental management. It will be an independent Crown agent at arms length from the Government with its own board of directors. The role of the Establishment Board is to start the recruitment process for a chief executive for the EPA, and give consideration to appointments to and terms of reference for the Maori Advisory Committee and Hazardous Substances and New Organisms Committee," Dr Smith said.

The Establishment Board will be chaired by former Wellington Mayor Kerry Prendergast. The other members include Richard Woods, Chair of the Environmental Risk Management Authority; Dr Keith Turner, former Chief Executive of Meridian Energy; and Anake Goodall, retiring Chief Executive of Te Runanga o Ngai Tahu.

"This group has a high calibre of skills and experience in organisational governance, management, central government processes, and an understanding of the environment – and its links to the economy – which are all essential in giving the EPA a sound start," Dr Smith said.

In November last year the Government introduced legislation to establish the EPA as a Crown entity. It passed its first reading unanimously and is currently before the Local Government and Environment Committee. That committee is due to report back to Parliament by the end of this month.

No presumption should be made that the Establishment Board is to form the new authority. ■

Members

Kerry Prendergast (Chair) was Mayor of Wellington from 2001 to 2010 and a borough and city councillor for 15 years prior to that. Ms Prendergast gained substantial governance experience and was involved in significant periods of change and growth during her time as Mayor. She also brings knowledge in environmental management and has experience working with Ministers and government departments.

Dr Keith Turner is a former Chief Executive of Meridian Energy and brings significant experience as a director of new organisations. He has also been effective in industry reform. Dr Turner is a director of a number of companies. He has 39 years experience in the electricity sector, including 21 years in senior executive positions. He has been instrumental in the reform of the electricity industry including being a member of the Transpower Establishment Board and the Contact Energy Establishment Team and the Market Surveillance Committee.

Richard Woods has been the Chair of the Environmental Risk Management Authority (ERMA), one of the agencies forming the new EPA, since 2008. He is a member of the Independent Police Conduct Authority and a former Chief Executive of the New Zealand Security Intelligence Service. He will bring his knowledge of ERMA and considerable experience in governance procedures and of central government processes. He will also bring strategic and leadership skills to the position.

Anake Goodall was Chief Executive Officer of Te Runanga o Ngai Tahu from November 2007 until February this year. He has 35 years experience in management and organisational leadership, principally in the areas of entrepreneurial organisational development, complex negotiations, asset management, environmental protection and enhancement. He also brings to this role, his extensive experience as manager of Ngai Tahu's historical settlement process and as an independent consultant to a number of Maori tribes.

RMA Changes Support Christchurch Recovery

The Government is streamlining the resource consent processes for land remediation works to enable homes to be rebuilt more quickly for Christchurch families hit by the 4 September and 22 February earthquakes, Environment Minister Nick Smith says.

"These are extraordinary circumstances that require extraordinary processes. There is no provision in any council's plans for this sort of land remediation work. This is the worst liquefaction known anywhere in the world and poses huge challenges in the reconstruction of Christchurch as it cannot proceed until the land is made safe," Dr Smith said.

These new regulations enable resource consenting for this land remediation work to be fast-tracked. The normal process of public notification, hearings and appeals would delay the rebuilding of suburbs for months and potentially years. Instead, affected parties will have two weeks to provide written comments prior to councils making decisions.

This minimum requirement for consultation can be extended if councils wish – although the Government's priority is facilitating the rebuilding as quickly as possible.

"The sort of land remediation provided for includes stone piles and land compaction and vibration works that will stabilise liquefied land and provide greater protection from any future earthquakes. We are expecting the first applications for this work next week and therefore need to have the processes in place as soon as possible to ensure these consents can be advanced quickly and the work begun."

These changes were approved on 8 March as Orders in Council under the Canterbury Earthquake Response and Recovery Act 2010. ■

"These new regulations enable resource consenting for this land remediation work to be fast-tracked. The normal process of public notification, hearings and appeals would delay the rebuilding of suburbs for months and potentially years."

Water Whisperers Tangaroa – A Feature Documentary

Susannah Peddie – Policy & Project Advisor, Water New Zealand

"The rivers and lakes of our country define us as New Zealanders, and to me if you take these things away you reduce all of us, you diminish us." Sam Mahon – Artist

As a nation we are intrinsically connected to our waterways, and we are all aware on some level that their quality is declining. This is having a profound impact on the life within them and the lives of those who rely on and enjoy them.

We can take heart then, and learn from groups all around New Zealand who are working to raise awareness, improve and care for our waterways. The uplifting and beautifully shot *Water Whisperers Tangaroa* documents ten such groups.

The film is directed by Kathleen Gallagher, and follows her 2009 documentary *Earth Whisperers/Papatuanuku*. When filming the latter, Gallagher realised that water was a critical issue. Water Whisperers is therefore "about the reconnection of ourselves with our lakes, rivers and oceans," and is intended to make New Zealanders aware that although our water resources are not in a good state, this is a situation that can be turned around. This positive message distinguishes *Water Whisperers Tangaroa* from other environmental documentaries which can be disheartening to watch.

"Gallagher showcases fresh and marine waters in her documentary, as well as looking at the relationship between them. Two places where riparian management has produced remarkable results are Whaingaroa Harbour (Raglan), and the Aorere River Catchment in Golden Bay."

The documentary spans a range of people behind the recovery and conservation of our waterways, and begins by following a group who are travelling down the Hurunui River in Canterbury in a bid to unite all users of the river. The group includes farmers, landowners and conservationists, and the range of people they meet along their journey is equally varied; fishermen, horse trekkers and river-boaters all talk about the importance the river holds for them.

The film moves to another Canterbury river; the Rakaia, where in the past you could catch four salmon before 9am and the only place in the house to keep all the fish, was in the bathtub. Those times are long gone, and to the disbelief of many, the Rakaia River stopped flowing to the sea for the first time in history in 2010. Fish and Game have successfully resurrected some old races at the Montrose Salmon Hatchery for breeding and at the time of filming, the Winnemem Wintu tribe from California were attending a hikoi with local Iwi to discuss conservation of salmon. Interviews and footage from this hikoi bring home the realisation that the water issue is universal. The Winnemem Wintu intend to create a hatchery based on the Montrose model in an effort to reintroduce salmon into their local river, the McCloud.

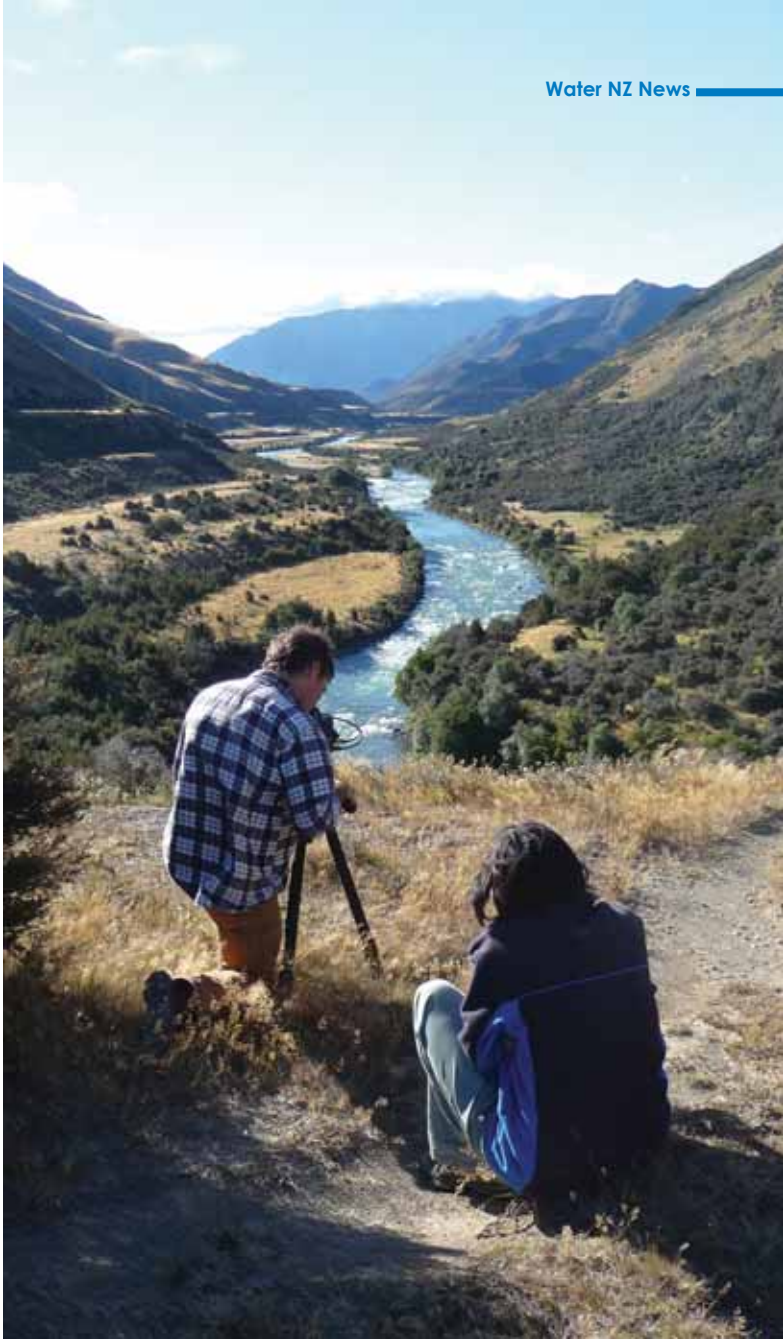
Gallagher showcases fresh and marine waters in her documentary, as well as looking at the relationship between them. Two places where riparian management has produced remarkable results are Whaingaroa Harbour (Raglan), and the Aorere River Catchment in Golden Bay.

In Whaingaroa Harbour, a catch per unit study in the 1990s showed a catch rate of one fish every 18 hours – the worst rate in the country. Since then, the community has transformed the area with intensive riparian management. The harbour is now entirely fenced off, as well as around 500km of streambank. Despite predictions that it would be at least 50 years before any difference could be seen, it has taken less than ten years for farmers to notice a great increase in productivity on their land due to riparian planting improving soil quality. Whaingaroa harbour is now healthy, and the catch rate has improved to two fish per hour, with people able to catch legal sized kawai, snapper, trevally and even kingfish off the wharf.

The Aorere River Catchment is another example of a successful collaborative process, this time between shellfish farmers facing closure, and local dairy farmers. Discussions between the groups began in 2005 and although initially confrontational, the pastoral farmers have since taken ownership of the problem, forming a catchment group to apply to the Ministry of Agriculture and Forestry Sustainable Farming Fund to upgrade effluent systems, and carry out fencing and riparian planting. Stream health has improved, now providing a habitat for whitebait, and mussel farmers can now open 70% of the year rather than 25–30%. Again, there has been noticeable change in a short amount of time.

As one farmer explains, in earlier days they were advised to build their cowsheds close to streams so effluent could be disposed of easily. This is a concept that we have inherited from Victorian times, according to Katherine Goldsmith, a writer for *The Ecologist*. Water has been viewed as an 'away' and has become a dumping ground for household and industrial waste. Goldsmith states that "Water should be absolutely sacred", and along with other shareholders, is doing her part to recognise this by regenerating a large block of land in Mangawhai.

Water Whisperers Tangaroa also looks into the restoration and conservation of our marine environment, and the tools used to facilitate this. In Kaikoura, representatives



From top left – Voyaging down the Hurunui, Chief Kayleen Sisk-Franco of the Winnemem Wintu beside the Rakaia River, Underwater footage at the Poor Knights Islands by Steve Hathaway, Above right – Filming the Hurunui River

from groups such as cray and paua fishers, local Iwi and Forest & Bird have been meeting regularly at Takahanga Marae since 2004. In 2005 they formed a group called the Kaikoura Coastal Marine Guardians (Te Korowai o Te Tai o Marokura), and worked together to produce a characterisation report on the nature of the coast in 2008. The group is currently working on a coastal management strategy. The Guardians have support from the government; two full time fisheries officers have been appointed for the coastal zone to discourage illegal fishing. All groups speak positively of the process.

The film moves to the far North, where some incredible footage was shot in two marine reserves. The Goat Island Marine Reserve in Northland is now one of the most popular spots to visit in New Zealand, with a quarter of a million people passing through a year, while biodiversity in the Poor Knights Islands; established as New Zealand's second marine reserve in 1981 and revised in 1998 to become a complete no-take zone; has boomed in the last decade with it now considered one of the best diving spots in the country.

The last subject of the film is the Horoirangi Marine Reserve in Nelson, which stretches along five kilometres of coast and covers around 900 hectares. Participants at the reserve's opening ceremony recall with amazement that just as the sun was coming up and they walked down to the water to place sprigs of kawakawa into the sea, three orcas surfaced 50 metres off shore.

Water Whisperers Tangaroa premiered in October last year, and Gallagher says the response to the film has been 'overwhelming.'

The recurrent themes of the film resound with the viewer long after it has finished. Breathtaking footage highlights the delicate balance that our world exists in. There is the sense of responsibility that one generation has for the next. There is a sense of the passion that New Zealanders have for their waterways. And there is a sense that water is a part of us – "a community to which we belong", but also that it runs through nature like the blood in our veins. As Pauline Reid of Ngai Tahu states at the beginning of the film; "we can't keep destroying it, we can't keep abusing it, because sooner or later, nature will take back what it owns."

This is a film I recommend for all to see. It takes us out of the urban environment and back to the source to show the raw beauty of our waterways, stirring the need to protect them for ourselves and for future generations. ■

Water Whisperers Tangaroa is currently showing around New Zealand. See the screening schedule at www.wickcandle.co.nz/water_whisperers_tangaroa.html.

2010 Sees Record Number of Trainees in the Water Industry

Water Industry Training

Water Industry Training is celebrating a record year for training in 2010. There were 655 trainees in formal training agreements last year, up 617 from 2009.

Water Industry Manager, Ashley Chisholm, says, "We are very pleased with the level of interest in training within the industry. Water Industry Training is proud to have been able to facilitate training for and support a record numbers of trainees during 2010. We would like congratulate everyone involved for their commitment to training and up-skilling. It is with anticipation we look forward to working with an equally impressive number of trainees and their employers in 2011."

Some of the 2010 statistics at a glance are:

- Number of trainees in formal training agreements = 655
- Number of employers involved in training = 192
- Training agreements by Level:
  - Level 2 = 4%
  - Level 3 = 44%
  - Level 4 = 30%
  - Level 5 = 22%
- The number of new agreements = 452
- The number of completions = 159
- Number of national diplomas achieved = 22
- Total credits achieved by trainees = 24990 (up from 20943 in 2009)
- Number of courses run for trainees = 70

Reticulation Qualifications Review

Water Industry Training and Infratrain are working together with industry to review the qualifications structure for reticulation training. The final round of consultation has now finished and the working group is finalising the details of a number of new unit standards for the redesigned qualifications. The new structure will be promoted widely to the industry before implementation later this year.

For more information on these new developments, contact the Water Industry Training team on 0800 WATER IT.

Water Operations Professionals (WOP)

The establishment of the Water Operations Professionals (WOP) scheme is progressing well. The scheme is designed to ensure that professionals in the water operations field continue to up-skill and develop their careers. The formal legalities that briefly held up the development have been sorted out and the administrative and registration processes are currently being developed by Water Industry Training. We are confident that operators will be able to apply for registration before mid year.

National Certificate in Educational Achievement (NCEA)

A recent initiative of Agriculture ITO and Water Industry Training has assisted nearly 4,500 trainees in the agriculture and water industries to gain their NCEA qualifications since its inception five months ago.

Many people who leave school without a recognised qualification have passed vocational units but are missing the literacy and numeracy credits required to gain their NCEA qualifications. It is this fact that has allowed Agriculture ITO to pioneer a programme to assist trainees to achieve their missing literacy and numeracy credits, enabling them to gain their NCEA Level 1 qualification. Many of these trainees also have sufficient credits to qualify for NCEA Level 2 and 3 as well.

This has meant that a considerable number of people who may not have obtained these qualifications at school can now be recognised for NCEA through having completed sufficient and relevant unit standards. For some people, this is the first formal qualification they have from their secondary schooling.

Water Industry Training's National Diplomas

There are many operators out there who have completed their National Certificate training and may be looking for their chance to take the next step on their career pathway. We would like you and your employers to take a look at our Level 5 National Diplomas.

There are three National Diplomas available that you could complete depending on your area of employment. A National Diploma typically takes two years of part time study, including a number of days in the classroom, plus on job training and assessment.

If you are unsure whether you have the opportunity to learn and practice all of the skills required for the full qualification, we can discuss smaller specific training programmes in these areas.

National Diploma in Wastewater Treatment (Site Technician)

If you are a supervisor or in sole charge of a larger or more sophisticated wastewater treatment plant, this is the course for you. It is also suitable for managers and professionals seeking specialised wastewater qualifications.

OPUS has confirmed that the location for the off job training component of the Wastewater Diploma for this year will be in Hamilton at the Wastewater Treatment Plant.

"The establishment of the Water Operations Professionals (WOP) scheme is progressing well. The scheme is designed to ensure that professionals in the water operations field continue to up-skill and develop their careers."

National Diploma in Drinking-Water, Water Treatment (Site Technician)

This is the highest level qualification for people working in, or progressing towards, a supervisory or management role in water treatment – either for local government or industrial water supply systems.

This qualification is ideal for people who are experienced in supervising or managing water treatment plants that serve populations of 5000 or more people, or more technologically advanced water treatment systems.

National Diploma in Drinking-Water, Assessment

This high level course is designed for public health employees, enabling them to implement Ministry of Health drinking water policies, legislation and standards. It is essential for anyone working as a drinking water assessor and it is also ideal for consulting and council engineers wanting more detailed and specific water treatment knowledge than is available in most engineering courses.

The qualification has all the water treatment theory components of the water treatment qualification and replaces the practical water treatment component with additional legislative and auditing skills to suit your typical job requirements.

Annual Calendar Competition

2011 calendar competition

Water Industry Training's 2011 calendar photo competition was a great success. Every year the standard of the photos submitted is extremely high and this year's competition was no exception. The collage above is a sample of the photos submitted for the competition. The winner was Jim Evans from New Plymouth District Council (top left photo). ■

Getting Water Policies Right – A Key Challenge for Our Nation

Brendon Burns – MP, Labour's Spokesman on Water and Climate Change

Brendon Burns, Labour MP

Water, as much as landscape, helps define who we are as New Zealanders. We use it for our recreation and it is essential for our primary production.

We are blessed with water in abundance – in our streams, rivers and lakes – just not always in the right place at the right time for us to maximise its use in farming, horticulture and recreation.

So getting the management of water right has to be one of the key priorities of any Government.

Political commentator Colin James recently reported that the pro-growth faction in Cabinet is in firm command. It has the view that there can and must be a rapid surge of growth, ahead of any new environmental controls; the consequence is that the environment must again come second.

Labour no longer accepts that view, if we ever did. Other nations envy our international brand as 'clean and green'. We cannot put that under further risk, most especially when it comes to water. It would be foolish to believe our ability to command premiums for our produce in an recessionary global trading environment can continue if we don't live up to our environmental branding. New Zealand's reputation in this area is already patchy, to say the least. Effluent and nitrates from expanding agri-business, notably dairying, continue to impact on water quality in spite of efforts to reduce their effects.

In urban areas, run-off from hard surfaces, sewage and residual industrial pollution are the primary culprits.

NIWA has been monitoring river water quality at 77 sites nationally for 20 years. A 2010 Annual Report reveals nitrogen and phosphorous levels have risen alarmingly at many sites in farming regions due to increased stocking rates, use of fertilisers and conversion of land to dairying. Many rivers are now not suitable for swimming.

A Cawthron Institute report in April 2010, stated the algal productivity and dissolved oxygen concentrations caused by dumped organic wastes in the Manawatu River at Opiki "were the highest ever recorded internationally" and although this was later qualified, the results did indicate that the river is "very" unhealthy, by any standard. The report suggested nutrient budgeting, improving the quality of waste discharges and fencing stock out of waterways were all methods to improve water quality.

Achieving that improvement is the job of regional and unitary councils but there is still no national policy statement or framework on freshwater in place to underpin their work and give them the tools they need to reverse this trend of water degradation.

The Value of Water

Year-round water is the key to sustainable economic growth in drier areas of New Zealand – stock-farming, cropping, viticulture, horticulture. Water is precious yet the only cost to major water users is that of resource consents, drilling and power costs.

Water storage can contribute to sustainable growth without further deterioration of water quality if it is managed properly; establishing such regimes presents a substantial challenge.

There are many options to harness peak flows beyond putting dams across rivers. There can be on-farm storage, or where appropriate, raised lake levels or dammed valley catchments.

> "New Zealand's dependence on urea and to a lesser extent phosphorus-based fertilisers needs to be reduced. Farmers need to be encouraged to look to alternatives which can be as simple as storing effluent and re-spreading it when conditions allow."

Consensus Required

Each major project requires broad community consensus, even if the major beneficiaries (and financial contributors) are farmers and power generators. The Canterbury Water Management Strategy, instituted by the now curtailed Environment Canterbury Councillors, underway at the moment is a test process.

We can only hope such processes are allowed to deliver the sort of win/win environmental and economic outcomes most New Zealanders want. However, the Canterbury water strategy is a work in progress; the huge boosts in land value which water deliver can over-power what communities want.

Let's not forget that water is a common good. It belongs to every one of us as New Zealanders. Just because you have a 100m deep well or intake pipe from a river, the water does not belong to you.

A modestly-rated resource rental charged, both as an economic and environmental tool, might be the best mechanism to encourage wise use of water. Any user with excess water should be able to on-pass the allocation where this remains sustainable, but not for windfall gain. Regional and unitary councils remain the best vehicle to administer water allocation and trading. Access to water from storage must be accompanied by strict environmental statements, rules and penalties.

Water storage has far-reaching implications for adding value to our agricultural exports through improving reliability. The MAF report "Situation and Outlook for New Zealand Agriculture and Forestry" in June 2010 identified a need for

Brendon Burns MP, Labour's water spokesman (front, in sunglasses), says New Zealanders no longer want the damming of main stems of rivers like the Hurunui

high-level strategic views of how we use this resource, complemented with catchment-by-catchment considerations.

The report states the economic benefits need to be explained more thoroughly, as urban stakeholders are skeptical of vague claims of economic "trickle down" benefits that are commonly used to sell large water schemes. Such schemes will need to be large, so they will be expensive, but more importantly, they must be strategically integrated into a whole-of-the-community cost-benefit process which measures the economic and non-economic (environmental) costs and benefits equally.

The majority of the urban and the rural population do not want the main stems of our remaining free-flowing rivers dammed and they don't want another round of environmental degradation; but neither do they wish to deny anyone of their right to generate sustainable economic prosperity.

Allocation of Water Permits

Allocation of water permits in this country has historically been on a "first-come-first-served" basis, but due to rapidly increasing demand, this approach is no longer appropriate, stated the Land & Water Forum Report "A Fresh Start for Freshwater."

The Forum suggests the resource should be quantified and the flows needed for ecological, environmental and recreational purposes determined. Then the Government should investigate a different system of allocation through rules set out in a regional plan.

A payment system should be established which would establish a value for the use of the water. And when existing permits expire, using the water more efficiently and to environmental standards could be a condition of renewal. The Forum accepts that "transitional issues" are certain to arise, whatever course is followed.

Fertiliser Use

A key driver of poor water quality remains farming practices. Much production is geared around extensive use and often poor management of urea fertiliser which produces toxic nitrate and often enters water supplies. It also feeds algal growth which can choke waterways and further reduce quality.

New Zealand's dependence on urea and to a lesser extent phosphorus-based fertilisers needs to be reduced. Farmers need to be encouraged to look to alternatives which can be as simple as storing effluent and re-spreading it when conditions allow. There is enormous variability in storage requirements – three days in Canterbury, 90 days in Southland.

While some regional variability is appropriate, we must encourage alternatives to reduce urea use and investigate/implement minimum effluent requirements. The western shore of Lake Taupo serves as a good example of what might be achieved. Here, the total nutrient load that will maintain lake water quality is being defined. Each farmer is then allocated their own percentage of that total nutrient loading. This becomes the permitted flow of nutrients to the lake from each individual property.

Carbon Neutrality

Consumer interest in carbon neutrality is growing in New Zealand, but is still well short of the UK. Tesco is making moves to display information about the carbon footprint of every item on sale in every one of its supermarkets. This trend will have an impact in New Zealand, particularly in terms of how we manage the carbon retention in soils under various production regimes. Traditional views will be challenged.

A Landcare Research study in 2009 compared soil carbon concentration rates in traditional farms using nitrates and phosphate versus neighbouring organic farms. This revealed carbon concentrations to be higher on the organic farms in five out of seven comparisons. The mean C concentration (aggregated across land uses) was significantly higher under the biodynamic regime.

Drinking Water Quality

We regard ourselves as a first-world nation yet our drinking water quality often lets us down. Notifiable waterborne diseases affected an estimated 14,100 Kiwis between June 2008 and June 2009, costing the economy an estimated $18 million, but these figures are widely believed to be vastly under-stated. (Most people don't have tests which confirm the cause of 'tummy bugs.') In addition, the latest Ministry of Health report on drinking water shows that the proportion of the New Zealand population whose supplies complied with the bacteriological criteria of the drinking water standards was just 80%.

This represents a 3% decrease from the previous survey.

Cost/benefit analysis shows good productivity gains flow from investment in safe drinking water. A major outbreak of waterborne illness could be counted in tens of millions of dollars.

A study by Opus International Consultants (and others) reveals that for every dollar spent on upgrading the supply, up to seven dollars can be saved through avoiding the medical costs associated with giardia and cryptosporidium infections. Such investment would also mean the reputation of our tourist destinations would be protected; general welfare and productivity in communities currently not complying would be lifted.

For 15 months until just before Christmas, Health Minister Tony Ryall deferred applications from small communities for assistance from the national funding programme to meet minimum standards for drinking water. He says he was evaluating the subsidy funding to see how 'such schemes align with government priorities and provide value for money in the health sector'.

The outcome was that he has cut the funding available. Meanwhile he has replaced the Ministry of Health's drinking water advisory team with a private consortium, paying it $2.25m over three years. The Government has also given councils the right to privatise water supplies for 35 years and removed the right for DHBs to have involvement in oversight of new water schemes. The Canterbury DHB has publicly and bravely warned of risks creating a Walkerton-type tragedy. (Several people died and hundreds were left very sick after an Ontario government cut 'red tape and regulation' around water quality.)

These policy changes underscore concerns about whether communities are really going to be given any say in new water schemes, be they purely for drinking water or irrigation or both. Let's remember; water belongs to every one of us as New Zealanders; we all have a stake in how it's used and delivered. ■

Leadership Profile

Suzanne Naylor – Headworks Engineer, Watercare

Recently awarded the Water New Zealand CH2M Beca Young Professional of the Year Award for 2010, Suzanne Naylor has enjoyed much success in the time she's been working in the water and wastewater industry, progressing steadily to the role of Headworks Engineer at Watercare Services Limited.

"I didn't always want to be an engineer, but I did always prefer the sciences over the arts at school. I was attracted to the definitive answers in science."

When Suzanne was considering her career options, engineering seemed to be the logical path and specialising in environmental engineering appealed to her interests and passions.

"It's worked out to be an excellent choice for me, and it's been a great industry to work in so far. I've been exposed to valuable experience and have learned so much since entering the workforce."

Suzanne credits much of her success and experience to Watercare, her employer of four years.

"When I started out as a graduate, I was quite daunted at joining the workforce because I realised how little I knew. I was qualified, but what I'd studied was really just the foundation learning I needed, everything else I had to learn on the job."

Suzanne's respect for her colleagues, especially those who have been in the industry a long time, put her in good stead to be able to learn from them as she got stuck into various projects. She says this, along with her willingness to take up project-based learning opportunities, has helped her to develop and grow relatively quickly.

"I don't think I can stress enough to future graduates the importance of taking up opportunities, it might not seem like a great job initially but the relationships or skills you may gain from it may be really useful later on."

Suzanne says she is finding the role of Headworks Engineer, which involves managing a team of people, very rewarding.

"In the beginning, I spent a lot of time listening to what my team felt the issues were and discussing how to address those issues. Because of this, I feel they've accepted me as a manager," she says.

Along with large scale projects, Suzanne has relished the opportunity to work on community projects. She is Watercare's representative for the Waikato Rivercare Society which works to increase the health of the Waikato River.

"It's great being able to utilise your skills to give something back to the community, especially when it involves something you are interested in, like riparian planting which was a main focus of this project."

> "With obvious, genuine enthusiasm and passion for her work it's clear that she will be an asset to the industry."

As she moves on from being considered a 'new entrant' to the industry, she has clear advice for other young people looking for a career in the water or environment sectors but it's advice that applies to other career paths.

"Try and get summer work with companies you may want to work for when you're qualified. It's a challenge in a recession, but approach companies for summer jobs and be eager to do any kind of work they need you to do."

Suzanne says that working over the summer break in a variety of jobs gave her greater awareness and skills to get her started in her career, something she is grateful that she had been able to do.

With her future career ahead of her, Suzanne says that she's looking forward to continuing in the field of environmental engineering, as well as operational areas. She has enjoyed her current role managing people and would like to continue to develop along this path.

With obvious, genuine enthusiasm and passion for her work it's clear that she will be an asset to the industry. ■

Suzanne Naylor was announced as the recipient of the CH2M Beca Young Professional of the Year Award for 2010 at the *Water New Zealand* Conference Dinner and Awards.

The award was established in 2009 to encourage in-novation and excellence within the water industry. The award acknowledges and rewards a young water professional who has made a significant contribution to the water industry and the general community and who has demonstrated exceptional achievement in the early stages of their career.

The following was the citation read out about Suzanne as she was presented the award:

"The recipient of this year's award became interested in our industry as a student following a visit to Watercare's new high-tech Waikato Water Treatment Plant in 2002. She worked student vacations at the Mangere Wastewater Treatment Plant carrying out odour monitoring and representing Watercare at community liaison meetings. Upon completion of her Environmental Engineering degree she joined Watercare as an Environmental Planner, working on consent applications and the management of an iwi-based plant nursery.

After valuable experience with Veolia Environmental Services in the UK she returned to a planning role at Watercare where she was responsible for designing a consent compliance system to achieve full compliance with over 150 consents. Her success was rewarded in 2009 with promotion to Headworks Engineer and she now manages the 15 large dams and 100kms of raw water trunk mains that supply the Auckland region and has a staff of 13. Quite a responsibility for an engineer who has yet to reach the age of 30!

In making their decision, the judges noted her wider contribution to the community and the environment as deputy chairperson of the Waikato Rivercare Society, participation in community and school education days, leadership of Watercare's graduate group and management of their native fish migratory programme."

Response – Advertising in *Water New Zealand's Journal*

It has been brought to our attention that an advertisement in the November 2010 issue of *WATER* contained the assertion that the product in question was "the first truly integrated modelling platform to incorporate both urban and river catchments".

A member has advised "*that a fully integrated modelling platform was first announced at an international conference in Sydney almost 20 years ago. As described by several authors in subsequent international publications, this package has since been successfully used to design high profile urban projects, such as the re-routing of the Auckland CBD drainage system around the underground Britomart Centre, and river projects such as the development of management rules for routing extreme floods through the Waikato chain of dams. Therefore, there can be no doubt that at least one truly integrated modelling platform has been used for years in projects incorporating both urban and river catchments.*"

"While we accept the current advertisement, referenced above, may have been prepared in all innocence, we do remind our *WATER* advertisers that this Code of Ethics does exist and it is responsible editorship that we make every attempt to give effect to it."

Given this information it would appear the assertion noted above is open to challenge.

Accuracy of information in paid advertisements is a difficult matter to effectively manage but we do note the New Zealand Advertising Standards Authority Code of Ethics has attempted to address the matter with the following explanation of the concept of Truthful Presentation:

"*Advertisements should not contain any statement or visual presentation or create an overall impression which directly or by implication, omission, ambiguity or exaggerated claim is misleading or deceptive, is likely to deceive or mislead the consumer, makes false and misleading representation, abuses the trust of the consumer or exploits his/her lack of experience or knowledge. (Obvious hyperbole, identifiable as such, is not considered to be misleading).*"

While we accept the current advertisement, referenced above, may have been prepared in all innocence, we do remind our *WATER* advertisers that this Code of Ethics does exist and it is responsible editorship that we make every attempt to give effect to it.

We trust our advertisers will see our point of view and assist us in ensuring the accuracy and relevance of product claims made. ■

Murray Gibb
Chief Executive, Water New Zealand

Crystal Ball Gazing – What 2011 has in Store for Water on the Legislative Front

Helen Atkins – Partner and Vicki Morrison – Senior Associate, Atkins Holm Joseph Majurey

This article provides an update on various issues and initiatives covered in articles from last year, such as:

- The Land and Water Forum
- The Environmental Protection Authority
- Environment Canterbury
- Auckland Council

Land and Water Forum

The much awaited Report of the Land and Water Forum was released in September last year. The Report considered the way that freshwater is currently managed and made a series of recommendations for how governance and management of freshwater could be improved. The recommendations included the need to:

- Set limits for freshwater use in terms of both quantity and quality
- Ensure that freshwater targets are met
- Improve freshwater allocation processes
- Plan for and develop rural water infrastructure in a consistent and collaborative manner
- Make changes to the current freshwater governance framework to enable a more collaborative approach to be taken and to provide greater national guidance
- Develop a national policy statement on freshwater building on work done and issues identified to date
- Recognise the importance of freshwater science and knowledge (including Matauranga Maori) to the framework of freshwater and land use management
- Investigate the way in which water services infrastructure is managed and organised to consider the potential benefits of rationalisation (including volumetric measuring and direct billing)
- Review legislation relating to drainage to ensure it is consistent with the need to protect wetlands and biodiversity and the other recommendations in the report
- Investigate the role of greater national direction in flood management and whether additional services are required

The goals in the Report and the recommendations calling for a more collaborative approach and greater national guidance (through national standards and policies) were generally supported by those within the water sector. However, opinions differed as to how these goals were best achieved, what further work needed to be done and the process and timing for implementation of the recommendations.

Following the release of the Report, the Land and Water Forum has been running a series of engagement meetings around New Zealand to give the public an opportunity to hear about the recommendations and to discuss the recommendations with Forum members and others within the water sector.

Meetings have so far been held in Tasman/Nelson/Marlborough, Manawatu, Taranaki, Wairarapa, Wellington/Hutt Valley, Waikato, Pukekohe and Canterbury, with notes from these meetings indicating good discussion of a variety of issues. These included (but were not limited to) the need to:

- Recognise and provide for different water users
- Encourage greater efficiency of use (for example through allowing greater transferability of water rights)
- Protect the health and wellbeing of the streams for future generations
- Progress the issues promptly so that issues are addressed early and water users/other stakeholders have greater clarity and certainty of the legislative framework to apply

Further meetings in South Canterbury, West Coast, Northland, Otago, Southland, Hawkes Bay, East Cape and Marlborough are planned over the next month or so. At the conclusion of these engagement meetings, while it is not explicitly stated on the Forum's website, it is expected that the Forum will collate the feedback received at these meetings and report findings to the Minister.

Following that, and assuming a positive Government response, the nuts and bolts work will begin in terms of giving some form and shape to the recommendations through the development of draft national standards and policies. For now it is a case of watch this space. We will provide a further update in next issue of *Water*.

> "In a press release in January this year Environment Canterbury Commissioner David Caygill announced the progress being made to implement the Canterbury Water Management Strategy. The underlying philosophy in the Strategy is that local communities should be making decisions on local water management – within the rules and standards set at the regional and national levels."

Environmental Protection Authority – Implications

In earlier articles we mentioned that an Environmental Protection Authority (EPA) had been established and that further legislation was expected to flesh out the eventual form and shape of the EPA along with the functions and powers that the EPA would have.

The Environmental Protection Authority Bill (the Bill) was introduced to the House on 16 November 2010 and completed its first reading on 23 November 2010. The Bill has been referred to the Local Government and Environment Committee and submissions closed on 28 January 2011. The hearings of submissions began this month.

The Bill is what is known as an omnibus Bill as it amends a number of pieces of legislation (ie the Climate Change Response Act 2002 (CCRA), the Hazardous Substances and New Organisms Act 1996 (HSNO Act), and the Resource Management Act 1991 (RMA)). The Bill established a new EPA as a Crown agent under the Crown Entities Act 2004.

The stated purpose for creating the EPA is to more effectively, efficiently and transparently manage the regulation of New Zealand's environment and natural and physical resources. As a Crown agent there is a clear split between the environmental policy functions led by the Ministry for the Environment (MfE) and the regulatory and technical functions of the EPA.

The Bill provides, amongst other things, for the EPA to:

- Process matters for proposals of national significance and applications called in under the RMA (as is the case with the current EPA)

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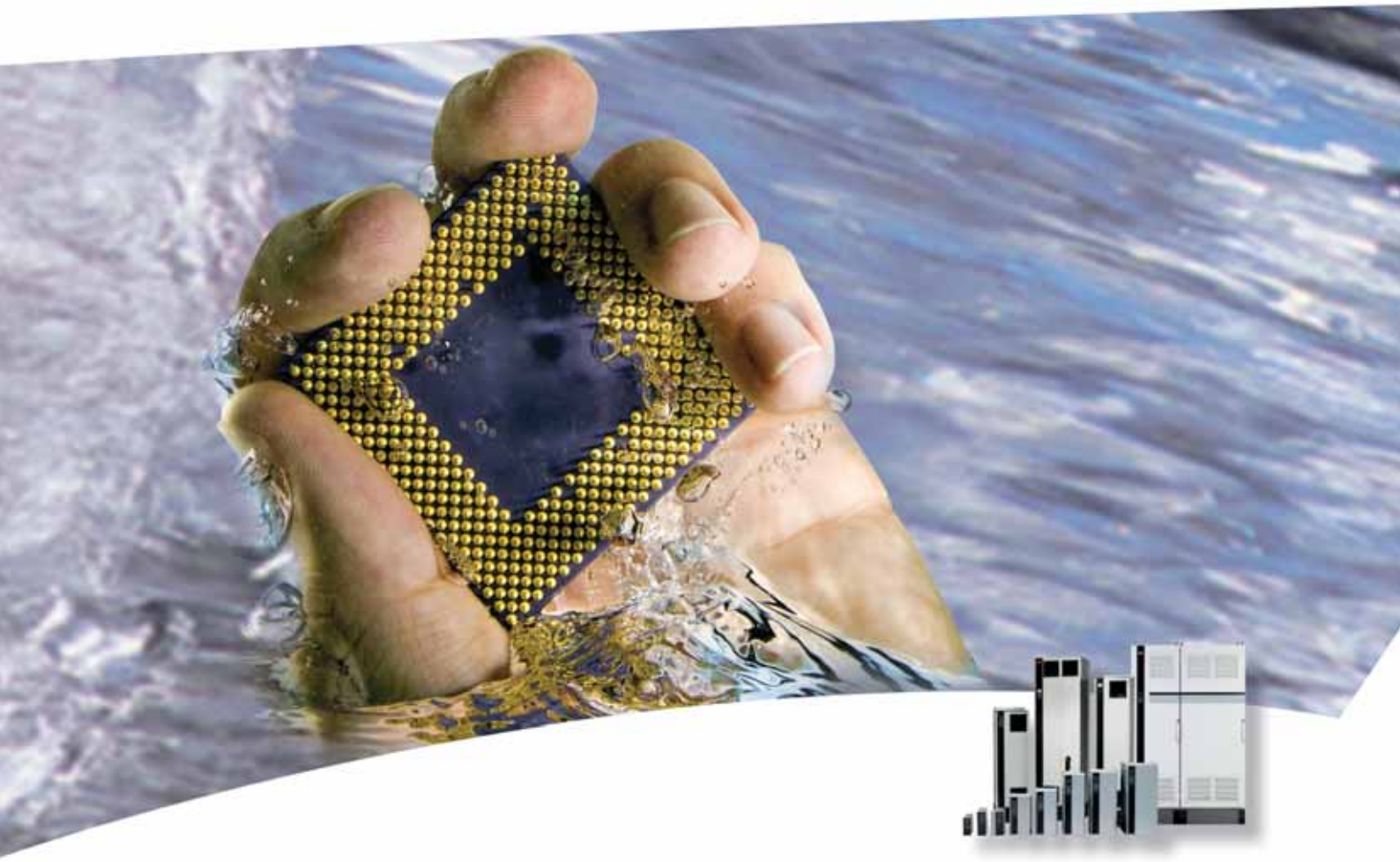

Danfoss Drives Down Running Costs

Real Energy Savings through Reduced Watt Losses

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THE REAL DRIVE

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"Since the Temporary Commissioners were appointed last year much progress has been made."

- Provide advice and information on development and implementation of national environmental standards developed under the RMA (currently done by MfE)
- Undertake all of the functions currently performed by the Environmental Risk Management Authority (ERMA) under the HSNO Act
- Undertake the administration of the Emissions Trading Scheme under the CCRA

The current intention is that the functions under the HSNO Act and the RMA are transferred to the EPA on 1 July 2011 and the CCRA functions are transferred on 30 September 2011.

There have been a number of submissions to the Bill that generally support its intent but seek specific matters to be clarified or altered.

The Committee is due to report back with its recommended changes by 28 March 2011. We will cover the outcome of the Committee's report in future articles.

Environment Canterbury

Since the Temporary Commissioners were appointed last year much progress has been made. We thought it may be worthwhile recapping some of the progress to date and those matters still to be actioned as we look to the year ahead.

In a press release in January this year Environment Canterbury Commissioner David Caygill announced the progress being made to implement the Canterbury Water Management Strategy. The underlying philosophy in the Strategy is that local communities should be making decisions on local water management – within the rules and standards set at the regional and national levels. The Strategy allows for this to happen through ten zone committees which have already been or are now being established throughout Canterbury.

The ten Canterbury zones are partly aligned with district council boundaries and partly with water catchments. The zone committees are being established through a collaborative process between Canterbury's councils and stakeholder groups, including Ngai Tahu.

The first zone committee was set up in July for the Hurunui-Waiau zone. Committees are also up and running for Waimakariri, Ashburton, Selwyn-Waihora and the Lower Waitaki-South Coastal Canterbury zones. The Upper Waitaki and Orari-Opihi-Paeora committees are close to being established, while the remaining three will be set up early this year.

These committees are still in their establishment and settling-in phase – receiving and reviewing information and setting priorities. In 2011, the committees will begin to develop local programmes to manage water in accordance with the Strategy's goals. These will culminate in a detailed implementation plan.

The Regional Committee, which met for the first time in October 2010 addresses those issues that cover more than one zone. The Regional Committee is considering the seven strategic options identified in the Canterbury Water Management Strategy for water storage and efficiency. The Regional Committee will also work alongside the zone committees to ensure integration of work programmes across the differing zones.

The first order priorities set out in the Strategy are: the environment; customary use; community supplies and stock water. These in turn are supported by the primary principles of: sustainable management; a regional approach; and tangata whenua. The second order priorities are: irrigation; renewable electricity generation; recreation and amenity.

Many of these priority areas have clear targets and timeframes associated with them:

- For recreational and amenity opportunities from 2010: to "maintain the existing diversity and quality of water-based recreational sites, opportunities and experiences" and by 2015: "At least 80% of river bathing sites (are to be) graded as suitable for contact recreation" (this compares to around 50% of rivers that are graded as suitable at present)
- The 2015 goals for drinking water include setting "catchment load limits for nitrate consistent with drinking water quality targets for each zone, identify priority areas where targets are not met and implement actions to ensure there is not further enrichment" and by 2040: "Average annual nitrate levels in all groundwater wells in Canterbury are (to be) below 50% of the maximum allowable value for drinking water"
- For irrigated land area, by 2020 the goal is to have started construction of regional storage and improved reliability of supply for at least 50% of irrigated land. The targets, therefore, give us a clear idea of where we want to be in the future

In Canterbury much work is underway but a lot more is required and we will provide regular updates as matters progress.

Auckland Council

It has now been over four months since the new Council was created and it is fair to say it is still in a settling in period.

The management structure of the Council is largely complete but there are inevitably going to be changes to it during the next few years. The Council has largely been in a 'governance' mode focussing on its relationships internally and externally including the role of the Local Boards, the relationship with the Independent Maori Statutory Board and the role of the office of the Mayor.

As mentioned in earlier articles Watercare (a statutory Council Controlled Organisation) is now responsible for both the delivery of bulk water and the local distribution of this throughout the region. Likewise for wastewater services. Council is still responsible for the plethora of issues surrounding stormwater reticulation and management.

For the most part it is business as usual in Auckland while the new structure, locations and functions of the Council are fully understood and provided for. There are no specific initiatives around water to note at this stage but we will continue a watching brief and report in future articles. ■

Helen Atkins is a partner at Atkins Holm Joseph Majurey specialising in resource management, environmental and local government law. Helen provides advice to both the public and private sectors and has been involved in a number of large development projects as well as advising on some of the most significant law changes in this area.

Vicki Morrison is a senior associate at Atkins Holm Joseph Majurey specialising in resource management and local government law. Vicki has worked in both the public and private sectors, and has given advice on large land development projects as well as iwi consultation issues.

New Approach Improves Pipeline Repair

Steve Hutchison – Senior Environmental Engineer, MWH New Zealand

In a New Zealand first, internal joint seals have shown themselves to be an effective repair technology for large diameter pipelines. Using this approach, repairs to the Hutt Valley Outfall Pipeline in 2009 have proven to be faster and more cost effective than traditional methods.

The 18.3 kilometre Hutt Valley Outfall Pipeline is a high value council asset serving a community of over 140,000. From the Seaview wastewater treatment plant the pipeline runs under a narrow winding road to Eastbourne, then for a further eight kilometres along a gravel track that follows the eastern side of Wellington Harbour to a short outfall south of Pencarrow Head.

The 1300mm diameter pipeline has over 4,000 prestressed concrete rubber ring jointed pipes including mitre block specials for the many bends around the coastal route. This pipeline has presented many challenges to Hutt Valley engineers since commissioning in 1962, including internal corrosion caused by hydrogen sulphide released by sewage, one catastrophic pipe failure in a tunnel section, and 41 pipe joint failures in the 48 years of operation. This included two major failures in 2009. These joint failures have been caused by several contributing factors including pipe settlement, unsatisfactory construction tolerances, internal pressure fluctuations, ingress of tree roots, loss of integrity of the rubber ring due to stress relaxation and general degradation with age.

The emergency repairs to fix the failures in 2009 required a new approach that promises an ongoing benefit to managing this pipeline and potentially other large diameter pressure pipes in New Zealand.

In late March 2009, an equipment failure at the Seaview treatment plant's main pump station produced a short pressure pulse that in conjunction with the degradation of the pipe joints resulted in five leaks which produced surface overflows. As part of its Professional Services Contract MWH was asked to project manage the repair work for Hutt City Council. The conventional repair method used up until this time was to excavate and cast a reinforced concrete bandage encasing the joint, generally undertaken with the pipeline off line and depressurised. This is a tried and proven technique but the disadvantages are that it converts a previously flexible joint to a rigid joint and requires a substantial excavation with all its attending costs, hazards and inconvenience to the public from traffic control.

While the first excavations and repairs were being undertaken a CCTV inspection of the entire pipeline length was carried out. This found several additional possible joint failures. These extra repairs and some very difficult access to two of the leak sites called for a new innovative approach. In a project that pulled together multiple suppliers and contractors, a mix of local and international expertise was drawn on to ensure a swift and successful outcome.

The cause of the leaks was movement of the rubber rings in the joints, many of which were believed to have been leaking for years. This was evident from scour of the pipe surface at the three joints that were excavated. In a Request for Proposal for structural rehabilitation of the pipeline, issued in 2004, two overseas contractors had suggested proprietary internal seals that could be an effective technology to deal with the intermittent joint leaks that had been

occurring. These seals do not provide a full structural solution but are suitable for pressure pipelines up to 20bar, retain joint flexibility, are quick to install, are cost effective and require no excavation.

For these repairs MWH commissioned Australian contractors Kembla WaterTech to supply and install 13 AMEX-10 seals, comprising a 260mm wide piece of profiled EPDM rubber and two 50mm wide grade 316 stainless steel retaining bands hydraulically jacked and wedged in place. A technician from the supplier (AMEX GmbH) flew in from Germany to supervise the installation. As part of this work AMEX trained local contractors E Carson & Sons Ltd to be authorised installers to provide for a faster response time for future repairs. While the seals were being arranged a CCTV inspection of the line was commissioned that identified another six potentially leaking joints. Eight weeks after the initial incident all five repairs were completed and the pipeline was fully operational. Eight days later, another failure of the pipeline occurred.

This failure, located near Eastbourne, required the operators to shut down the wastewater plant outfall pumps to partially drain the pipeline for an internal inspection. This investigation revealed horizontal longitudinal cracks in three adjacent 16inch pipes caused by pressure from the roots of a large Norfolk Pine designated as a Protected Tree in the District Plan. In order to protect the tree, the decision was made to undertake a slip line repair of this structurally damaged section. Steel pipe sections were manufactured, installed and grouted in place.

While CCTV quality has greatly improved in recent years, these cracks had not shown up in the inspections and it was decided that a visual inspection of the pipeline was required to establish the full extent of the pipeline's condition. MWH commissioned E Carson & Sons to undertake a manual inspection of the pipeline over several days and discovered a further 40 possible joint faults. In order to test

From top – Joint leak excavation, Pressure testing rig, Main outfall pipe existing route

"The emergency repairs to fix the failures in 2009 required a new approach that promises an ongoing benefit to managing this pipeline and potentially other large diameter pressure pipes in New Zealand."

these possible faults, a special pressure testing rig based around the AMEX seal was commissioned and fabricated locally. This rig was specially designed to be dismantled and reassembled through the existing pipeline pressure access lids which are only slightly larger than an A3 sheet of paper. Of the 40 possible joint faults 33 were found to hold the test pressure and the seven that failed had AMEX-10 seals installed. A further 100 joints were tested as part of the survey of the pipeline condition and while one did not hold the test pressure the overall pipeline condition was considered acceptable to resume operation. In total, eight further internal seals were installed on pipe joints that were identified as leaking or otherwise faulty.

Throughout this complex, time-pressured process the environmental effects of the repairs were being carefully monitored. Given there is no down time for the pipeline to be taken off line for maintenance, treated effluent had to be diverted from the Seaview wastewater treatment plant to the lower reaches of the Waiwhetu Stream. There it was treated with the UV disinfection system adjusted to deliver the maximum dose. During this period of repairs, daily samples of suspended solids, biochemical oxygen demand (BOD) and indicator faecal coliform and enterococci were taken upstream and downstream of the treatment plant discharge to closely monitor the quality of the stream.

The use of this innovative internal seal system has provided several benefits over the conventional concrete bandage technique including a much quicker installation time and halving the repair cost. This trenchless technology approach has allowed the repairs to be undertaken without the considerable disruption to traffic and public inconvenience caused by excavation for external repairs. This new approach is now starting to be used on other projects around New Zealand with a range of applications including outfall pipes using divers for underwater installations. In future it may be used to reinforce pipes in sensitive situations such as under buildings and railway lines. It has become a key tool for Hutt City Council in managing joint repairs on this pipeline along with the ongoing condition assessment programme. The success of the repair work, with no failures since its completion in 2009, has put the pipeline back on track to meet its original life expectancy. ■

Steve Hutchison – Senior Environmental Engineer, MWH New Zealand

Steve is a senior environmental engineer at MWH based in Wellington. He is the project manager for the MWH professional services contract for the Hutt Valley Trunk Wastewater system. Steve has a particular interest in wastewater scheme asset management and pipeline condition assessment.

To discuss this topic please contact Steve on +64 4 381 6715 or email steve.j.hutchison@mwhglobal.com

Rainwater Harvesting – A Question of Sustainability?

John Male – Development Leader – Water Resources, Aurecon

"Is irrigation sustainable?" was the topic I was asked to speak on at a seminar in Australia some years ago. I was relieved I couldn't participate because of the uncertainty around the answer. A similar question could be posed about rainwater harvesting.

The fundamental issue around the uncertainty is simply this – to what extent can humans alter the natural hydrological cycle before there is negative impact to the changes we make to the natural water system?

In the case of rainwater harvesting – how much water can be abstracted before we change the natural balance and there is a negative impact on people or the environment which we inhabit?

The Concept of Rainwater Harvesting

In the broadest sense rainwater harvesting (RWH) is the collection of rainfall runoff from non-channelised surfaces for human and productive use through a non-centralised system. The collector surface may be a roof or the ground.

Once runoff enters pipes or channels it becomes simply runoff that may be harvested using other water harvesting techniques related to on line or off line storages. Furthermore these larger harvesting systems are usually part of a centralised system and that differentiates them from RWH.

RWH has been practised for many centuries but for us in New Zealand RWH is characterised by either a rainwater tank for collection from roofs, or a storage pond on farm land for the collection of local runoff and used for stock water.

Increasing Interest in RWH

Water security is becoming a significant national and regional priority in many parts of the world. In New Zealand we are blessed with relatively large rainfall but often this occurs where there is no demand so the water simply runs off to the sea. However, in other parts of the world water is scarce and becoming increasingly so. About 20% of the population lacks access to safe drinking water. Population growth, industrialisation, increased urbanisation and agricultural intensification are all moving us towards a global water crisis.

Against this demand the world's freshwater resource cannot be increased so the interest is how we can collect and utilise the relatively small proportion of the rainfall that falls on land surfaces. In Australia the recent drought resulted in financial incentives being applied and now many houses have a separate rainwater collection tank on the property. In Singapore where land and water resources are limited collection roofs have been placed on some high rise buildings and water is stored in roof top cisterns for non-potable use. This has resulted in water savings and the cost of water reduction. In Tokyo and Berlin roof rainwater and in some cases local parking area runoff collection is stored in underground tanks again for non-potable use. Indonesia recognised the need to modify the drainage system and has regulated that buildings must have an infiltration well. This collection of roof runoff is used to recharge groundwater systems and will lead to significant savings through conservation.

"Conservation measures are clearly required and it is only an issue of when and how these are implemented. Progressive introduction of demand management strategies in New Zealand will encourage all citizens to adopt water conservation measures, including the use of freely available rainwater."

Other countries such as Bangladesh use RWH tanks as an alternative to other sources because of contaminants in the alternative supplies. Initiatives around the use of RWH have also occurred in China and throughout Africa. RWH is also used as a source of irrigation water where land contouring is used to provide the storage for water.

The Attraction of RWH

The attraction of RWH and its utilisation is that it can contribute to a sustainable water strategy through:

- Reduction of reliance on remote water sources
- Self sufficiency or at least a degree of it when combined with a centralised reticulated network
- Reduced risk of natural disasters compared to a lifeline centralised approach
- Owners being also system operators and so more likely to exercise water conservation strategies
- Restoring the hydrological cycle through
- Reduction of rapid runoff through runoff mitigation of water that would otherwise contribute to flooding
- Groundwater infiltration

Further attractions of RWH are:

- Apart from the cost to collect and use the water RWH is free
- The time to design and install a RWH system is relatively short
- RWH technologies are flexible and can be modified for the location
- RWH eliminates the need for costly treatment and distribution systems
- Rainwater is of a relatively high quality

Potential Negative Aspects of RWH

RWH is not the perfect solution despite its appeal and simplicity. There are disadvantages with a RWH system:

- It may need to be supplemented with other water sources during a drought
- Capital costs can be relatively high
- Individual maintenance is required after installation
- There may be an on going cost for any centralised community scheme irrespective of demand on that system
- Storage tanks take up space and they could also pose a hazard for children

Catchment Scale Considerations

Upscaling RWH from an individual property to a catchment scale provides a test as to how sustainable RWH could be. Many of the catchment scale assessments that have been undertaken are directed towards the hydrological impacts of rainwater harvesting for irrigated agriculture. Modelling management scenarios shows that there is an upper limit of RWH area, where the benefits of productivity and increased groundwater recharge are opposed by a reduction in stream flow.

Urban catchments also have an upper limit for sustainable RWH depending on the impervious area, and the percentage of that which acts as a collector surface, and the size of storages. It is conceivable for 10–20% of the total rainfall being harvested.

The impacts of abstracting this amount of water on pipe sizes, channel conveyance, flood levels, channel flushing, stream bank erosion, assimilative capacity of a waterway and sedimentation could potentially be significant and not sustainable.

How Sustainable is RWH?

In some countries the gap between demand and supply of water is forever widening. In others the increasing demand is satisfied by the provision of infrastructure at an ever increasing cost. Overarching the circumstances of countries is the fact that there is no more water and that available freshwater is less than 1% of all water on the planet and a high proportion of that runs off to the sea.

Conservation measures are clearly required and it is only an issue of when and how these are implemented. Progressive introduction of demand management strategies in New Zealand will encourage all citizens to adopt water conservation measures, including the use of freely available rainwater.

However, there is a limit to which RWH can be adopted before it impacts on the hydrological cycle. RWH is sustainable within limits. These limits vary between catchments. Because of the potentially wide ranging impacts of RWH as a conservation measure it needs to be packaged within a holistic framework rather than simply used to target a single outcome such as minimising capital investment in a centralised water supply system, or acting as detention facilities for flood control. ■

Stormwater Harvesting and Reuse

Anri Le Roux – Civil Engineer and Lance Pearce – Civil Engineer, Civil Work Group Manager, Opus

Once reserved for rural areas, rainwater tanks are now a significant part of the urban landscape in Australia. The recent drought and water-conscious times have highlighted the need to manage our precious water resources more sustainably. By expanding the use of stormwater runoff and captured rainwater, we can add to our water supply and reduce water pollution. Stormwater is now recognised as a valuable resource, rather than a nuisance to get rid of as quickly as possible, especially in large urban areas.

Rural Rainwater Tank

Stormwater harvesting refers to the collection and storage of stormwater run-off for reuse, often as a substitute for water sourced from reticulated pot-able supply. Most stormwater runoff is generated from hardstand and impervious surfaces, such as roads, car parks and roof areas. With an increase in urban-isation, naturally pervious areas are being converted to impervious surfaces and an increase in stormwater runoff is the inevitable result.

Appropriate harvesting solutions can benefit all sites, large and small. High water users such as large outdoor applications and some manufacturing and industrial processes in particular can realise significant ongoing benefits.

Over recent years, stormwater harvesting and reuse has emerged as a new field of sustainable water management in Australia. Harvesting and reusing stormwater offers both a potential alternative water supply for non-drinking uses and a means to further reduce pollution in our waterways. Stormwater harvesting complements other approaches to sustainable water management, including rainwater tanks, greywater systems, effluent reuse and demand management. This combined approach is known as Total Water Cycle Management and is becoming more popular with projects aiming to obtain Green Star Accreditation with the Green Building Council of Australia or other sustainability rating schemes.

In residential cases, most people have no idea how much water they use in the home. Therefore, it might come as a shock to learn that an average family uses hundreds of litres of water every day, nearly half of which is used in the bathroom. When one realises only one percent of the earth's water is available freshwater, it's clearly wasteful to flush our toilets, wash our cars and water our gardens with drinking water. Drought and water restrictions in Queensland have created an enormous market demand for rainwater tanks.

Harvesting roofwater and urban stormwater for safe reuse has many potential benefits. It can help reduce the detrimental impacts that urban developments can have on waterways, by establishing a more natural water cycle and reducing waterway pollution. It can provide long term water security for developers through the availability of an alternative supply source and insulates large users from rapidly increasing supply costs.

Although stormwater harvesting has many benefits there is sometimes risk involved with such initiatives. Public health and community safety risks, environmental risks and operational risks must be appropriately addressed, managed and minimised to make stormwater harvesting techniques viable.

To ensure the stormwater harvesting techniques pose no environmental or public health risk, captured stormwater may require appropriate treatment before reuse. Stormwater may contain chemicals and disease-causing micro-organisms (pathogens). Roofwater generally has lower levels of chemical contaminants and pathogens than urban stormwater, which collects contaminants during its passage over roads and other surfaces, picking up chemicals and pathogens from environmental and sewage sources.

Consequently, the health and environmental risks associated with roofwater reuse are typically lower than those associated with stormwater reuse in similar applications. The most commonly recognised illness associated with polluted water is gastroenteritis (with symptoms such as diarrhoea and vomiting) arising from waterborne pathogens following the drinking of contaminated water. Potential environmental risks include impacts on plants and soils in irrigation areas. The health risks tend to be acute, whereas environmental risks tend to be chronic, developing over time.

Rainwater Tanks

Roofwater harvesting generally involves installing rainwater tanks to collect roofwater from residential dwellings for uses such as irrigation, cooling towers, toilet flushing and laundry demands. On some developments in Australia, especially Queensland, developers are becoming more conscious of water demands and therefore specify endemic plants (as landscaping), which do not require additional water to survive. The demand is increasing to harvest roofwater from larger developments, such as community halls, schools and commercial premises. Due to space restrictions on commercial premises, rainwater tanks are likely to be installed underground.

The size of rainwater tanks is determined by a few factors including the area available for the tank, the roof area, or catchment, and the reuse demand. Water demand for toilet flushing is extremely variable, depending on the type of development. Toilet demand values are published in a number of guidelines, such as the Australian Department of Natural Resources and Water 'Planning Guidelines for Water Supply and Sewerage (March 2005)'. A tank supplier, or for larger developments a consultant, can easily determine the most appropriate and cost efficient tank size for the premise.

Modern Residential Rainwater Tank

Tanks for storing roofwater are available in a range of suitable materials, including galvanised steel, fibreglass, polyethylene and concrete, and may be rigid or flexible. The main requirements for these storages for non-potable roofwater use is that they are structurally sound, watertight and light-proof. They should incorporate access openings for monitoring and maintenance and any openings area should be appropriately screened, to minimise the potential for mosquito-borne diseases.

In South East Queensland, local government mosquito control programmes do not routinely target mosquitoes which breed in domestic containers although these mosquitoes can impact on human health and lifestyle. In North Queensland the container breeding species Aedes aegypti is responsible for the latest dengue fever outbreak in which over 1000 cases have been reported. Much of Australia has previously sustained Aedes aegypti and

Marley Rain Harvesting Products – providing safer specifying solutions for the collection, storage and distribution of rain water.

When collecting rainwater as a partial or total source for a water supply it is essential the design of the system meets the need for potable (safe drinking) water.

Water collected from a roof and stored and distributed from a water tank, can contain a nasty range of pollutants that can contaminate water, for example bacteria from bird droppings, insects, rotting debris, airborne dusts (containing heavy metals).

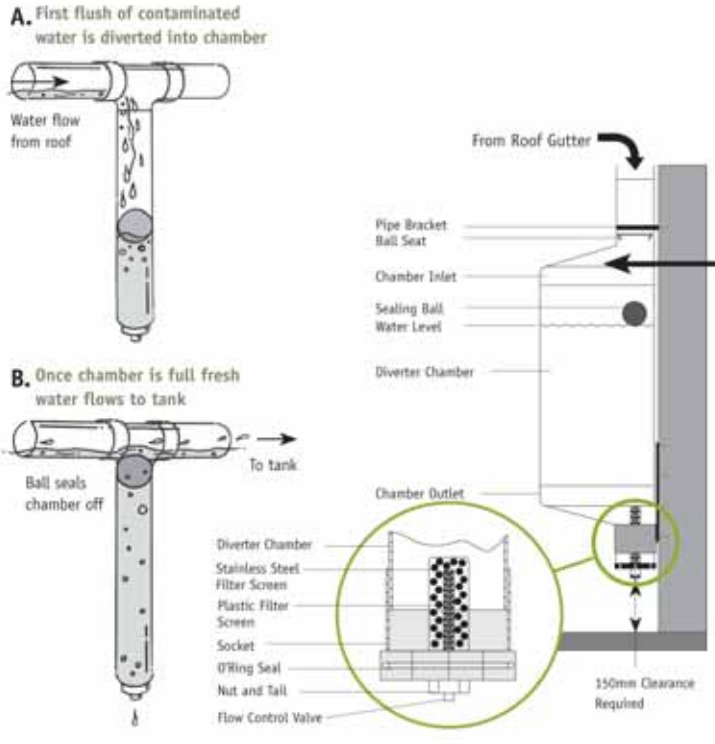
The Marley Rain Harvesting System comprises of a number of unique and cost effective components that are designed to work with the Marley PVC range of spouting and downpipes to help make tank water as clean as possible.

FIRST FLUSH DIVERTERS

Water diversion is a key component to water quality. The main function of the first flush diverter is to prevent the first flow of water from the roof from entering the water storage tank.

When it begins to rain, the first flow of contaminated water is diverted into the diverter chamber. Once the chamber is full, the fresh water automatically flows into the storage tank.

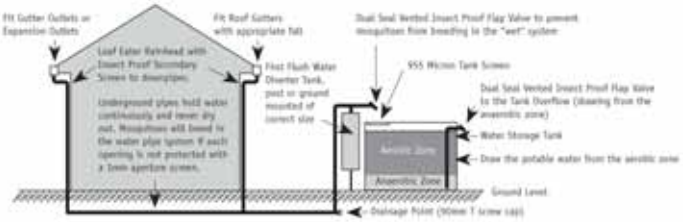
The type of first flush diverter to be fitted should be chosen by assessing the quantity of water to be diverted.



Choosing the most suitable components for a rain harvesting system will be based upon whether the tank is set up as a wet or dry system.

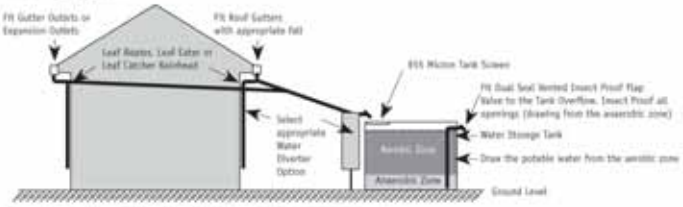
A TYPICAL "WET" SYSTEM (syphonic system)

A "Wet" System is a system where the pipes are fitted in such a way that when the rain stops the pipes to the tank do not drain out. They hold water. With this type of system, the pipes must be fitted with screens at each end to ensure that insects cannot enter and breed in the system. A "wet" system needs to be fitted with a First Flush Water Diverter at the tank, with a capacity equal to that of the pipes plus whatever amount is to be diverted from the roof. To lessen the amount of water to be diverted at the tank, a Downpipe First Flush Water Diverter can be fitted on the building to take the required first flush from the roof.



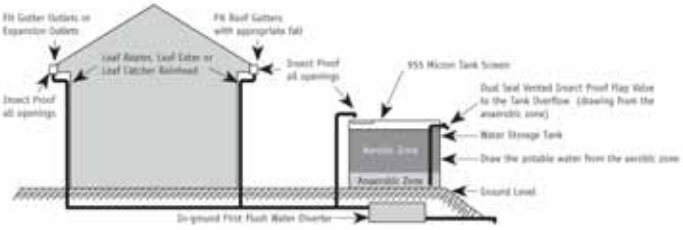
A TYPICAL "DRY" SYSTEM

A "Dry" System is a system where the pipes drain out and dry out after rain. A system where pipes do not hold water after the rain stops. Large buildings normally make it near impossible to have "dry" systems. For slightly sloping sites an In-Ground First Flush Water Diverter will turn a "wet" system into a "dry" system.



A TYPICAL "WET" SYSTEM CONVERTED TO A "DRY" SYSTEM

For slightly sloping sites an In-Ground First Flush Water Diverter will turn a "wet" system into a "dry" system.



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"Harvesting and reusing stormwater offers both a potential alternative water supply for non-drinking uses and a means to further reduce pollution in our waterways."

dengue viruses but the provision of town water reticulation has been cited as one possible factor in the disappearance of Aedes aegypti from the south. Drought conditions have recently promoted significant changes in the way householders store and use water. Queensland Health reports that 38% of households in Brisbane have one or more rainwater tanks and 27% of households in Brisbane currently collect or store rainwater in a container other than a rainwater tank. It is therefore extremely important to incorporate reliable insect-proofing.

Aedes aegypti mosquito

Stormwater Harvesting

Stormwater harvesting represents a relatively new form of water reuse in comparison with rainwater tanks and treatment plants. Harvesting involves the collection of runoff from drains and creeks. However, reuse of stormwater is increasingly seen as a potential option for meeting water demands and other objectives. At present, harvested stormwater is mainly used for irrigation of public parks and golf courses. Strictly speaking, harvesting of stormwater might not be classified as 'reuse' or recycling, because the water has not been used previously.

As mentioned above, urbanisation approximately doubles runoff volumes, due to the increase of impervious surfaces and reduction in infiltration of rainfall. This increased runoff can affect the health of stream ecosystems, cause downstream flooding, alter wetting-drying cycles in natural wetlands, cause severe erosion and convey pollutants to downstream receiving waters. Environmental and hydraulic benefits are usually achieved by reducing runoff volumes to predevelopment peak levels. While stormwater harvesting is environmentally beneficial, there are circumstances – mainly relating to the cumulative effects of numerous small schemes – where there are potential environmental risks.

Stormwater harvesting schemes where the environmental risks from the stormwater extraction are low, and where all of the stormwater could be harvested, include harvesting from a drain that discharges directly to a beach, a tidal waterway or a lake (where the drain contributes only a small portion of the inflow into the lake).

Schemes where a more detailed water balance and environmental impact assessment is required include developments upstream of natural wetlands, lakes, constructed wetlands and natural streams which collect baseflow.

Water Sensitive Urban Design (WSUD)

Roofwater and stormwater reuse schemes are commonly used in water sensitive urban design strategies for new urban developments. Water sensitive urban design (WSUD) is an internationally recognised concept that offers an alternative to traditional development practices. WSUD is an holistic approach to the planning and design of urban development that aims to minimise negative impacts on the natural water cycle and protect the health of aquatic ecosystems. It promotes the integration of stormwater, water supply and sewage management at the development stage.

WSUD represents a fundamental change in the way urban development is conceived, planned, designed and built. Rather than using traditional approaches to impose a single form of urban development across all locations, WSUD considers ways in which urban infrastructure and the built form can be integrated with a site's natural features. In addition, WSUD seeks to optimise the use of water as a resource.

The Model for Urban Stormwater Improvement Conceptualisation (MUSIC) is a software tool that simulates the behaviour of stormwater in urban catchments. MUSIC is the preferred tool for demonstrating the performance of stormwater quality treatment systems within the urban areas of South East Queensland (SEQ). Features that can be modelled in MUSIC include rainwater tanks, constructed wetlands, bioretention basins and swales.

Bioretention basin at Arundel, Gold Coast, designed by OPUS

Stormwater Harvesting Example

The civil engineering team in the Brisbane office of Opus International Consultants Pty Ltd worked on the design and construction of the iconic Dreamworld Theme Park on the Gold Coast.

A number of different treatment trains were considered as part of the water sensitive urban design of the project. Stormwater Quality Improvement Devices such as gross pollutant traps were ruled out in order to implement a more natural, aesthetically pleasing and community friendly stormwater treatment train. In keeping with the ethos of the development it is proposed to utilise a more natural community friendly approach in the form of water reuse ponds, hidden under the water park structures. The purpose of the ponds is to capture as much rainwater and surface water as possible for reuse demands.

As part of the system two grassed swales were constructed along the boundaries of the site. Runoff from the catchments enters the swales through conventional piped drainage. The swales discharge to each of the reuse ponds. A bioretention swale was ruled out because the water level that may occur from the water reuse ponds will reduce the treatment efficiency of any filtration drain or media.

All the stormwater catchments discharge to the water ponds. The northern pond has a water storage volume of 400m³ and

Swale and reuse pond at Dreamworld Theme Park, Gold Coast, designed by Opus

the southern pond has a water storage volume of 200m³. The runoff stored in the pond is used to supply water for irrigation and toilet flushing throughout the Water Park. This annual water demand is modelled in MUSIC as 30ML per year.

Each pond has landscaped sides and a Bentofix synthetic or HDPE liner to maximise the water stored. Dreamworld monitors the ponds for algae blooms and an aeration system can be implemented to the pond if required.

The water reuse ponds utilise natural physical, biological, and chemical processes work to remove key pollutants. Sedimentation processes re-move particulates, organic matter, and metals, while dissolved metals and nutrients are removed through biological uptake. The reuse feature of the pond has several key environmental benefits. The greatest benefit is the increased pollutant removal and groundwater recharge that occurs because a large fraction of the annual stormwater runoff volume (and pollutant load) is applied back to the watershed. Consequently, water reuse ponds achieve even greater mass pollutant removal rates than standard stormwater ponds. Without reuse, ponds cannot reduce the volume of runoff delivered downstream, and must rely exclusively on pollutant removal pathways within the pond to capture and treat the stormwater. Furthermore water reuse also reduces the demand the Water Park will have on the existing water supply of the Gold Coast City Council.

Source controls implemented on the Water Park site are sweeping, rubbish bins and education of staff. These source controls represent an additional reduction in the total pollutant loading produced.

The Dreamworld Theme Park has already implemented a high degree of maintenance as part of the daily operation of the park.

Dreamworld Theme Park, Gold Coast where reuse ponds are hidden underneath water slides and other structures

The Theme Park is machine swept on a regular basis and all spills on site are cleaned as soon as they occur. Education measures for the Water Park include information sheets and training for staff on the requirements for keeping the site clean, use of slow release fertilisers and not discharging waste (organic and chemical) down the stormwater system. The use of appropriate signage also reinforces these messages. ■

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Rainwater Harvesting – System Dynamics, Diurnal Patterns and Getting the Modelling Right

Steven Lucas – Bonacci Water, Peter Coombes – Bonacci Water and Michael Barry – BMT WBM

Introduction

The use of domestic rainwater tanks with mains water trickle top-up in urban areas can produce considerable reductions in mains water demand and stormwater runoff. It is commonplace to analyse the performance of rainwater tanks using continuous simulation with daily timesteps and average water use assumptions. But is this resolution enough considering the complexity of demand management strategies, rainwater tanks and wastewater reuse within an urban water supply system?

This article discusses the main messages emanating from recent rainwater harvesting studies published in several international peer-review water industry journals. The common theme is that robust analysis of the performance of rainwater tanks used in urban areas that employ both mains water and rainwater supplies is essential to understand impacts on regional water security, stormwater management and provision of infrastructure.

Modelling Rainwater Harvesting Systems

Inputs to the modelling of rainwater harvesting systems, such as climate (rainfall and evaporation) and water demand, have traditionally relied on daily timesteps and average assumptions. Understanding how, where, why and when water moves through water supply catchments provides insight into how different water systems behave. Any modelling approach must consider the dynamics of all sources and sinks of the urban water cycle to be considered robust and the smaller the scale the smaller the required modelling timestep to reveal the detail. Allotment scale water use patterns modelled with behavioural and probabilistic indoor and outdoor use, coupled with modelling the dynamics of the rainwater tank configuration, is considered vital in evaluating the performance of rainwater tanks. One such model that satisfies these criteria is the Probabilistic Rainwater and wastewater Reuse Simulator (PURRS).

The PURRS uses a unique probabilistic and behavioural framework for continuously simulating allotment water use dynamics. For example, the probability of outdoor water use increases with the number of consecutive dry days, and this water use behaviour is captured in the diurnal water use pattern and indoor end-use categories used in the model. These attributes are often ignored in many allotment water balance models.

The use of 6-minute timesteps captures the diurnal variability of rainwater reaching the tank and drawdown from the tank from household water use. The PURRS predicts daily water use from mains water, treated wastewater and rainwater tank supplies, and provides storm event-based information about the performance of the system, annual maximum stormwater peak discharges and peak water demand (daily and instantaneous). These are important design criteria for water supply, wastewater treatment/reuse and stormwater management. Details of the PURRS model can be found in Coombes (2002).

The importance of continuous simulation and time step and duration of climate data for robustly evaluating rainwater harvesting strategies at the allotment scale has been demonstrated by Coombes and Barry (2007) and Lucas et al (2006).

Duration and Timestep of Climate Input Data

Lucas et al (2006) compared the "common" use of three modelling approaches with four Australian locations. The modelling approaches included using Spreadsheets (Excel), the Model for Urban Stormwater Improvement Conceptualisation (MUSIC v3) and PURRS. PURRS used rainfall records up to 79 years at 6-minute timesteps (refer Lucas et al, 2006). The mains water savings derived from the water industry's "common" use of MUSIC and spreadsheets for evaluating rainwater are compared to the PURRS results in Figure 1.

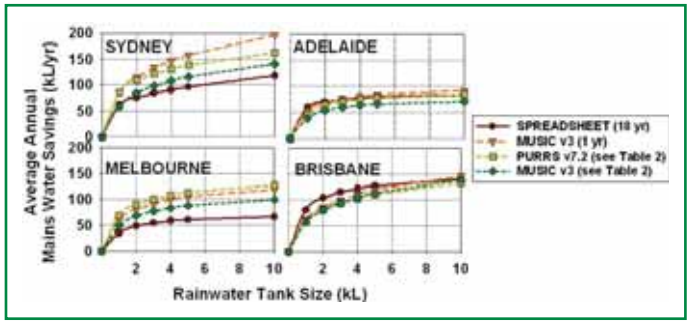

Figure 1 – Comparison of mains water savings derived from common uses of the selected models (refer to Table 2 in Lucas et al 2010 for the duration of rainfall used in each case)

Figure 1 showed that the use of meteorological templates that use 1 year of rainfall in MUSIC resulted in an over-estimation of mains water savings for Sydney and Brisbane, and an under-estimation of mains water savings for Melbourne and Adelaide in comparison to PURRS results. The use of longer BOM records provided in MUSIC resulted in consistent under-estimation of mains water savings at each location. A proportion of this under-estimation can be attributed to periods of "missing" data in the BOM record provided in MUSIC. The Spreadsheet showed an under-estimation of mains water savings for Sydney and Melbourne and an over-estimation of mains water savings for Adelaide and Brisbane.

Figure 2 shows the % difference in mains water savings from the common use of MUSIC and Spreadsheets.

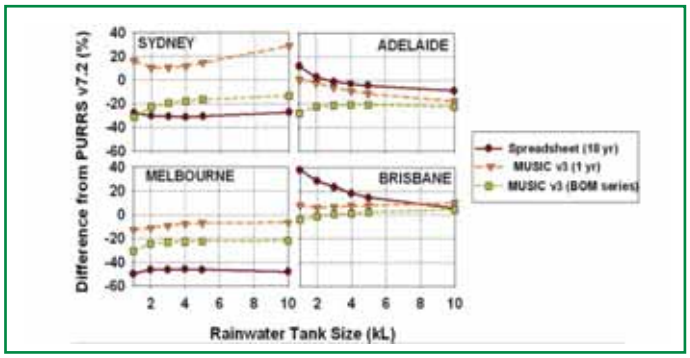

Figure 2 – Difference in results from the common use of Spreadsheet and MUSIC in comparison to PURRS

The range of the over/under estimations produced by the water industry's common use of the models is considerable and the magnitude of these errors would be unacceptable for water planning and evaluation of rainwater harvesting strategies. The difference observed between the common use of models and the PURRS results is most likely a consequence of using climate records of different durations with missing data in some of the BOM records. Therefore, climate inputs should be at 6-minute timesteps, be of the longest duration possible and be complete and continuous. The different treatment of water demand inputs, the timestep of

simulation and the configuration of the tanks used in the models will also contribute to the variability of results.

The Effect of Timestep and Average Assumptions

In Barry and Coombes (2007), the rainwater tank with mains water trickle top-up scenario for a range of Australian locations was analysed using 6-minute timesteps and climate dependent water demand. Having correctly modeled rainwater tank configuration and 6-minute timesteps using PURRS the comparison in Figure 3 shows the errors resulting from Case (a) (daily timestep and climate independent water demand) and Case (b) (daily timestep and average water demand) when modeled with PURRS.

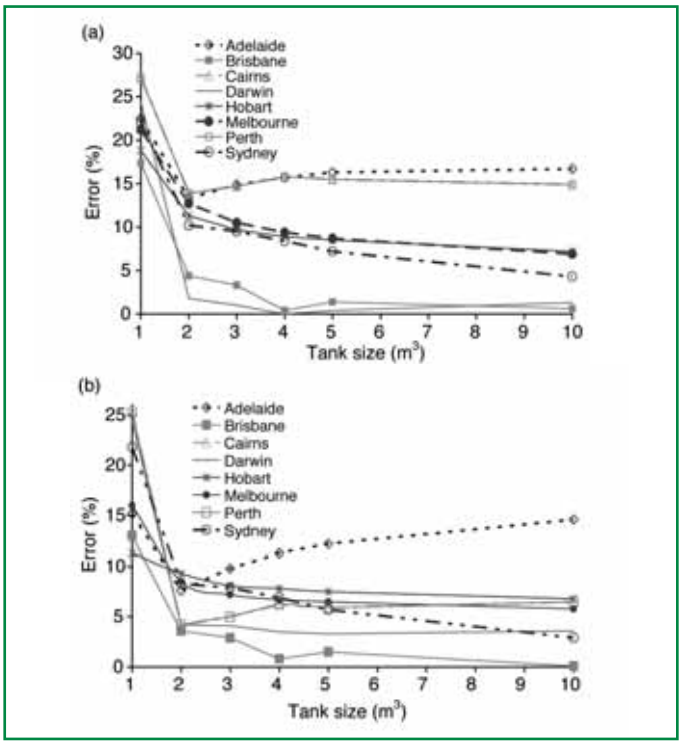

Figure 3 – (a) Summary of errors using daily timestep and climate independent water demand and (b) Summary of errors using daily timestep and average water demand (from Coombes and Barry, 2007)

The study established that the use of daily timesteps produced considerable under-estimation of annual rainwater yields that were dependent on tank size, rain depth, seasonal distribution of rainfall, water demand and tank configuration. Greater underestimation of rainwater yield was observed for smaller rainwater tanks and some cases these differences in yield diminished with increasing tank size. The study concluded that the performance of rainwater tanks is critically dependent on many variables that may not be considered in analysis using less detail such as daily timesteps and average water demands.

Diurnal Water Use Patterns and Demographic Patterns and Water Supply Design

When 6-minute timesteps and climate dependent water demand is considered and correctly modeled then the true dynamics of a rainwater harvesting system are revealed. Figure 4 shows the comparison of observed and predicted water level in the rainwater tank (using PURRS). Robust modelling requires that the patterns of rainwater inflow to the tank and water demand from the tank are correctly modeled; as these are the primary drivers of available storage in the rainwater tank before the next rain event and how much rainwater there is available for use. If a model cannot simulate actual water level in the tank then insights cannot be revealed.

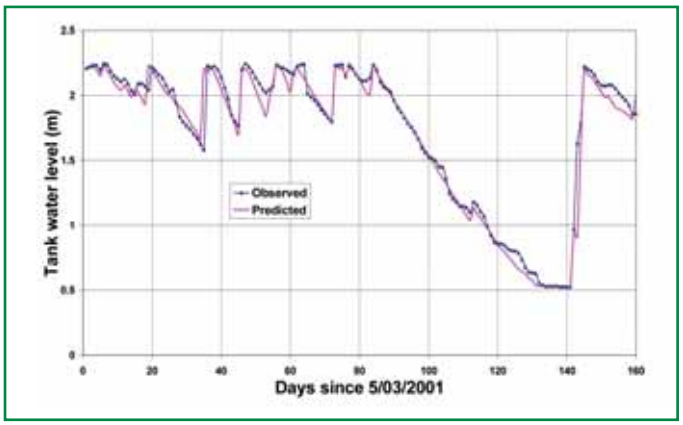

Figure 4 – Comparison of observed and predicted water level in the rainwater tank at the Maryville house (from Coombes, 2002)

Water demand from the tank varies with dwelling type and occupancy however the use of smartmeters has allowed household water use to be monitored at 5-litre increments to provide the data in Figure 5. In a house without a rainwater tank these diurnal water use patterns represent the demand on the mains water supply system. Many diurnal water use patterns from many dwellings of different occupancy typically make up the diurnal mains water use pattern of the supply network.

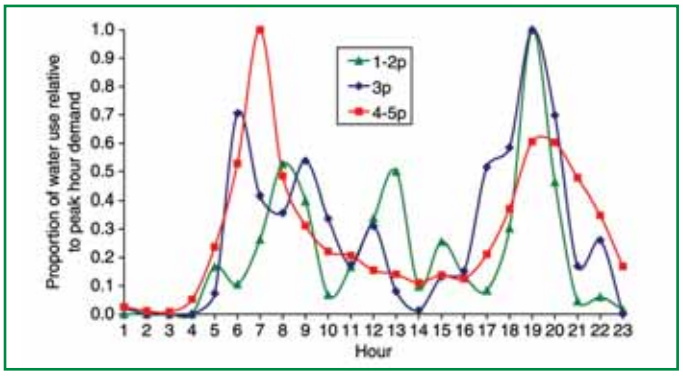

Figure 5 – Household water use patterns as used in Lucas et al (2010)

However, Figure 6 shows that when a household has a rainwater tank with mains water trickle top-up the household "mains water" use pattern is vastly different to those seen in Figure 5.

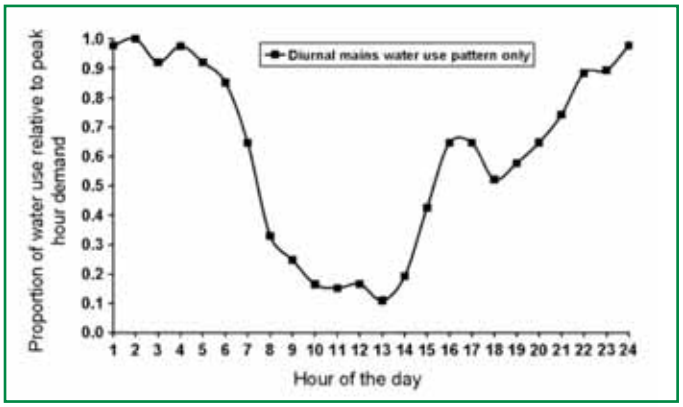

Figure 6 – Diurnal mains water use pattern resulting from demand management and a 3kL rainwater tank with mains water trickle top-up (from Lucas et al, 2010)

"The range of the over/under estimations produced by the water industry's common use of the models is considerable and the magnitude of these errors would be unacceptable for water planning and evaluation of rainwater harvesting strategies."

The reason for the difference can be explained by the timely delivery of mains water trickle top-up. For example, there is distinct morning and evening peaks in household water use (see Figure 5) and assuming that the rainwater tank approached minimal (top-up) level at midnight, the mains water trickle top-up system would start (refer Figure 7).

The mains water trickle top-up remains on until a preset water level is reached. At this time there is sufficient water in the tank to supply the next morning peak demand. Note that the rate of water use in a dwelling of given occupancy is related to the number of toilets, showers, taps, etc., so it is highly unlikely that the volume of water in the tank (after mains water trickle top-up) would be used or

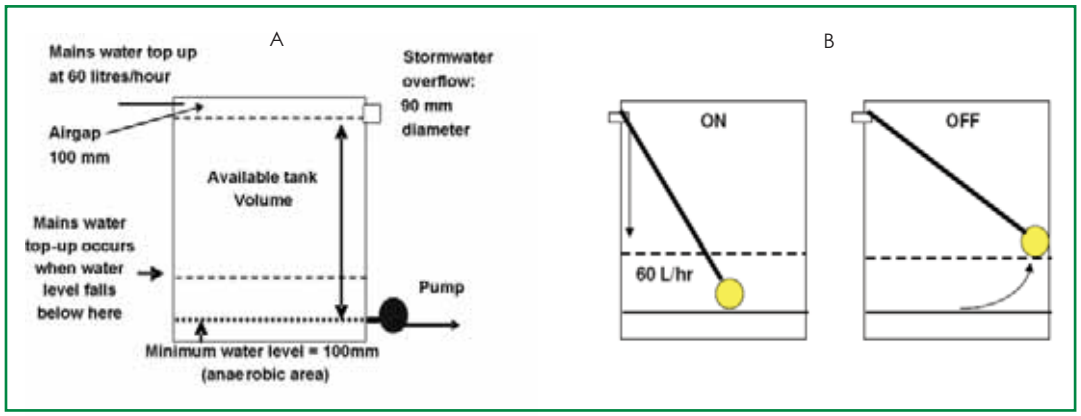

Figure 7 – (A) Rainwater tank configuration as used in PURRS analyses and (B) the operation of the mains water trickle top-up system

the trickle top-up rate exceeded in a domestic situation. Rainwater tanks are typically topped-up with mains water at traditional "off peak" times to supply the proceeding household water use peak, resulting in the household "mains water" use pattern seen in Figure 6. When it rains then mains water is not required until the water level is drawn down to the mains water trickle top-up minimum. These insights into the performance of rainwater harvesting systems cannot be observed using average water demand at daily timesteps.

On a larger scale, the spatial and temporal patterns of many dwelling types of varying occupancy are also important drivers for how and where water is used within an urban water supply system. Table 1 and 2 show dwelling type and household occupancy breakdowns used in Lucas et al (2010).

Table 1 – Dwelling type breakdown

Dwelling Type Breakdown	
Detached	47%
Semi-detached	22%
Flats, Units & Apartments	31%

Table 2 – Household occupancy breakdown

Household Occupancy	
1p	30%
2p	37%
3p	17%
4p	11%
5p	5%

Lucas et al (2010) describe an allotment water demand distribution analysis where demand management (water efficient appliances) and rainwater tanks with mains water trickle top-up (DM+3kL) were modelled using H_2OMapWater Suite; a water supply network model (from MWHsoft). It is important to note that allotment scale modelling using PURRS provided the water demand input data to the network model and several diurnal water use patterns were used. The impact on determination of "peak hour demand" was tested with increasing uptakes of 3kL rainwater tanks with mains water trickle top-up. Figure 8 shows results from the network modelling based on allotment scale water demands predicted in the PURRS, appropriate diurnal water use patterns (Figures 5 and 6) and a demographic profile (Tables 1 and 2).

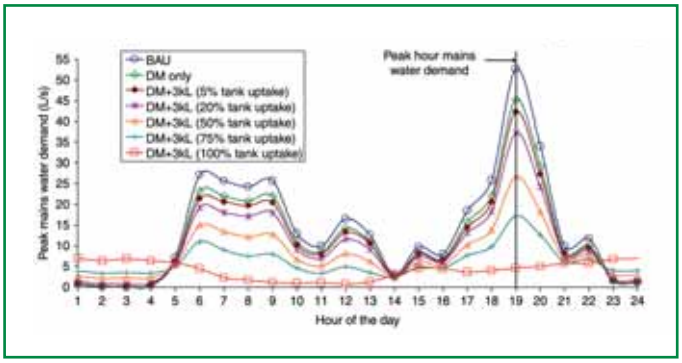

Figure 8 – Network modelling based on allotment water demands predicted from the PURRS, appropriate diurnal water use patterns (Figures 4 and 5) and demographic profile (Tables 1 and 2)

The business-as-usual (BAU) scenario at the allotment-scale resulted in the highest peak hour "mains water" demand (53 L/s). The peak hour mains water demand occurred at 19:00 hours and for design purposes provided the "discrete peak" for comparing design criteria for subsequent water supply scenarios. The BAU morning peak (6-9am) was broader however not as high (~26 L/s) as the evening peak. The diurnal mains water use pattern for demand management only (DM) had a similar shape but lower peak hour mains water demand than the BAU scenario. The reduction in peak hour mains water demand for DM only is likely to be a function of end-uses in the home and the ability to reduce flows for these uses, compared to not having water efficient appliances at all (BAU).

In Lucas et al (2010), each of the 436 dwellings (on 253 allotments) were incrementally assigned a 3kL rainwater tank with a trickle-top rate of 5L/6-minutes (60L/hr) which equated to a peak hour mains water demand of 0.016L/s/dwelling. The mains water trickle top-up rate used in the network simulation was arbitrarily selected based on data in Barry and Coombes (2007). Peak hour mains water demand was assigned to each allotment based on the number of dwellings. For example, 0.016L/s for a detached dwelling, 0.032L/s for two semi-detached dwellings and 0.096L/s for six flats, units or apartments on a single allotment; and this reflected the demographic profile and symmetry of mains water demand within the cluster. The diurnal mains water use patterns shown in Figures 4 and 5 were used in the network simulation. For DM + 3kL with differing % uptakes an equivalent percentage of dwellings were denoted DM + 3kL and the remainder were denoted DM only. For example, DM + 3kL (20% uptake) reflected that 87 dwellings (of mixed occupancy, lot area and dwelling type) had 3kL rainwater tanks with mains water trickle top-up; and 349 dwellings had DM only.

The most significant aspect of DM + 3kL (100% tank uptake) with mains water trickle top-up is that the peak hour mains water demand was removed. In fact, all DM + 3kL scenarios reduced peak hour mains water demand considerably more than BAU and DM only scenarios. This would greatly affect traditional design criteria estimations and cost benefit analysis of integrated urban water supply systems.

Cost Benefits of Robust Modelling

Rainwater tanks provide many economic benefits that are often overlooked in traditional cost-benefit analysis. For example, Coombes et al (2002) and Coombes (2005) discuss allotment-scale rainwater tanks as an integral part of urban water cycle management, where the economic benefits to the community are derived from mains water savings, construction and depreciation savings resulting from a reduced requirement for stormwater infrastructure and interest earned on community savings due to deferral of new water supply headworks. These benefits are often overlooked in traditional cost benefit analysis because these insights require modelling rainwater harvesting systems at 6-minute timesteps (rainfall and water demand) to reveal the detail.

A recent study (Coombes, 2007) found that the widespread installation of rainwater tanks (up to 10kL) used to supplement mains water supplies for domestic laundry, toilet and outdoor use can produce considerable reductions in operating costs and greenhouse gas emissions of regional water systems supplying cities, ranging from a present value of $57 to $6,371 per household with an installed rainwater tank. Coombes and Barry (2008) demonstrated that rainwater harvesting from rooftops has a greater resilience to climate change than traditional dam storages. Many of these benefits require identifying the patterns and dynamics that contribute to an integrated urban water system and modelling the detail is vital for robust outcomes.

Conclusion

This paper has discussed outcomes from rainwater harvesting studies that provide insight into rainwater harvesting system understanding. The main messages highlighted are:

a. That to capture rainfall variability, rainfall records should be of long duration (many decades), at 6-minute timesteps and have no missing data (continuous)
b. That the performance of rainwater tanks are critically dependent on many variables that may not be considered in analysis using less detail such as daily timesteps and average water demands
c. That diurnal water use patterns must be appreciated at the household, allotment, cluster and supply-catchment scale to robustly determine design criteria for urban water supply network infrastructure
d. That the economic benefits of rainwater tanks (with mains water trickle top-up) to the community are derived from mains water savings, construction and depreciation savings resulting from a reduced requirement for stormwater infrastructure and interest earned on community savings due to deferral of new water supply headworks

Traditional approaches to modelling rainwater harvesting systems have missed all of the above insights. The way forward requires us to acknowledge the detail and correctly model how a given water supply system performs. Large dams and centralised treatment and distribution behave differently to "tens of thousands" of individual rainwater tanks situated throughout an urban area. Using daily timesteps and average assumptions does not capture the dynamics of how rainwater tanks work. While daily data may be suitable for large dams, the use of 6-minute timesteps is needed to fully observe how rainwater tanks (with trickle top-up) perform as part of an integrated urban water supply; and this data can then be used as input for regional water infrastructure planning. ■

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Andrew Curtis – Chief Executive, Irrigation NZ

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It is well proven that all communities – national, regional and local – benefit considerably from reliable upgrade and development of irrigation schemes. This fact has now been reinforced by recent ex-post studies in both South Canterbury and the Lower Waitaki catchment.

In South Canterbury the benefits of the irrigation development have boosted the region's economy by over $40million per annum and 480 full-time employees have also contributed to a younger more skilled workforce in the region. This 2005 ex-post study also showed on-farm gross farm revenues increased almost three-fold from $900/ha to $2,100/ha, farm expenditure increased from $644/ha to $1,503/ha and a cash farm surplus increased from $210/ha to $570/ha, on the additional 16,000ha irrigated through the Opuha Dam project.

"The above example proves reliable irrigation is the way forward for the primary sectors, minimising the boom-bust scenarios of old and creating opportunities for dependable, high value production and thus wealth transfer to communities. However, well implemented irrigation can contribute far more value to communities than just its direct benefits."

More recently the Opuha findings have been reiterated by the 2010 North Otago Irrigation Company (NOIC) ex-post study, which recorded almost identical benefits. Total gross farm revenue increased more than three-fold from $21m to $65m, most of which flowed to the local economy – farm expenditure increased from $13m to $43m, and the total cash farm surplus increased from $7m to $22m on the 10,000ha that was irrigated. Over $62m was also spent by farmers on farm conversion, most of which flowed into the local economy.

Both the Opuha and NOIC have proven that reliable irrigation brings massive gains to the local community – over three times that gained by individuals. Reliable irrigation therefore creates an economic win for everyone.

In terms of consistent on-farm production, reliable irrigation also demonstrates clear benefits. Comparing the impacts of the 2010 droughts in Northland and Waikato, these two regions, without reliable water supply, fell considerably behind the central South Island in terms of production. For example, milk production in the upper North Island, including Northland, dropped 8% on a daily basis compared to last season. The Waikato fell 10.5% while the central South Island (Canterbury and North Otago) increased 5.5%.

For the same period Dairy NZ figures record Waikato milk solids/cow herds ranging between 0.9 – 1.4MS/cow/day with an average of 4kg dry matter/cow/day of supplement being fed in addition to pasture. Canterbury milk solids/cow herds, despite low rainfall, were between 1.5 – 1.8 MS/cow/day, and most were harvesting silage for winter supplement feeding!

The above example proves reliable irrigation is the way forward for the primary sectors, minimising the boom-bust scenarios of old and creating opportunities for dependable, high value production and thus wealth transfer to communities. However, well implemented irrigation can contribute far more value to communities than just its direct benefits.

The Opportunity

There needs to be wider understanding that irrigation is an investment in communities – local, regional and national. Future upgrade and development of irrigation schemes must be undertaken in a manner in which the maximum benefits are realised and flow on – achieving the value add component. It's no longer about irrigation scheme upgrade and development – it's about investing in communities in order to realise the opportunities that irrigation (water) can create – cultural, social, environmental and economic.

Many of the challenges to achieve the above are leadership and co-ordination based. Presently the multiple local and central government agencies that impact on and benefit from irrigation development have a tendency to work towards their individualistic goals in a silo manner. They also have little interaction with the private sector.

However, for successful future irrigation scheme upgrade and development there needs to be clear leadership enabling the co-ordination of all key areas, for example, transport networks (road, rail and ports), energy requirements and generation (external and internal), communication networks (rural broadband – local and global), industrial development (service industries and secondary processing – value add). Integration of additional social benefits such as securing town water supplies, flood defence and creating recreational opportunities must also be integrated as appropriate.

Irrigation NZ is confident that the second generation National Infrastructure Plan will go some way towards achieving the required

leadership and co-ordination, particularly as these are now widely acknowledged gaps.

The Land Use Intensification Challenge

The wealth that irrigation creates needs to be capitalised upon to ensure the environmental prize can also be realised. Water quality is the challenge ahead for irrigation. For irrigators – it is the impact land management practices can potentially have upon water quality – such as the loss of nutrients to the environment, which has to be overcome. For the irrigation service industries – it is the capability to provide irrigators with the well designed and installed irrigation systems they need so they can achieve this.

To date the green lobby has likened irrigation in New Zealand to a satanic pastime, a plague on New Zealand's clean green image. This viewpoint has been developed from simplistic assumptions of the status quo, branding the actions of the problematic few, who in the case of irrigation are often limited by reliability – either at supply or distribution level, as the future norm. Yes the irrigation industry admits that it has challenges ahead but they are not insurmountable, particularly with the advent of precision irrigation technologies and if the irrigation operator is trained so that irrigation is well managed. Reliable irrigation becomes the enabler to this scenario giving farmers the certainty they require to allow investment in technology and training and thus better environmental management.

Good Management Practice (GMP) irrigation keeps grass and crops growing optimally, absorbing the applied nutrients. This enables farmers to proactively manage losses from the system, as opposed to a dry land scenario where there is no control over soil moisture and consequent plant growth, leaving nutrient outcomes unequivocally in the hands of the rain gods!

For irrigators there are two key elements to GMP irrigation and thus to ensuring good water quality outcomes:

1. It rains every autumn in New Zealand – it's a given. Irrigators need to arrive at the end of the growing season with minimal free nutrient (in the soil) that can be lost through run-off or leaching – Sound Nutrient Management Planning is the answer to this
2. We need to minimise nutrient losses to the environment from our seasonal irrigation practices – Improving Water Use Efficiency is the answer to this

The challenge ahead for GMP irrigation is developing and implementing systems that benchmark irrigator performance. These benchmarks can be used to inform irrigators as to 'where they are at' and give individuals an indication of 'where they have to go' in relation to both their peers and the optimum – driving change. Irrigation NZ has a number of current interlinking projects underway to successfully work towards these goals.

There are significant benefits that can be created with a sound co-ordinated approach to irrigation scheme upgrade and development. Such an approach will make irrigation a 'no brainer' for future proofing the New Zealand economy and ensuring the required environmental outcomes are achieved. New Zealand needs to take a progressive 'grow the pie' approach to irrigation scheme upgrade and development in order to create opportunities for all stakeholders. Urgent collective action on irrigation scheme upgrades and development for 2011 is the best way to achieve this. ■

Oxfam is working in North and Central Bougainville to help 10,000 people access safe water. Photo: Tom Greenwood

World Water Day Shines a Light on the Issue of Clean Water

Oxfam New Zealand

Water is essential for life. Clean and accessible water is a luxury that most New Zealanders take for granted, yet many in the developing world face a serious threat to their lives due to dirty, unsafe water. The root of this underlying tragedy lies in these sobering facts: more than one billion people live without access to clean water; 80 per cent of all illness in the world is caused by dirty drinking water, and in the next 24 hours, diseases caused by unclean water and inadequate sanitation will claim the lives of 5000 children.

On 22 March, 2011, people in New Zealand and around the world will take part in World Water Day, an annual day of observance that highlights the importance of fresh water and advocates the sustainable management of water resources. As an initiative born out of the 1992 United Nations Conference on Environment and Development, World Water Day was launched in 1993 and each year has adopted a new theme.

This year's focus is Water for cities: responding to the urban challenge. With over half of the world's population now urban dwellers – and this number rising rapidly in the developing world – investments in water and waste infrastructure have not been able to keep up with the rate of urbanisation. Coping with the growing needs of water and sanitation services in cities is therefore one of the biggest challenges this century and the pressure is exacerbated by climate change, conflicts and natural disasters.

While cities are complicated to manage, they also provide the best opportunity to improve livelihoods and water and waste infrastructure development. The big opportunity is to adopt an efficient integrated urban water and waste management system that recycles and reuses water. This results in the minimisation of environmental and downstream pollution.

World Water Day is not an event that calls for celebration, nor is it a sombre occasion. Rather it is an opportunity to highlight a problem and work towards a solution. Taking part in World Water Day offers a chance to create momentum and compel the international community of governments, non-governmental organisations and individuals to take action on global water issues.

Organisations around the world are encouraged to host events and activities that focus on improving water, sanitation, and hygiene provision. The showcase for World Water Day 2011 will be held in Cape Town and hosted by the Government of South Africa, in collaboration with United Nations agencies. The event includes an array of panel discussions, debates, exhibitions and culture.

Here in New Zealand, Oxfam is marking World Water Day by holding four exhilarating team races in stunning locations in Auckland, Christchurch, Tauranga and Wellington 19 – 26 March 2011. The Oxfam Water Challenge is an annual Top Town-style relay event open to those in the water sector, from consultants and

"The big opportunity is to adopt an efficient integrated urban water and waste management system that recycles and reuses water. This results in the minimisation of environmental and downstream pollution."

construction companies to environmental agencies and councils. Teams of four will race to carry 20 litres of water across the finish line to highlight the fact that people in the developing world often have to carry up to 20 litres of water over long distances everyday just for their family's basic needs.

Launched in 2009, the event has grown from strength to strength, raising over $28,000 last year for Oxfam's Water for Survival programmes. These long term water projects are having a profound impact on the lives of people living in Bougainville, Papua New Guinea, Vanuatu, East Timor and Samoa.

Pauline Komolong, an Oxfam Water Engineer in Papua New Guinea, explains, "The water makes life easier. It's piped down to the village so women and children do not actually have to work to fetch water. But it's the toilet that really makes a lot of difference in their health."

It's easy for good intentions to go awry, as evidenced by water systems in the developing world that fall into disuse because there are no spare parts. Oxfam's approach is to engage local communities, make sure they have a vested interest in the work being done, and design programmes that they can eventually take over and maintain themselves. One example is Oxfam's programme in Bougainville. Before work begins, villages must pay 10% of the cost of materials for the toilets and water systems. They also agree to provide all the labour. This ensures the community is motivated and takes ownership of the project, and because local people are doing the construction, they learn how the systems work. Julie Tulaso lives in Poisinami village, in the steep mountains of Central Bougainville. She is an assistant to the local Village Health Volunteer. The closest road is a 25 minute walk and the only health clinic in the region is an hour away by four-wheel drive. Julie says, "With this project of water and sanitation, it's actually motivating people to build a toilet. The main problem is diarrhoea, which is caused by eating with dirty hands – either when taking in food or when preparing food."

Unless everyone has access to a toilet, there is still disease in the village so Oxfam uses a model called Community Led Total Sanitation to make sure all local residents have access to basic sanitation. The agency trains communities in good hygiene practices, such as hand washing with soap. The next step is to do a community mapping exercise, otherwise known as "poo mapping", whereby residents draw the landmarks, rivers, paths, trees and houses in their village. Then with a red pen, everyone marks where they typically go to the toilet. This is an effective way of highlighting the problem of open defecation.

Finally, when the sanitation work is complete, a safe water system is built.

"Before, you'd see kids that don't usually take a shower for a week because the water is too far away. Now they can literally wash outside the house," says Pauline Komolong. "When you design a gravity-fed and turn on the first tap, you see women crying – tears of joy, like they don't have to carry buckets of water for hours and hours each day," she adds.

Clean water is essential, but it's not the only thing necessary for a life that is healthy, safe and dignified. With this holistic approach, Oxfam is helping people take more steps towards achieving their fundamental human rights, and to maintain that progress for the long term.

To get involved in World Water Day, visit: www.oxfam.org.nz/water

"When you design a gravity-fed and turn on the first tap, you see women crying – tears of joy, like they don't have to carry buckets of water for hours and hours each day."

Oxfam water engineer Pauline Komolomg in Sirovai village central Bougainville, with the piping that will be used to build a gravity-fed water system for the community.

iCAN Samoa – Supporting Our Pacific Neighbours in the Aftermath of Tsunami

Maree Newson – Volunteer, iCAN

It's now over a year since the devastating earthquakes and tsunami hit the island of Upolu, Samoa. Maree Newson reflects on her experience with a group of young Wellingtonians who travelled to Samoa to assist the ongoing tsunami recovery effort in July. Over one week, they supplied and installed four rainwater collection tanks to provide one village with the vital fresh water it desperately needed.

If you asked me to describe Samoa in one word, it would be *warm*. As I walked down the plane aisle there was a rush of warm, muggy air and stepping out into the scorching sun heat mirages stretched ahead.

As we followed the coast along to Nofoali'i, our base for the duration of the project, I tried to soak it all up and focus on the task ahead. I had arrived a couple of days in advance of the rest of the team – Ben Irving, Tom Paulin, Bryony Cunningham-Powe and Jessica Hooper were to follow.

As I was welcomed into their homes and families, their churches and their workplaces, I was captivated by the Samoan people and their way of life. It was difficult to imagine that their communities had been through any great hardships.

But on my second day, when I paid my first visit to Salani, I saw countless new gravestones, houses torn apart, bridges washed away, and villages eerily empty of women and children.

Suddenly, it all became very easy to imagine the events that had unfolded there.

On 29 September 2009, Samoa was devastated by a series of tsunami waves, following an 8.3 magnitude earthquake only 193 kilometres from the southern coast. At their highest, the waves reached 14 metres. In Samoa 143 lives were lost, including seven New Zealanders, with five missing. Hundreds more were injured. There was widespread damage to housing, roads, and 20 villages on the south coast of Upolu were completely destroyed. The worst affected were women and children.

New Zealand sent people, money, supplies and messages of condolence and support – over 130 medical, forensic, naval diving, engineering and specialist personnel assisted with the relief effort. Red Cross, Oxfam, Habitat for Humanity, Caritas and many other organisations launched dedicated programs.

Back home, many of us felt drawn to help, but with no specific skills or resources at our disposal, we were at a loss. I'm a lawyer – I can write great letters, but I can't build a house or operate heavy machinery. And then, almost six months after the tsunami, an opportunity arose to put my excellent letter-writing skills to good use.

Some friends posted a message – on facebook, naturally – about their idea to take a group to Samoa to volunteer with the ongoing recovery. It would be iCAN Samoa – a development of the iCAN community project that had been formed in Wellington in 2009. We were young, enthusiastic, and on the lookout for a project that we could take on as a team.

While the urgent relief effort addressed immediate needs – shelter, food, medicine, and water – the departure of many dedicated teams left communities to rebuild and re-establish their lives. As collective attention was drawn away, families who had lost children, parents, grandparents and livelihoods had to figure out how to start again.

And so we encountered Kiwi and Loudeen. Taimalieutu Kiwi Tamasese and Tafaoimalo Loudeen Parsons coordinate the Pacific section of the Family Centre, an organisation run by Anglican Social Services out of Lower Hutt, Wellington. Following the tsunami, the Pacific team worked in the southern villages affected by the tsunami, visiting with families and offering psycho-social work, support and counselling. But the ability of each community to recover emotionally was inevitably linked to their physical needs – water and sanitation.

The devastation of the tsunami had only exacerbated existing problems with quality and quantity of the water supply in Samoa. Although running water had been restored to many of the coastal villages, the tsunami drove many of its victims inland. Road access is difficult, and sometimes impossible. Drinking water must be

The boys cool off on the drive home

rationed and, for many villagers who have moved to inaccessible higher ground, the only source of freshwater is through daily trips with buckets to coastal areas. Freshwater is a basic resource that is desperately needed for drinking, washing, cleaning and cooking.

We co-ordinated the project with the Family Centre, and with their Samoan partner – Afeafe o Vaetoefaga – the Pacific Academy of Cultural Restoration, Research and Development, which was our host group on the island. Our task was to fundraise for and install water tanks in Salani, using local suppliers and training and working alongside the community.

None of this would have been possible were it not for a very special addition to our team. Roy Hughes is a builder based in Auckland who had helped with a similar project prior to the tsunami in Falelima, Savaii – the other main island of Samoa. His expertise, leadership and humour helped us to overcome any of the logistical (or mathematical) issues we encountered.

For our project, we had a few key goals:

- One of the first things we wanted to be sure of when planning the project was that we wouldn't be installing a few pretty-looking water tanks that actually didn't last very long, or were difficult and expensive to maintain. All of our supplies were sourced from local businesses in Samoa. The 3000 litre tanks we installed had been used successfully in similar projects around Samoa (including by Oxfam NZ) – they are relatively light and stable, keep water healthy, and can be installed and maintained easily and cheaply
- We wanted to partner with the community – so we used local suppliers and involved local people in the process. Local volunteers planned and trained alongside us to build bases for the tanks, and to install them
- We wanted to focus on installing tanks where they would be accessible to everyone in the village, rather than only to individual households. So we chose two church halls and a women's committee building
- We wanted to make sure we were making every dollar count – each member of the iCAN Samoa team personally covered all of their own travel expenses – including flights, transport, accommodation and food. This means that all donations went directly to funding the water tanks, plumbing, guttering and equipment, getting them to Salani, and installing them. Anything we had left over was to be used to fund the second iCAN Samoa project
- And, finally, we wanted to get to know the country. Ideally, water was to be the first in a series of projects that would give young people in Samoa and New Zealand opportunities to work together, build friendships and connections, and demonstrate leadership for social change

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"The devastation of the tsunami had only exacerbated existing problems with quality and quantity of the water supply in Samoa. Although running water had been restored to many of the coastal villages, the tsunami drove many of its victims inland. Road access is difficult, and sometimes impossible. Drinking water must be rationed and, for many villagers who have moved to inaccessible higher ground, the only source of freshwater is through daily trips with buckets to coastal areas. Freshwater is a basic resource that is desperately needed for drinking, washing, cleaning and cooking."

Normally, as guests, we would have been hosted by the community we were working with. But, logistically, the families in Salani were already under enough pressure. So each morning we ate a breakfast of pawpaw and lime, bread and coconut jam, and piled into a pickup truck to make the 90 minute drive across the island.

Our first issue was transporting the tanks themselves – a delivery truck we had arranged to hire in advance had been involved in an accident. Not an unusual scenario. When the road rules were changed in Samoa in September 2009 the number of vehicles on the roads tripled in the space of three months as Japanese imports flooded in. And driving through Samoa is somewhat like being on a drive-through safari – with less exotic animals. Dog, dog, pig, chicken, dog, cow, chicken and so on. Add to that the poor quality of the roads and the fact that heavy rain or slips often put higher routes out of service, and you see why logistics became a major issue.

Our first journey was an anxious one, but we soon learned to trust in the skills of our driver/handyman/comedian, Bob. Ben was also brave enough to get behind the wheel and the two of them ferried three tanks from Apia to Salani, an hour each way, one at a time, as well as several loads of guttering and materials.

Before the tsunami, Salani had a vibrant tourist industry – focussed on the surf resort and camp located there. The tsunami destroyed the coastal land of Salani village and the surf resort, and drove many to rebuild inland. When we arrived, we found several buildings partially demolished, and many of the homes empty. The debris that was left surrounding homes and churches had to be cleared before we could start work.

Once the locations of the three initial tanks had been decided, we measured out the roof catchment areas, levelled and marked up guttering, built bases for the tanks and fitted plumbing and taps. Roy talked us through the process, showing us how to measure and adjust for the existing slope of the roofline (there was not a level wall in sight), where to place the tanks and how to fit it all together. Once the first three tanks were installed, we set about scoping out some of the other potential sites.

Top to bottom: Ice, Po'o, Roy and Kemu pleased with their efforts following completion of a tank, the original iCAN Samoa crew (left to right) – Bryony, Ben, Jessica, Maree and Tom in Salani, the crew with Roy and locals Ice, Bob and Po'o alongside the women's committee building in Salani

As we drove away from the coast and up into the hills we came across a number of large tanks that had been donated by Oxfam and Red Cross as temporary water storage during the immediate recovery stage. While the locals did not have the resources to buy guttering, these tanks were perfect for rainwater collection. Setting our eyes on quite a spectacular roof (a habit for catchment-spotting that I have yet to shake), we also supplied and installed guttering on the newest church in Salani, still under construction.

On afternoons when we had time to spare, we explored the waterfalls, freshwater springs, and beaches surrounding Salani. One afternoon, we had the privilege of visiting the Women's Project in Tafitoala. The women had been meeting each Tuesday to prepare hand-painted fabrics to be used for lavalava and puletasi. Many of their supplies had been lost, and they were slowly rebuilding the skills and the money to make the project sustainable. As with many tourist destinations, local producers have to compete with cheaper, mass produced imported products. While we chose colours and patterns, and watched them work, they told us about the things that had changed since the tsunami. When we returned to New Zealand, Tom was able to co-ordinate sponsorship for the group from a Wellington store – Harfords Menswear.

Each evening, as we drove back along the southern coast and over the saddle of the western hills, the crew slowly wound down. Shattered from a day in the sun, full to the brim with coconut milk and the most delicious cucumber sandwiches, we got to witness some of the most beautiful sights on the island. And every person we passed on the journey would wave a greeting. Loudeen explained

to us – "Samoa is a very face-to-face culture. We're so small, that everyone knows everyone, and we greet each other that way."

We were lucky to have local hosts who were patient and understanding – they explained the different norms and behaviour we should be aware of – why we had to drive more slowly through villages during the evening prayers, when it was appropriate to swim or not, that formal greetings take place seated in a circle, and how families eat a meal in succession – the eldest and the guests first, then the children who have served, then the rest, and finally the boys.

Samoan life is centred on the village – communal spaces are just as important as private ones, and extended families generally live within walking distance of one another, if not on the same property. In the evenings, it seems every person under the age of 30 is playing sport. Sundays are a day for church, food, and rest.

Departures

On our final evening with our host family, once all the work had been done, Bob and his team of performers put on a show for us – a more entertaining version of the dance performance we had seen at Aggie Grey's Resort the night before. We shared another fantastic meal and reflected on the week. I had never laughed so often, so hard, for so long in my life. My legs ached, I had heatstroke, I was exhausted, and the mosquitoes had feasted on me. And yet I had started to feel more at home in Samoa than I have anywhere in my travels.

During our last day on Upolo, we took a final drive with Bob around to Salani to visit our (now full) tanks, and on towards the eastern side of the island. We saw where massive coconut palms had been ripped away by the wave, where a beach resort that had been swept away was rebuilt, and the half-demolished buildings that still remain. It looked like a war zone. But as we drove up into the hills, the vegetation thickened and the land changed. The rainforest was only a few minutes' drive, yet it seemed remote and lush. While families have retreated to the safety of the highlands, they have strong ties to their ancestral lands at the coast. Whether they choose to rebuild or relocate, they will continue to rely on whatever water they can source.

Lessons from Our Own Backyard

While witnessing the recovery effort taking place in Christchurch, I was struck by the devastation we experience when the infrastructure we so often take for granted is no longer available. It also reinforced the importance of community support, and of "co-sufficiency". Rather than being isolated and "self-sufficient", families affected by the tsunami found strength in one another and worked together to rebuild their homes and their lives. In New Zealand, we have a tendency to see self-sufficiency as the answer. People here are more isolated within their neighbourhoods. It was only in Samoa that I started to recognise how differently we approach the use of communal resources.

In October 2010, Ben and Tom returned to Samoa along with two new additions to the crew. The visit was part research and consultation, part project work. As well as installing bought tanks, the team sourced additional guttering and worked with local families to find permanent homes for the water tanks that were donated by aid agencies as immediate disaster relief. The crew also scoped priority areas for further work. We learned that the need for water is sometimes greater than the people can communicate. In turn, sometimes communities overestimate the need in their area. Finding ways to assess priority with respect for cultural protocols can be a challenge, but with the assistance of local organisations we think it is achievable.

Then, in January this year, Ben returned to live for one month in Samoa – Ben explains, "Our goal is to make iCAN Samoa a regular event – an opportunity for young leaders to use their energy and ideas to support our Pacific neighbours in ways that are meaningful and creative".

What's Next?

Many aid organisations have been working to provide immediate relief to communities, and the Samoan Water Authority is working to establish a reliable and permanent supply. This infrastructure is expensive, and will take some time to be established. In the meantime, families and especially children inland and at the coast need access to water that is safe and healthy for drinking and cleaning. For now, access to water is the first priority for iCAN Samoa. ■

iCAN Samoa – The Facts

What's the Agenda?

The iCAN Samoa team is a group of young Wellingtonians who have been involved with youth and community leadership since 2003. We're backed by ON THE EDGE Trust, a Charitable Trust led by and for young people. We're not affiliated with any particular political, cultural or religious group.

Our goal is to co-ordinate a series of projects which will provide young people with opportunities for self-motivated volunteer work, travel and cultural exchanges that create positive social change. Through this project – experiencing the Samoan culture and context as a contributing participant, not just as a tourist, we can build stronger relationships within rural Samoa, gain a better understanding of our region and lead by example.

Sponsorship

Huge thanks to our major sponsors – heaps! Ministry for the Environment and jobs.co.nz and to all the individuals that donated towards the cause.

Also – extra thanks to Harfords Menswear for their assistance to the Tafitoala Women's Project.

iCAN Samoa Team:

Ben Irving
Tom Paulin
Bryony Cunningham-Powe
Jessica Hooper
Maree Newson

How Can I Help?

If you or your business can help with know-how, training, supplies, manpower or sponsorship, we'd love to hear from you.

To make a tax deductable donation go to www.givealittle.co.nz and search for iCAN.

For more information or to get involved with iCAN Samoa, contact the team: Maree Newson – mareenewson@gmail.com or www.ican.org.nz

Constant Waterlevel SBR (CWSBR®) – New Arrival on the New Zealand Wastewater Market

Werner Gebauer, Axel Dederichs, Dr. Tim Koeckritz – GWS Technologies

Sequential batch reactor technology (SBR) is widely introduced in New Zealand and overseas as a modern wastewater treatment process. The SBR process enjoys growing popularity worldwide and is based on the principle that treatment of wastewater works significantly better under defined volume conditions. Classic sewage plant technologies (i.e. continuous flow plants) cannot provide the same process stability. The more reliable operational performance of SBR plants can cover a wider range of dynamic wastewater discharges arriving at the plant.

So far sewage lagoons and ponds were exempt from the benefits of the SBR technology as constant SBR process volumes were not achievable due to pond geometry and process. Ten years ago, the German Company GAA mbH near Hamburg, created a Constant-Waterlevel-SBR process (CWSBR®) for wastewater ponds, introducing a fully operational SBR system for any type of sewage pond. Due to the reduced structural costs and state of the art construction, savings are substantial and can be up to 50%. Distributed through GWS – Technologies, Taupo, CWSBR® pond systems are now also available in New Zealand and Australia.

In the past the main discussion about wastewater treatment was focussed on the amount of concrete, and machinery required for building a plant. Remembering the early 1990s, wastewater treatment was characterised by continuous flow plants. Although the principle of SBR was known since the early 20th Century, the development of programmable logic control (PLC) systems enabled the SBR technology to finally take off and say goodbye to continuous flow plants as the only way of treating sewage effluent. However in rural areas wastewater was still treated in simple ponds and lagoons but the quality of treatment was not sufficient to comply with high environmental standards. Hence, the construction of new pond systems even for rural communities was discarded as the applying standards could no longer be met. This has now changed with the introduction of the CWSBR® Technology.

CWSBR® (Constant Water level SBR)

CWSBR® contains the original SBR process including all operational advantages. Like the original SBR system, CWSBR® is based on modern PLC-technology and also was made possible through the development of modern synthetic materials and geotextiles, creating the tools for a dynamic pond technology. CWSBR® combines the principles of a standard above ground SBR plant with the low cost installation of a traditional lagoon type treatment plant.

Since batch processes are characterised by periodic changing water levels, common SBR-plants use solid tanks or containers as reactors to handle large sewage quantities. In order to transfer SBR technology to a pond structure, replacing concrete walls with an earthworked lagoon, naturally supported by surrounding soils, the initial requirement was to eliminate fluctuations in water level. The CWSBR® system is equipped with "Hydrosails" which are attached to the pond floor. Fixed floats on the top edge are keeping the sails always upright enabling the Hydrosails to separate the pond volume into the different SBR reactor zones with the simple difference that the volume changes are operated vertically compared to the horizontal changes in a standard SBR configuration (Figure 1).

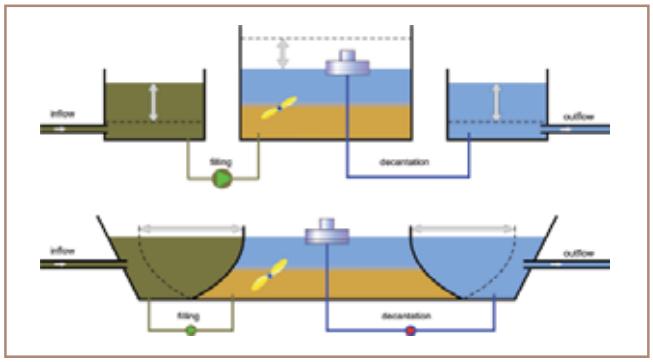

Figure 1– Comparison of water volume changes of CWSBR® and standard SBR

From the primary treatment zone, the CWSBR® system pumps the water into the activated sludge zone. The Hydrosails follow the change in volume passively. With balanced water tables on both sides of the sails, tension and stress is not a problem as the Hydrosails move with the alternating flows. As the water table throughout the pond maintains a constant level at all times buoyancy problems for the pond liner caused by fluctuating volumes are unknown and slope stability is not an issue. The invention of the CWSBR® system was not an easy task but with 20 years of experience in SBR engineering GAA managed to create a low cost sewage treatment system with the ability of high Nitrogen elimination and Phosphorus removal. The CWSBR® system complies with the latest German and

European standards for wastewater treatment (ATV Standards) which are acknowledged as a high industry standard allowing for comparability and adaptability of SBR plants worldwide. A full animation of the CWSBR® cycle is presented at www.g-a-a.de.

Development and Plants Constructed to Date

The first CWSBR®-plant was built in Germany in 2000 in order to retro-fit an existing sewage pond system. After ten years GAA's knowledge and experience with pond retrofitting can be summarised as follows:

CWSBR® grants full SBR performance including nitrification, denitrification, phosphorus removal by Bio-P and fully stabilised sludge. The attribute typical for SBR technology, highlighting that the treatment success is independent from the plant size also applies for the CWSBR® systems. To date new plants sizing from 800 PE to 210,000 PE were designed and constructed. Upgrades of existing ponds and lagoons were carried out up to 5.000 PE by retrofitting and extending existing wastewater ponds (Figure 2/3).

Figure 2 – CWSBR® is a full performance SBR process in the shape of a pond technology, which grants highest wastewater treatment standards

Figure 3 – CWSBR® System under running conditions, showing aerated zone

Short Time of Construction – Usage of Existing Structures

For retrofitting projects, an average construction time of 3 months has been established. New CWSBR® plants are typically constructed within 3 to 6 months depending on size and local conditions.

As the CWSBR® system is a high-end wastewater treatment process, increasing the treated volume per time ratio substantially, approximately 70% of the total pond area will be available after the upgrade for other tasks like stormwater retention or further sludge stabilisation processes. Existing buildings and structures will be incorporated in the design and will be used for the installation of the plant equipment.

Costs

The decisive argument for a CWSBR® installation is the low investment to establish a state of the art, full-scale SBR technology, where costs can be less than 50% compared to a standard above ground SBR plant. Other cost advantages derive from OM advantages like the elimination of expensive pond sludge removal every 5 to 7 years, which is replaced by continuous sludge stacking in a separate bed. Whereas the energy demand for wastewater aeration is comparable to standard SBR plants, the cost for circulation pumping is reduced by 35%. This reduction is deriving from the constant water level which requires the pumps to only overcome friction losses with no static head involved. Also an important advantage of CWSBR® compared to classic SBR is the decrease of the required time for sedimentation and decantation. In the classic batch process the SBR zone is a homogenous mixture of water and activated sludge. After the treatment process, the sludge settles and above a clear water zone is consequently established. This clear water zone is separated from the sludge zone by a floating decanter, which follows the sludge level until it has reached the minimum level of fill in the SBR reactor. However in a CWSBR® plant with constant water level the decantation is performed without changes in the water level. As a result the decantation device operates at a greater distance from the sludge zone and a very good water-sludge separation can be achieved even at a high flow decanting velocity.

CWSBR® Performance (up to 5000 PE)

The stability of the microbiological mixture in a CWSBR® system allows complete nitrogen elimination even at low BOD intakes (Table 1).

CWSBR® system are operating well within the Environmental Waikato operating guidelines for Nitrogen reduction and are showing a constant high level of performance at substantially less CE and OM cost.

	Influent [mg/l]				Effluent [mg/l]			
	COD	BOD	NH_4-N	NO_3-N	COD	BOD	NH_4-N	NO_3-N
August 6	240	128	39,1	2,1	19,6	4	1,3	2,2
August 13	398	363	32,1	2,5	21,0	6	1,3	2,8
August 20	344	122	32,0	2,6	14,9	4	0,6	4,6
August 26	105	52	11,2	1,7	20,8	11	0,9	3,1

Table 1 – Stability of nitrogen elimination within a CWSBR® plant in Nauroth-Mörlen, Germany (August 2010)

Large CWSBR® Plants

The largest CWSBR® plants to date have been built in China for up to 210,000 population equivalents (PE). The latest plant was commissioned in 2010. With the size of those plants the CWSBR® system is now established as one of the world largest built SBR systems, and has found its way from use in rural environments into the wastewater management of big cities. The decision to construct large size plants was naturally made in China where pond technologies have a long tradition. The next plant with a capacity of 130,000 PE was ordered recently and is currently in the design stage. As already established for the smaller plants, the large plants are constantly showing the same treated effluent quality.

Figure 4 – Large CWSBR® Plant under construction

Figure 5 – CWSBR® Control Bridge and Hydrosail separating activated sludge zone from clear water zone

Summary

CWSBR® systems are the first choice when it comes to building new plants or retrofitting and upgrading existing sewage ponds and lagoons to the standards of the largest SBR-plants at low cost. Ten years experience in building and operating CWSBR® plants have shown that this low price SBR alternative meets all expectations of modern wastewater treatment. CWSBR® applications are now established throughout the world ranging from 800 PE up to 210,000 PE demonstrating that the CWSBR® system and its simple form of construction can be adapted to all rural and municipal wastewater treatment applications. The efficiency of wastewater treatment including the elimination of all relevant wastewater components was continuously demonstrated at a high level of reliability. ■

Can We Afford Not to Harvest?

Greg Yeoman – Director, Stormwater 360

Water as a local and global resource is requiring vigilant planning and management more than ever to cope with todays demand and climate. Growing population and increased industry, drought and flooding are putting mounting pressure on our current resources and infrastructure, making stormwater harvesting and water reuse systems a practical reality.

While New Zealand is not facing the same water shortages as Australia, the cost and demand of water in New Zealand is increasing significantly, particularly in the expanding Auckland region. Following the water crisis of 1994, a pipeline from the Waikato river was constructed to reduce Auckland's water supply shortage. Last year however, Auckland was again faced with another shortage as the treatment plant was at capacity after last summer's droughts. Auckland's population is predicted to grow to 1.7 million by 2026 – an increase of approximately 40% on 2001 levels (Statistics NZ). Stormwater reuse is a viable long term alternative to building further pipelines and treatment plants to cope with the future demand.

Industrial operations use accounts for 11% of New Zealand water use, (excluding hydro generation)* while drinking water accounts for only 8%. On-site underground storage tanks or stormwater reuse systems are ideal for these facilities as they typically have large impervious surfaces. Underground stormwater reuse tanks have the potential to not only save industry large sums of money for water supply, but also to manage the stormwater by reducing runoff volumes and discharged pollutant loads. Currently the price for water in Auckland is between $1.30 and $2.33 per 1000L. A 1ML storage tank in Auckland could save up to $2,300 every time it was emptied, this could be significant for a high water use industrial premise.

With flooding, stream erosion, beach closures and water shortages rapidly becoming common headlines and utility water prices guaranteed to increase, we have to ask ourselves, at what stage do we adopt the technologies being used widely overseas?

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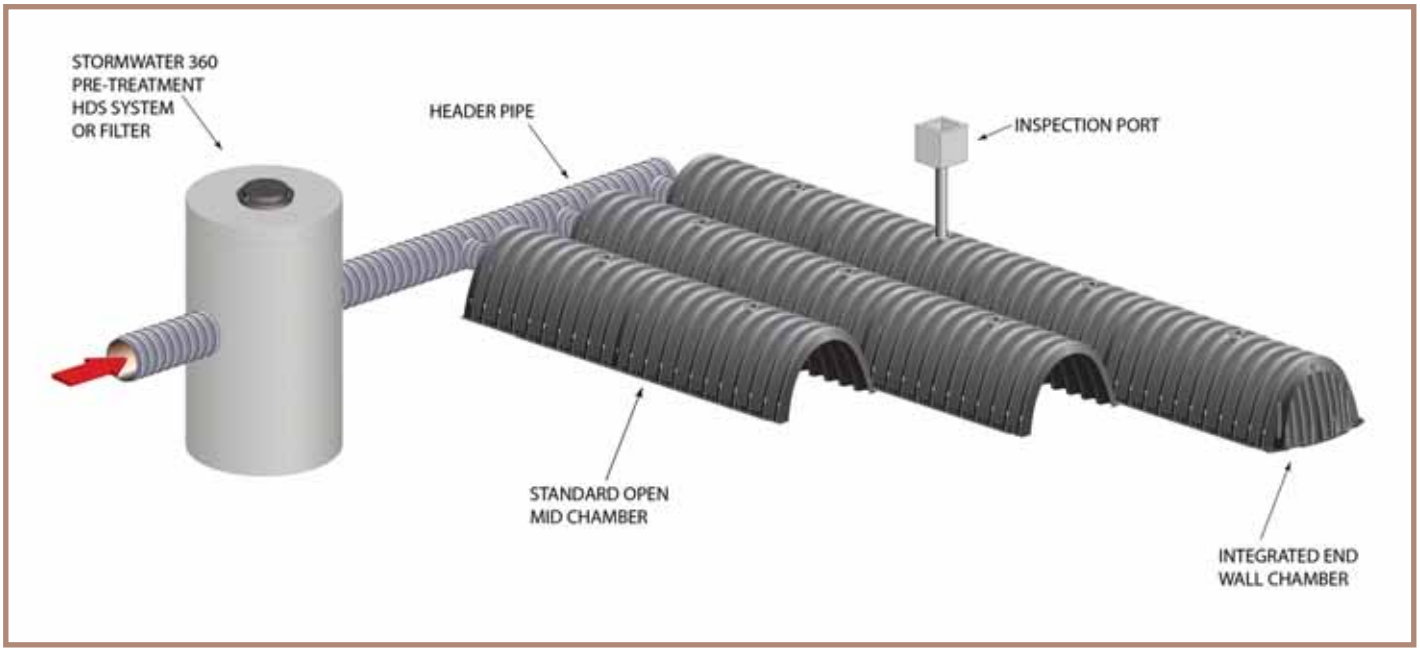
Williamstown Reuse

ChamberMaxx System



Case Study: Water reuse at Williamstown Cricket Ground, Melbourne, Australia

When the tender was let for Hobson Bay City Council's Willliamstown Cricket Club upgrade, a major component was to introduce a water reuse scheme for irrigation of the cricket ground.

The requirement of 10 – 12ML (10,000,000 – 12,000,000L) estimated yield over the annual period for irrigation of the cricket ground set a challenging brief for Hobson Bay City Council engineers. The final concept adopted was a two phase construction programme. Phase one consists of a 1ML (1000,000L) underground ChamberMaxx plastic arch detention system, with Phase Two being a treatment train consisting of a wetland upstream of a proposed media filter which is then pumped into the detention system.

A 20Ha residential catchment provides the collection area for the storwmwater harvesting system. The harvesting system is to be completed in three stages, the first stage being the installation of underground ChamberMaxx storage chambers. This stage needs to be completed first to cause minimum disruption to the cricket season.

Underground plastic arch chambers were determined to be the best option for Phase One of the project, and the competitive tender was awarded to Stormwater360 Australia using their ChamberMaxx detention arch system. With low profile storage depth of 770mm and high traffic loading capability the chambers provide a versatile low cost detention option. Each chamber weighs approximately 40Kg which means they can be easily man-handled around the site without the need for lifting with heavy machinery. Site installation Contractor Shane Harrison commented "The ChamberMaxx arch system is the easiest I have installed to date. With the moulded in end sections it's simply a matter of overlapping the chambers before backfilling with the crushed rock". A total of 401 plastic arches were used to achieve the 1ML requirement.

With the prolonged dry periods of recent weather patterns combined with the possibility of tropical storm events, catching rain runoff from the surrounding catchments benefits the local community two-fold. "It's feast or famine it seems these days. Harvesting the stormwater runoff from the roading and hardstand areas both reduces the risk of flooding while preserving the rivers and aquifers from the heavy irrigation demands of the sports park." ■

*Update of water allocation data and estimate of actual water use of consented takes 2009-10, MFE

Green Building Design

Greentank Environmental Engineering

Greentank Environmental Engineering is well-known as an established tank supplier to the petroleum industry, with most of New Zealand's major oil companies using Greentank tanks for environmentally safe retail fuel storage.

Greentank has applied that same expertise to the water and wastewater industry, and has become accepted as a superior option for the underground storage or processing of liquids in a wide range of applications. In other words, green building project owners and designers can take advantage of what Greentank already offers.

Storage tanks aren't the only Greentank products that can be incorporated into other green building projects. For instance, wet wells and lift stations can also be key elements in green building projects.

The following are just a few examples of how Greentank tanks, in already-proven applications, can be a key element in design concepts for green building projects in both new construction and renovation projects.

Rainwater Harvesting

A key objective is to limit or eliminate the use of potable water, or other natural water resources, for landscape irrigation.

Greentank tanks are routinely used to collect and store captured rainwater or recycled site water, which is then used for landscape irrigation. Using rainwater and/or greywater instead of potable water is one way to reduce the use of potable water for irrigation. Using Greentank water tanks, a system can be designed to conserve as much as 100 percent of potable water for such purposes.

The use of rainwater "cisterns", incorporated into building designs, is a practice that has been used for decades. Now, architects and building designers may incorporating a state-of-the art Greentank fibreglass cistern, providing the confidence that the collected water supply will be there as needed and not lost through cracks and leaks from less reliable storage products.

Rainwater Collection

Onsite Wastewater Treatment

Onsite wastewater treatment is an increasingly recognised commercial design concept for which Greentank tanks are a superior design component. The need to address wastewater management has led to a growing focus on onsite treatment.

Greentank wastewater tanks may be used as various kinds of tanks, process, dosing, recirculation, collection and holding tanks, all part of a complete wastewater treatment system in such projects as schools, commercial buildings, office complexes and housing developments. As wastewater treatment system designers develop new technologies, Greentank tanks continue to be a part of that evolution.

Wastewater Treatment

Stormwater Retention

Environmental concerns have changed the management of stormwater runoff.

When stormwater runs directly into sewer systems, it can result in either groundwater contamination or overloading of stormwater infrastructure. To address these problems, many communities now require a specific retention time before allowing stormwater to run into the drainage system. Typically, retention ponds are used to meet this requirement. As part of a stormwater management system, Greentank underground water tanks offer a better alternative.

"Green building design protocols promote the design and construction of buildings that are environmentally responsible, profitable and healthy places to live and work."

Greentank offers corrosion-resistant tanks in a range of capacities up to 150,000 litres which are pre-fabricated in a controlled factory environment subject to stringent QA/QC procedures which are seamless with no joints. Completed tanks may be economically transported to site throughout New Zealand and installed in a short time frame without minimising down-time due to inclement weather commonly associated with cast in-situ concrete constructions which require lengthy time frames for form work and curing.

An additional benefit of our underground tanks is that while meeting retention-in-time requirements, developers and property owners can also make better use of property by locating Greentank stormwater tanks in car parking areas. This is a significant benefit with the rising cost of land. (Greentank tanks are rated for H-20 loads.) In addition, the collected stormwater can be used for non-potable uses such as landscape irrigation.

Stormwater Rentention

Variety of Applications

Aside from the design concepts shown above, Greentank tanks have a wide variety of other applications.

Greentank fibreglass underground tanks can be used in office developments, schools, healthcare facilities, mixed-use commercial developments, national parks and ski resorts, to name just a few.

There are a variety of ways that Greentank fibreglass tanks are used in innovative ways. For instance, Greentank manufactures oil/water separators, grease traps and interceptors and our tanks are also used for fire protection systems, car wash water-reclaim units, camping grounds, rest areas and livestock truck effluent collection tanks. Whatever a customer's tank needs, a Greentank can be designed and manufactured to meet that particular application.

Green building design protocols promote the design and construction of buildings that are environmentally responsible, profitable and healthy places to live and work.

Key factors to take into account when planning new construction and major renovations are: sustainable sites, water efficiency, energy and atmosphere, materials and resources, indoor environmental quality, and innovation and design process.

As shown in this article Greentank fibreglass tanks can be part of a variety of applications that may be incorporated to meet these green building design objectives. ■

Hach Acquires Accurate Detection and Accurate Measurement in Australia and New Zealand

Hach Company

Hach Company has this month announced the acquisition of Accurate Detection and Accurate Measurement (Accurate), distributors of analytical and detection instrumentation including Hach water quality analytics in Australia and New Zealand.

This move gives Accurate's customers direct access to Hach's innovative water quality products and extensive service support. Hach has more than sixty years of water analysis expertise and offers personalized application support, local training, a full water analysis product portfolio, and a new loyalty program for Australian and New Zealand customers.

"We're excited about expanding our direct sales and service team in Australia and New Zealand and offering customers additional ordering options," Chris Fergen, Vice President, Sales and Service, said. "These changes will provide our customers with Hach products and expertise straight from the source to support their water analysis applications and needs."

Hach will continue to supply Accurate's leak detection and pipe and cable location equipment to Australian and New Zealand customers, who can now easily bundle their purchases with water quality analytics.

For over 60 years, Hach Company has been developing innovative solutions used to test the quality of water, other liquids and air. Manufactured and distributed worldwide, Hach systems are designed to simplify analysis by offering sophisticated on-line instrumentation, accurate portable laboratory equipment, high-quality prepared reagents, complete easy-to-follow methods, and life-time technical support. ■

For more information on the complete offering, please visit www.hachpacific.com.

"Hach will continue to supply Accurate's leak detection and pipe and cable location equipment to Australian and New Zealand customers, who can now easily bundle their purchases with water quality analytics."

Microbiological Training – Ever Wondered What's in your Wastewater Treatment Plant?

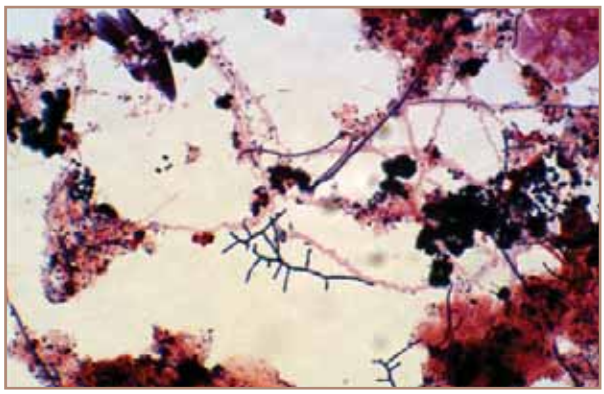
AWT NZ Ltd

Wastewater treatment plants are intriguing collections of a wide range of bacteria and larger organisms. Encouraging the growth of beneficial organisms is vital to good plant performance.

The job of the wastewater treatment plant staff is to manipulate the plant conditions to encourage the 'good bugs' and send the undesirables packing. Operators do this on a day to day basis by ensuring key control parameters such as sludge age and dissolved oxygen concentrations are maintained at certain levels. These and other control parameters are great at ensuring conditions in the plant are appropriate for good microbial community development.

However, as all operators know, wastewater treatment plants are not steady state processes. They are constantly exposed to varying environmental conditions, flows and influent compositions. They also have mechanical and control issues. These variations mean that maintaining the control parameters in the ideal range for the microorganisms is difficult. Once the organisms have changed for the worse, it often takes a while for issues to become apparent e.g. poor settling or foam. By this stage it is often too late to turn things around quickly.

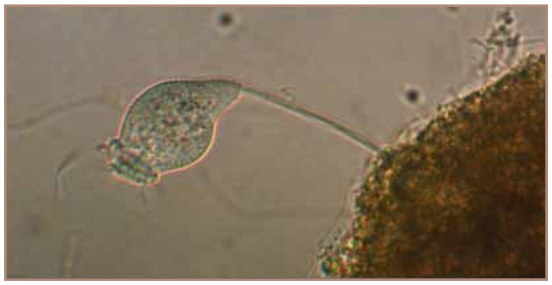
Looking at our microbial community down the microscope is a very easy way of picking up changes early – before they become evident at the clarifier. With minimal training operators are able to judge how the microorganisms are grouping together (floc formation) and whether specific microorganisms are present or absent. These two areas can give operators a good idea of the conditions at the plant at the time. Deterioration can be spotted early and troubleshooting started before impacts are noticed in the discharge.



Often filamentous bacteria are the cause of poor settling and foaming. Different filaments grow under different plant conditions, so

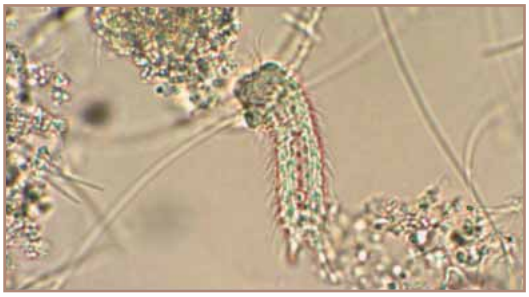
it is very useful to determine what types are dominant in the mixed liquor. Stains and microscopic examination are a relatively easy way of doing this and generating some potential causes so that troubleshooting can begin and effective action taken.

Determining what's up in the plant from the microorganisms present is possible due to research and lab studies undertaken over the years investigating which conditions specific organisms proliferate under. There is still a lot of research ongoing in this area including microscopic investigation of enhanced phosphorus removal organisms GAOs and PAOs).



For example certain types of ciliates (above) are found in large numbers when the bacterial population and dissolved oxygen concentration of the treatment process are high, the wastewater environment is stable and a mature floc structure has developed. These ciliates usually indicate a stable wastewater environment and a healthy biomass.

Whereas Gastrotriches (below) appear to occur only in nitrifying activated sludge systems, probably due to their susceptibility to ammonia toxicity. Gastrotriches are normally found when wastewater treatment plants are started. These conditions resemble low sludge age, high Food/Microorganism situations.

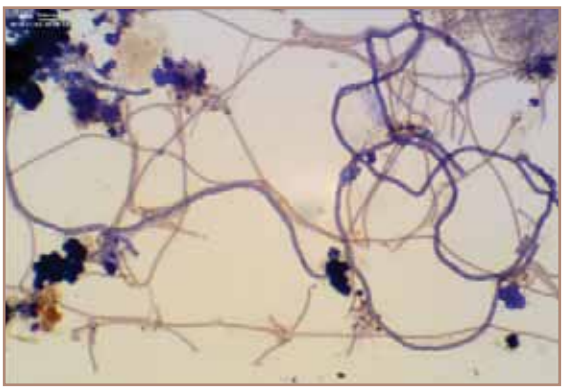


Many operators however don't have the opportunity to get to know the bugs in their WWTP and take advantage of these quick and easy techniques. This is often due to a lack of training and a perception that you need to be a fully trained microbiologist to obtain information from your microorganisms. While wastewater microbiology is a vast and complicated field where there is much still to learn, some very useful information can be gathered from a look down the microscope and some simple staining techniques.

"Many operators however don't have the opportunity to get to know the bugs in their WWTP and take advantage of these quick and easy techniques. This is often due to a lack of training and a perception that you need to be a fully trained microbiologist to obtain information from your microorganisms."

AWT provide 1 day training courses to give operators the basic skills required to start making the most of this resource. The training course takes you through the basics of the sludge organisms that may be present and what this means in terms of the likely conditions in your plant, how to prepare live and stained slides and how to use a microscope. We also discuss basic operational parameters and techniques, and how these affect the biomass. The groups are small and we often end up discussing local issues.

Much of this information is now available in textbooks and with a microscope and a basic knowledge of how to work this and carry out stains operators can take advantage of this valuable information source. ■



Timbertank Development Finds Answers to Earthquake 'Sloshing'

Timbertanks

The impact of the 4 September 2010 Canterbury earthquake on concrete, steel and Timbertanks' water storage installations was significant. It has required the company to develop and introduce new technology based on provable engineering, to suit conditions that may be encountered in future.

In the months that followed the quake, managing director Justin Jordan and consulting engineer Waldo Granwal commissioned the design of a computer programme with which to test the effect of waves sloshing in a tank. The process is known as computational fluid dynamics (CFD), using ANSUS computational fluid interaction and mechanical programmes.

"Research into the effect of waves created by an earthquake in tanks holding fluids has not previously been done. We believed our earthquake base isolation would be sufficient to withstand the stresses imposed on a tank under the existing regulations," explained Justin, "but at some sites in Canterbury that wasn't the case."

Because the 7.1 earthquake was very localised and amplified by the underlying deep alluvial shale layer, an unusual action of a strong pressure wave followed by a long period of low frequency secondary shear waves was created, causing most of the damage to water tanks.

"New Zealand engineering was caught out by the extent of the sloshing – the wave velocity acceleration which caused the tank to move around," he added. "The earthquake produced pressure waves which resonated at the same frequency, an effect not seen before in any New Zealand 'quake."

But not all tanks were affected. "We had a tank at Templeton where the highest reading of the earthquake was taken and it is working fine today," says Justin. "The phenomenon that amplified the 'quake in Christchurch is not to our current knowledge present in any other New Zealand location."

Justin and Waldo have been working with a wave-testing tank in which various methods of introducing a baffle to ameliorate such sloshing are being modelled. It provides a good visual illustration of what happens and has so far provided some solid answers to the problem.

The company has employed an engineer to continue with research using the CFD programme that will allow future tank designs to be modelled with Edgecumbe and Darfield pressure waves striking them.

Top – A 100m³ tank at Cookie Time Templeton (24km from epicentre) survived the September 4 'quake
Above – The wave testing tank at Timbertank's Auckland premises

"In the past, base isolation has neutralised tank slosh – so now, a tank with a level of risk will have a baffle installed. Which is exactly what we have done – installed a baffle in our tank at Northlands Mall in Christchurch, and others will follow.

"We believe the combination of a baffle and our base isolation will stand the next test, but our ongoing development this year should reinforce the conclusions we have reached so far.

"This CFD programme will be able to model concrete and steel tanks where a baffle may be seen as a suitable upgrade." ■

In the much more severe Christchurch earthquake on February 22, the baffle installed in the Northlands Mall tank worked successfully, the tank still stands and is ready for use.

The Hampton Downs Race Track

Lagoon Mixing

A World Class Wastewater Plant for a World Class Race Track

Hynds

Hampton Downs Race Track is a world class centre for adventure activity, corporate hospitality and motorsport, situated just 60 kilometres south of Auckland and 65 kilometres north of Hamilton. It covers 20 hectares and will incorporate a motel, business apartments, a conference centre, retail outlets, restaurants and hospitality lounges. The wastewater generated from stage one of this development is estimated at 100m^3 per day and is required to be treated and disposed on site.

Fraser Thomas Ltd were the consultants for this project and they designed a STEP system to pump the primary effluent to a wastewater treatment plant, located approximately one kilometre from the main race track.

This project to treat and dispose of the wastewater was split into two separate contracts. The first contract was to design and build a wastewater treatment plant and Hynds Environmental have constructed a partially buried modular wastewater system using SAF (fixed film) technology designed to treat the effluent to a secondary level.

The plant has been constructed using a combination of precast concrete tanks manufactured in the Hynds factory in Auckland and modular concrete tanks constructed onsite using Hynds "Hypond" systems. The plant includes primary treatment followed by a two stage fixed film biological treatment process. The third stage is clarification using a laminar plate separator which also returns activated sludge back to the primary tank. An Imhoff tank is utilised to thicken the waste sludge from the system it is discharged offsite. The entire plant is controlled using a Hynds PLC unit which can be monitored remotely by the Hampton Downs operations team and also by Hynds Environmental via the internet.

The second contract was for the installation of 38 kilometres of buried drip-line irrigation covering 3.8 hectares of farm land. This disposal system includes an advanced fine particle filtration system that incorporates an automatic back-washing system. The disposal system has been installed as four separate fields. The Hynds PLC system monitors the amount of water to be discharged and provides this information to an irrigation controller which ensures each of the four disposal fields receives an equal amount of the treated wastewater. This irrigation system will be used to grow grass which will then be processed into hay and sold to the market. ■

For further information on Hynds Environmental Wastewater Treatment Systems, please call 0800 425 433 or visit their website at www.hyndsenv.co.nz

Hampton Downs Nearing Completion

High Efficiency Lagoon Mixing System With No Moving Parts

Pump Systems

Vaughan Rotamix will solve many of the traditional problems associated with mixing storage lagoons at local authority and industrial wastewater treatment plants as no moving parts are installed in the lagoon.

Submersible mixers and floating shaft driven mixers have electric cables and moving parts in the wastewater, which can be prone to problems of fine fibres and rags reweaving and wrapping around moving parts, shafts and cables. If an electric motor fails for any reason, this will require the complete mixer to be removed, which in turn will affect the operational aspects of the lagoon.

The Vaughan Rotamix Process Mixing System is today's most cost effective means of mechanical mixing available, for sludge and wastewater storage lagoons, sludge tanks, digesters and other high-volume applications. A Rotamix lagoon mixing system comprises of fixed nozzle assemblies that are mounted on the floor of the lagoon to factory specified angles and are permanently fixed in place. No additional adjustment is required. The Rotamix system uses an externally mounted self-priming Vaughan Chopper Pump to recirculate and precondition the contents of the Lagoon. The self-priming Vaughan Chopper Pump will handle solids-laden material and sludge containing rags, fibres and hair. This virtually eliminates problems with fibrous material and other debris reweaving into clumps, while ensuring the pumps and nozzles remain clog-free.

The heavy-duty Rotamix nozzles are constructed in ductile cast iron and are glass lined for abrasion resistance and reduced friction. The entire assemblies are then white metal sandblasted and powder coated to provide superior surface protection. Each nozzle mixing assembly comes with a 10-year full replacement warranty for wear and corrosion.

The unique mixing flow pattern created by Rotamix eliminates dead spots, reduces energy requirements and prevents against the formation of scum mats and solids settling inside the lagoon. As there are no moving or rotating parts within the process, no scheduled nozzle assembly maintenance is required. This major advantage is particularly relevant for lagoons with fixed membrane covers. When compared to conventional mixing systems, the Rotamix System can save the end user up to 60% in combined capital, operation and maintenance costs.

The Rotamix system can be easily retrofitted into existing lagoons. With the ability to operate intermittently, even when mixing lagoons after periods of storage, overall energy costs are significantly reduced. Depending on the process and layout of the lagoon, it is even possible to fill, mix and transfer multiple lagoons using a single self-priming Vaughan Chopper Pump. All Rotamix systems come with a Mixing Performance Guarantee, where Vaughan Co provide complete mixing system responsibility. ■

Sick and tired of pump **clogging problems?**

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Vaughan®

Water Harvesting Pays Dividends for Foodstuffs and City Water Supply

Tasman Tanks

As the push for corporate sustainability continues to escalate throughout Australasia, an increasing number of companies are recognising the importance of water management.

Foodstuffs Auckland for example – New Zealand's largest retail organisation employing over 30,000 employees, has recently implemented an innovative water harvesting project in Auckland, designed to save millions of litres of potable water.

The project, for CTD Nesdale – Foodstuffs' state-of-the-art chilled and frozen goods distribution site, now harvests rainwater for use in the site's refrigeration system.

Chris Wilmoth, Operations Manager with Foodstuffs Auckland, explains the site has two areas; a chiller which runs at approximately +2°C and a freezer which runs at about -25°C.

"The rainwater is now used to cool ammonia which circulates throughout the building creating the cool temperatures," he said.

As part of the innovative project, the rainwater is stored in an 840m^3 tank, supplied by leading storage tank company Tasman Tank Co.

"As the site was expanded, there was an increased need for water which had to be met. The tank has saved us huge quantities of water, we are now able to use rainwater collected from the roof instead of Auckland City's water supply," Mr Wilmoth said.

One of Foodstuff's water tanks

The tank, a TS 600 bolted tank with a heavy duty Aeon PTR liner, measures 15m x 4.76m and has an effective capacity of 630m^3.

"We chose Tasman Tanks as they are specialists in large capacity tanks. They understood our needs and used their expertise to make sure these were met.

"The quality of work was high and we truly believe that we have benefited greatly from the project. We would definitely use them again," said Mr Wilmoth.

He explained that this was Foodstuffs' first water harvesting project.

"CTD was chosen first, but we are always thinking about how we can improve/expand our services however we always aim to do so in a productive and sustainable way.

"The tank was part of an expansion project of the site which took approximately 12 months. The expansion had to take into

"As the site was expanded, there was an increased need for water which had to be met."

account our growing industry but also the new needs that expansion would require – especially water thus the tank was included in the design.

"Future plans will definitely include water harvesting so we will have minimal impact on the environment," he said.

Mr Wilmoth went on to say he would definitely recommend other companies to consider investing in such a project. "There are so many benefits to be gained both financial and environmental," he said.

"As a large company in an ever expanding industry, Foodstuffs Auckland is very conscious of the company's impact on the environment around it. "Whilst we have financial goals we also have environmental goals and aim to have a minimal impact on the environment around us as we grow.

"Water harvesting is just one aspect of how we can grow in a sustainable way as a company. We had the resources available to use water harvesting and thus took advantage of it which has paid off hugely," Mr Wilmoth said.

Ian McGregor, Tasman Tanks' New Zealand territory manager, said the move by Foodstuffs to use a bolted steel tank made a lot of sense.

"The modular tanks are speedy and safe to erect, and offer a method of construction that can be readily and aesthetically blended with surrounding buildings in applications such as commercial and industrial mining, energy, resources, manufacturing, government and infrastructure, engineering, food and beverage processing, chemical and primary product processing, water and wastewater and fire protection."

Mr McGregor explained that bolted steel tanks are steadily overtaking alternatives such as concrete because they won't leak, they are less expensive to build in the first place, they are cheaper and easier to maintain and typically outlast alternative materials.

"Welded tanks would have been an option here but they are more expensive to build," Mr McGregor explained.

"This particular liner type tank installed is an all steel bolted round tank using Zincalume sheet panels that when required can be powder coated to blend with existing buildings."

Mr McGregor said another major factor giving impetus to the adoption of bolted construction throughout New Zealand is suitability and speed of construction in remote and climatically challenging areas.

"Bolted site construction allows for control of all quality processes in good or bad weather. It is not subject to uncontrolled factors from outside influences, which (in the case of concrete) can impact upon mixtures specifications and joint connections."

Mr McGregor said companies who are contemplating the move away from concrete tanks should talk to the experts in this area.

"Tasman Tanks recognises that factors such as innovation, cost-efficient design and quality products are key to customer satisfaction, therefore each tank is designed and constructed for each specific use and location," Mr McGregor said. ■

For sales phone 0800 826 526 or email sales@tasmantanks.com.au, www.tasmantanks.com.au

Valve Actuators

HTC Specialised Tooling

Valve Actuators

HTC Specialised Tooling is the New Zealand agent for RAD Torque Systems. RAD makes torque systems which make valve exercising a fast and easy process. Their range includes battery powered, electric and pneumatic tools.

RAD has been trading for 19 years and the business has developed a strong place in the global torque market - developing torque wrenches and a large range of specialised reaction arms. The reaction arms were first developed to make working on large mining machinery easier as well as large projects where machine downtime is a critical issue.

RAD provides complete one stop kits for special purpose applications.

The company has now used this experience to develop reaction arms for use in water treatment and sewage plants. These reaction arms are easily fitted to pneumatic and battery powered torque wrenches providing a fast, safe, ergonomic and efficient solution to opening and closing larger valves.

"The most popular RAD tools for water and sewage treatment markets are Pneumatic & Battery Powered Tools."

The most popular RAD tools for water and sewage treatment markets are Pneumatic & Battery Powered Tools.

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- Aluminium regulator cage
- Equal power in both forward and reverse
- Smooth flow of power eliminating destructive hammering
- Controlled torque accuracy +/- 5% and +/- 2% on repetition

Battery Multipliers

- Precision adjustable Posi – Clutch for accuracy of torque output from 150 – 1750 Nm output over 5 different models
- Safe & simple to use
- 300, 700 or 1000mm extension piece kits available
- Controlled torque accuracy +/- 5% and +/- 2% on repetition
- Weather proof case

RAD provides a custom made service, so special tools to suit any unique application can be made to order. As this is a large part of their business, special projects can be engineered and delivered quickly.

RAD tools are available for purchase or hire from HTC – full calibration, repair and service facilities are also available. ■

Visit www.specialisedtools.co.nz/product-videos.htm to see the tools in action or for further information call Shane at HTC on 0800 48 2000 or email info@specialisedtools.co.nz

Colilert-18 for Wastewater Faecal Coliform Testing

Environmental Diagnostics

Although E.coli has now become the preferred indicator for faecal contamination in water there are still occasions where laboratories may wish to test for faecal coliforms, such as, wastewater discharge consents requiring tests for faecal coliforms or where there is a desire for continuation of large historic data sets of faecal coliform testing.

The thermotolerant coliform group (faecal coliforms) are total coliforms that grow at 44.5°C. The Colilert®-18 test method for total coliforms and E.coli is carried out at an incubation temperature of 35°C. A yellow reaction result is positive for total coliforms.

During 2010 IDEXX Laboratories conducted a U.S Environmental Protection Agency (USEPA) Alternative Test Procedure (ATP) study to demonstrate that Colilert®-18 can detect faecal coliforms in wastewater samples when incubated at 44.5 ± 0.2°C.

The Colilert®-18/Quanti-Tray™ method was compared against Standard Method 9222 D (M-FC membrane filtration) for the quantitative detection of faecal coliforms in wastewater. Colilert®-18/Quanti-Tray™ samples were incubated at 44.5±0.2°C in an air circulating incubator and M-FC membrane filtration samples were incubated at 44.5±0.2°C in a water bath. The yellow positive wells were used to determine the MPN value of faecal coliforms/100mL.

The Colilert®-18/Quanti-Tray™ method gives comparable results as those of the M-FC method with a false positive rate of 3%. Results are definitive at 18–22 hours. In addition, positives for faecal coliforms observed before 18 hours and negatives observed after 22 hours are also valid.

> "In June 2010, the U.S EPA announced that laboratories may begin to use Colilert®-18 for the detection of faecal coliforms in wastewater and recommended the method for inclusion in future regulatory additions to the list of approved methods for wastewater faecal coliform testing under 40 CFR: Part 136.3 (Clean Water Act) programme."

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For further information contact Environmental Diagnostics Ltd or visit the IDEXX website www.idexx.com

Water New Zealand Conferences and Events

Water New Zealand 7th South Pacific Stormwater Conference 2011
3 – 6 May 2011
Sky City Convention Centre, Auckland, New Zealand

2011 *Water New Zealand* Backflow Group Conference
3 – 4 June 2011
Rutherford Hotel, Nelson, New Zealand

2011 *Water New Zealand* Annual Conference & Expo – *'Advancing Water Reform'*
9 – 10 November 2011
Energy Events Centre, Rotorua, New Zealand

Visit the Water New Zealand website for more information on 2011 Conferences. www.waternz.org.nz/events

Other Conferences

2011 NZ Land Treatment Collective Conference
23 – 25 March 2011
Palmerston North Convention Centre,
Palmerston North, New Zealand
www.waternz.org.nz/events

Water Malaysia 2011 Conference
5 – 7 April 2011
Kuala Lumpur Convention Centre, Malaysia
For more information visit www.mwa.org.my

2011 Australian Water Association Conference ' Ozwater 2011'
9 – 11 May 2011
Adelaide Convention Centre, South Australia
For more information visit www.awa.asn.au

IWA Diffuse Pollution Specialist Group – 15th International Conference
18 – 23 September
Energy Events Centre, Rotorua, New Zealand
For more information visit www.dipcon2011.org

84th Annual Water Environment Federation Technical Exhibition and Conference
15 – 19 October 2011
Los Angeles Convention Centre, Los Angeles, California, USA
For more information visit www.weftec.org

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