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Distribution: Hannah Smith, P +64 4 495 0897,
ISSN 1179-2949 (Print), ISSN 2382-1906 (Online)

The next issue of WATER will be published in
July 2015.

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Established in 1958, Water New Zealand is a non-profit organisation.



Brent Manning

The Case for Metadata Standards

At the end of March I co-presented to a Local Government Forum on the topic of water quality data with the President of the New Zealand branch of IPWEA, Braden Austin. Not a sexy topic but one that will help us improve sector performance and already has the ear of various government departments.

The theme of our presentation was that common data standards are needed for our sector, particularly public water utilities in local government, to enable common asset management (AM) practices to be applied.

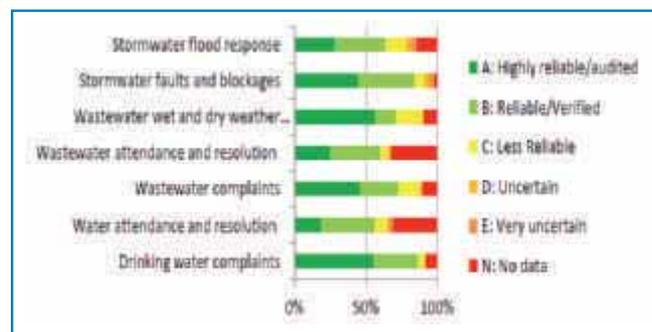
So what is Metadata? Simply put, it is data about the data, similar to a cataloguing system in a library you use to search out a book. Given most of our data is in digital form, using a common means of describing data across our sector has further benefits, by allowing assets to be identified by criteria, pooling similar resources, and comparing condition and performance against relevant factors such as location, through electronic search and sorting.

We can learn from the roading sector, where a voluntary group called the Technical Analytics Governance Group (TAGG) has set themselves up to better define meta data relating to roads and structures within roads across the country. Roading asset managers have had to grapple with the application of common meta data standards since the introduction in the 1990s of the Road Assessment and Maintenance Management System, a system since made more 'user-friendly' with the introduction of user defined tables. To give credit where it's

due it is our own Water Utilities Association (WUA) chaired by Dr Laura McElhone of Dunedin City Council, who have tabled the case for better metadata definition for water utilities. Laura and those working in AM for water infrastructure recognise common metadata standards are critical to establishing improved practice across the sector, rather than being the domain of a few well resourced utilities. I don't see this taking away autonomy from any utility around decision-making; I just see it as enabling us all to tap into the vast arrays of asset specific and condition and service performance data that we already possess.

But the benefits are not just confined to AM practices – it has operational application too. Last month *Water New Zealand* produced its seventh edition of our National Performance Review (NPR) (otherwise referred to as Benchmarking) for the 2013–14 year. I am pleased to report that we had 31 voluntary participants this time, up from the 29 of the previous year, and this continues a trend of increasing participation since its inception with a pilot amongst eight volunteering organisations in 2007. The 31 participants collectively service over 70% of New Zealand's population.

The NPR shows that there is still much to do. For a start, where are the other 36 public water utilities within Local Government? It's not an expensive exercise generally, and in 2014 we reduced the cost for new or small authorities. We have in the order of 45 Territorial Local Authorities (TLAs) actively attending the Water Services Manager's Groups (WSMG) meetings and activities, so we know there is more information to be tapped there. What was concerning to me about the 2014 NPR results is the confidence gradings reported below:



The red portions of the bars show that quite a few of the participating utilities do not have the data to report response times to water and wastewater customer requests.

Which is concerning given that from July this year all councils are required to report their median response time for such activities, as part of the newly introduced mandatory measures. You can't define a median from a data set if you don't have the data set, or even worse the system to collect the data, and we only have two more months before these measures apply.

Here in the operational sense better data definitions are needed too – let me give one simple example, again referring to the new mandatory measures.

All Councils are required to report the number of complaints received about their core services (being water, wastewater, stormwater, flood protection, and roads). I suspect no two councils have the same definition of what a "complaint" actually is, and will have different processes and timeframes for resolution. To my mind a complaint is not a customer service request, nor a customer enquiry; it should be about poor service (if that should occur) or lack of a response relating to a service request or enquiry perhaps. If Councils use different definitions for this one relatively straight forward measure, then the data comparison formed will be nonsensical. The idea behind benchmarking should not be to name and shame but to learn from those who consistently perform well ahead of the pack. Typically good performance doesn't happen by accident – it results from good process and practice, and having good staff. The sharing of better practice then helps us all.

There is no doubt we are coming under a spotlight – Local Government New Zealand (LGNZ) in 2014 published the results of their three waters survey, and the key themes observed from that exercise, in an

issues paper prepared by Castalia Strategic Advisors for LGNZ. More recently they have made an effort to get around the country with a series of workshops to present possible solutions to the issues. They soon will publish another paper reflecting their preferred solutions. I encourage you to engage and participate. ■

Brent Manning,
President, Water New Zealand

New Members

Water New Zealand welcomes the following new members:

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VICTORIA ANDERSON
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KRISTIN STOKES
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SHAYNE CUNIS



John Pfahler

High Level Results from National Performance Review

The three waters assets managed by local authorities in New Zealand have a replacement value somewhere upwards of \$45 billion. It is important for the economic performance of New Zealand that these assets are well managed. Work being done by Local Government New Zealand, the National Infrastructure Unit of Treasury and the Office of the Auditor General has highlighted the importance of access to good data if we are to effectively manage our three waters assets.

The 2013–14 National Performance Review produced by *Water New Zealand* is one mechanism designed to assist councils in this regard by benchmarking their performance in asset management against other councils in New Zealand. This year 31 councils participated in the survey, including Watercare in Auckland. This year's survey covers about 70% of the population. The results from the survey point to considerable room for improvement in the management of these assets.

Revenue generated from operating three waters assets does not appear to cover the cost of running the services provided. The economic sustainability of NPR participants ranks low against international benchmarks when compared using cost coverage ratios, a metric that relates revenue to expenditure.

In basic terms an economically sustainable entity will have revenues that cover total costs by a ratio of 1 or more. Participants had a median cost coverage ratio of 0.64, significantly lower than the median cost coverage ratio of European benchmarking participants of

1.03. Operational cost coverage was also lower than international benchmarks, with a median of 0.95 amongst NPR participants compared with a median of 1.09 for over 1000 utilities participating in a benchmarking exercise run by The World Bank.

Cost coverage ratios reflect actual expenditure by utilities. The economic sustainability of participants would appear

“Of considerable concern for longer term asset planning is that the survey highlights that the confidence in pipeline condition grading is generally low, with over half the grading data categorised between ‘less reliable’ and ‘no data confidence’.”

lower if budgeted expenditure was used, as on average NPR participants expenditure in 2013–14 was only 68% of that budgeted. One implication is that this shortfall between revenue and costs is being sourced from other sources available to Councils.

Another outcome from the survey is that an average participant metered only a third of residential properties, a lower figure than a recent benchmarking study in the Pacific Islands. Metering has been demonstrated in several parts of New Zealand to be an effective tool for managing network demand. The most recent case study is Kapiti Coast District Council which has reported a 20% decrease in peak water demand following the introduction of residential water meters in 2014.

The NPR also shows significant room for improvement in the understanding and management of water loss. Median annual losses of NPR participants were 161 litres/service connection/day. This value was twice as high as participants in a 2014 urban Australian benchmarking study which had median annual real losses of 79 litres/service connection/day. *Water New Zealand* guidance notes and software to support the assessment and management of water loss has been around since 2002, was updated in 2010 and expanded in 2014. Greater uptake of residential water metering would make substantial improvements to the accuracy of water loss assessments. The loss

of 70 million cubic meters of water across the 31 participant Councils points to an immediate need to improve performance in this area.

Residential water use is high relative to international benchmarks, with median water consumption of 231 litres per person per day significantly higher than a World Bank survey of just over 158 litres, although comparable to that of Canada. I guess this just highlights the old adage that you can't manage what you don't measure.

Another interesting observation is that the median residential water and wastewater charges for a connection using 200 cubic meters was \$742, substantially lower than the equivalent charge in urban Australia of \$1,280. Again, you don't value a resource unless it's being properly charged for.

For the first time the NPR survey has included the customer service level indicators required by the Department of Internal Affairs which will be mandatory to report on from 2015. Attendance and resolution times had the least data available. The result from the survey suggests many councils have a considerable amount of work to do on some of their customer complaint and reporting systems if they are to comply with DIA reporting requirements.

Of considerable concern for longer term asset planning is that the survey highlights that the confidence in pipeline condition grading is generally low, with over half the grading data categorised between ‘less reliable’ and ‘no data confidence’. *Water New Zealand* has initiated discussions with its membership on the development of metadata standards to provide a common platform for assessing asset condition. We will be collaborating with a range of stakeholders, including other representative bodies to facilitate the development of such standards.

Going forward the challenge is to work with these stakeholders to ensure we have much better coverage of rural councils in next year's benchmarking exercise. We also need to work on having better data standards being used by all councils so that the information being collected provides results which can better inform management decisions. ■

John Pfahler
Chief Executive, Water New Zealand

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Awards 2015

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- ProjectMax Young Author of the Year
- Opus Trainee of the Year
- IXOM Operations Prize
- Ronald Hicks Memorial Award
- Poster of the Year
- Exhibition Awards: Best Multi and Best Single Expo Stands

Visit www.waternz.org.nz for information on the criteria for entering on award.

Key Dates for your Diary

10 June	Registrations open
24 July	Earlybird registrations close

Key Diary Dates for Presenters

29 May	Authors advised of selection
28 July	Poster summaries due
17 July	Final Papers due
4 September	Powerpoint presentations due

Registrations

Registrations will open via www.waternz.org.nz on Wednesday 10 June. An email & mailout flyer will be sent to Water New Zealand membership and past attendees once registrations have opened.

Conference Themes

The 2015 Conference will have a core theme of 'Optimising Our Water Value'. Our water's value is not all about money – it is an essential element of our health, well-being and economic future. The conference will explore smart ways of allowing us all to better understand that value proposition. Join us in Hamilton and be part of the conversation.

The programme will include general streams as well as the specialist streams of Operations, Modelling, IWA and SWANS. The general technical streams will be divided into sub streams.

Exhibition Sites

Expo sites are now on sale!

Held for the duration of the Conference, the expo gives delegates and trade visitors the opportunity to meet with leading equipment manufacturers and eservice providers and see state-of-the-art equipment, technology and services.

The Annual Conference Exhibition continues to be the largest trade exhibition for the sector with over 170 sites. Lunchtime demonstrations will also be held.

Visit waternz.org.nz to view further information and to book a site.

Poster presentations

Submit summaries from the end of June

Poster presentations are always a popular component of the Annual Conference. This year will include electronic and interactive elements. Poster summaries need to be submitted by Tuesday 28 July.

Please visit www.waternz.org.nz and click on the conference logo to be directed to the conference website for more information and to submit your poster summary online.

Sponsorship Opportunities

There are a range of sponsorship opportunities available to suit all budgets.

Contact Rebecca Wright via email: waternz@avenues.co.nz or phone: +64 4 473 8044 for further information

For more information on the conference and awards programme please contact Hannah Smith, Water New Zealand – email: hannah.smith@waternz.org.nz or visit www.waternz.org.nz and click on the conference logo on the home page to go directly to the conference website.

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Board Profiles – Kelvin Hill and Hugh Blake-Manson



Kelvin Hill

My introduction to Aotearoa commenced in 1971 where at the age of 11 I arrived from the UK to a South Waikato community. What struck me at the time was the pristine environment, the fresh green surroundings and the crystal clear drinking water available from streams and lakes. Reflecting on the last 43 years of my working career water has featured, be it in my place of residence, recreation or employment.

My passion for engineering developed into a career path and subsequent studies through the NZCE cadetship program, I gained qualifications in both Civil and Mechanical fields. My first position was with Gillman Partners consulting firm based in Hamilton where I spent three years involved in the dairy industry designing and detailing cool-store buildings and various plant upgrades. The opportunity to enter the pulp and paper industry as a site engineer afforded valuable experience on large multi-disciplined projects over the next six years and provided insight into the way the water resource is used.

Lake Taupo provided the next setting, working for Fletchers in the timber industry as a Project Engineer for seven years, installing a wide variety of process equipment and machinery with water being a key resource in the production process. Returning to the Waikato construction industry I managed a large workforce undertaking capital projects around the region including design and building of wastewater and water treatment plants. A stint overseas working in Australia, Malaysia and Vietnam also provided me with international learnings. In 2003 I joined consultants Duffill Watts and King based in Tauranga and was responsible for the \$38 million Omokoroa wastewater project.

I am currently the Utilities Manager for Western Bay of Plenty District Council responsible for the service delivery of our three waters and solid waste. My focus during the last nine years has been to deliver the highest level of water services to our customers, while maintaining vigilance on operational costs. Key drivers in this role include providing leadership to the asset management and operational teams. A significant component of our daily workloads revolves around meeting resource consent conditions and statutory requirements of our treatment plants and installing new infrastructure within our network.

In 2006 I attended my first Water Services Managers Group (WSMG) meeting in Wellington which provided an excellent opportunity to meet like minded people and share interests in the water industry. I am currently a member of the WSMG executive committee and also a member on the Technical committee, providing input into the *Water New Zealand* conference program. One of the strongest assets *Water New Zealand* has is the wealth of experience across the Special Interest Group sectors that touch on the water industry.

I was elected to the Board of *Water New Zealand* in 2013 with the vision that *Water New Zealand* is the one stop shop for leadership and advocacy for our members in the three waters sector. In terms of water management it is clear that New Zealand has reached a pivotal point in its economic growth where the tensions of our

environmental wellbeing are at odds with our aspirations for economic change. We have the opportunity to make a significant contribution to the discussion on how New Zealand manages its water resources over the next 50 years. I look forward to adding my contribution to the Board and working with the executive team in achieving this direction.



Hugh Blake-Mason

I am a born and bred Cantabrian, hopefully not too one-eyed! With a family of three girls covering primary to high school, there are numerous activities they are involved in that keep us busy, particularly in the Lyttelton Harbour basin where we live.

I have been privileged to be on the Board since 2011. Among other matters, I was particularly driven to see the water sectors

enormous wealth of technical skills enhanced and promoted through training and conferences. As Chair NZWETA and member of the Industry Partners Group I am part of a team that has made good progress in improving the sectors training linkages and opportunities, most recently with a change in ITO provider from the Primary ITO to Connexis and stronger joint venture support between the Water New Zealand and the ETC training college.

I've worked in the rural and urban water and transportation infrastructure sectors since completing formal training in Natural Resources Engineering. This has taken me around the world, including in the UK (both engineering and ICT) and nationally – Selwyn and Tasman Districts as a project engineer then Strategic Asset Manager 5Waters. Turning community and legislative requirements into improved services for the customer is a very rewarding part of local government engineering.

I was heavily involved in the Canterbury Strategic Water Strategy during my time at Selwyn, with the major focus on the zone water quality improvements. Working in the highest population growth rate district also brought many other opportunities – completing evidence for consenting of a new Rolleston treatment plant and two water conservation orders were part of the role.

Following eight years at Selwyn District I moved to City Care Ltd as Christchurch Water & Wastewater Contracts Manager. With a team of engineers covering the water, waste, pumps and treatment plants and CCTV (for all SCIRT footage) the opportunities for innovation and improvement are tremendous. I trust that the investment New Zealand has made in Christchurch is returned nationally and internationally through improved industry technical, operations and maintenance skills and standards.

I was heavily involved in scoping the 3Waters non-financial performance measures. This was an exercise in determining meaningful community focused performance measures. Behind this is the need for effective and timely data collection, management and its utilisation. Treasury has highlighted this as one of nine key focus areas in the National Infrastructure Plan. I see this as one of the most significant challenges and benefits for water services in New Zealand over the next five years. ■

“We have the opportunity to make a significant contribution to the discussion on how New Zealand manages its water resources over the next 50 years.”

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Water Loss Training Days

Richard Taylor – Principal Engineer – Water, Thomas Civil & Environmental Consultants Ltd

Water Loss Training Days were held on 26 and 27 February 2015 in Auckland. The event was organised by Thomas Civil & Environmental Consultants Ltd, Auckland, and was attended by 45–50 people each day. The purpose of the training was to upskill water supply staff and others (consultants, suppliers, contractors etc.) in the area of water loss assessment and management. It was particularly relevant as the Department of Internal Affairs' mandatory performance reporting for councils includes a measure for 'Real Water Losses'.

Attendees included 28 water supply staff from 18 councils nationwide, two staff from Water Authority Fiji, nine consultants, three maintenance contractor staff, four suppliers (including a representative from Zenner International, Thailand) and five sponsor staff, which provided a great mix of people for the event.

The training was carried out by Richard Taylor (Thomas Civil & Environmental Consultants Ltd), with assistance from Ian Maggs (Water Loss Management Pty Ltd, Sydney), Charles Chapman (Detection Services Ltd) and Kevin Head (Arthur D Riley Ltd). Short presentations on managing water losses were also made by Barry Sarjeant from Tauranga City Council and Nick Ulrich from Wellington Water.

“An interactive session was used to look at the drivers for water loss management, and an overview of the NZ Water Loss Guidelines was provided.”

On the first day the basic principles of water loss management were covered; the water balance, water loss performance indicators, the four main components of managing water losses, design of district metered areas (DMAs) (by Ian Maggs), principles of pressure management, apparent losses and metering (by Kevin Head) and strategies for partially metered and small systems. An interactive session was used to look at the drivers for water loss management, and an overview of the NZ Water Loss Guidelines was provided. Charles took a very practical and informative session on active leak detection equipment and methods.

The second day was used to consider detailed aspects and issues associated with the water balance, performance indicators



Attendees at the Water Loss Training Day held recently in Auckland

and the uncertainties in the calculations. Issues to consider in the design of DMAs and a recommended process for implementing DMAs were covered, and there was a question and answer session on leak detection methods and results. Two case studies, on using real time data to manage water losses, were provided by Barry Sarjeant (Tauranga City Council) and Nick Ulrich (Wellington Water). Ian Maggs took a session on 'Smart Water Management' which provided insight into the way in which water loss management is becoming more sophisticated and analytical, and how this is the way of the future. The technology being used is also becoming more affordable.

The writer would like to thank the other presenters for their contribution to the training; their input made the training event a much better experience and meant that additional expertise was available during question times and discussion. The writer would also like to thank the five sponsors who were very positive and provided early support for this inaugural event; this was greatly appreciated. The sponsors were: Deeco Services Limited, Detection Services Ltd, Arthur D Riley & Co. Ltd, Cla-Val Pacific Ltd and Jeff Booth Consulting Ltd.

The positive feedback received indicated the training days were very successful and so a similar event is planned for two years time (February 2017). ■

The Dream of Beer made from Sewage Water is Alive in Portland

Last year, Hillsboro Clean Water Services in Oregon held a competition for home brewers to create beer using 30% sewer water. Now they want to take it to the next level by teaming up with the Oregon Brew Crew to craft beer using only purified sewer water. Mark Jockers of the Clean Water Services told KGW News that the purified sewer water is actually cleaner than the average glass of drinking water, "The water that comes from the high purity water system is the cleanest water on the planet."

Jockers hopes that this will change the way people look at purified sewer water so that, eventually, the recycled water will help relieve droughts.

According to Oregon Public Broadcasting, the Oregon Health Authority approved the sewage water beer, but they still have several steps to take before getting the green light. The Oregon Department of Environmental Quality will hold a public hearing on Feb. 12 to evaluate the proposal, and the beer will need to pass several other hearings before it's officially above-board for consumption.

That doesn't mean Portlanders will be able to order "sewage brewage" on tap at their local bar — the beer will only be served at events, not manufactured for sale at breweries.

Hopefully there will be plenty so that people can drink enough sewage beer to not care where the water came from. ■

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Garry Macdonald Recognised for Excellence in Water Engineering

Garry Macdonald, Beca Business Director for Water, has received the 2015 Angus Award from The Institution of Professional Engineers New Zealand (IPENZ). The Angus Award is the 'Supreme Technical Award for Engineering Achievers in the field of Water, Waste and Amenities'. It recognises Garry's exceptional contribution to the water engineering field and was presented to him at the IPENZ Fellows' and Achievers' Awards Dinner on Friday 13 March 2015.

In his 38-year consulting engineering career, Garry has led many technical and project teams in the delivery of improved waste and wastewater schemes for New Zealand's major cities.

His award citation said "His technical expertise and experience in strategic planning for wastewater management was recognised through his appointment to lead peer reviews of major local authority wastewater schemes. He has authored and co-authored 45 technical papers, won 12 technical and project awards and in 2001, he received the Richard S Engelbrecht International Activities Service Award from the Water Environment Federation for furthering advancements in the global water environment."

Garry is actively involved in a number of industry bodies. In 2012 he was elected as President of IPENZ. He is a Past President and an Honorary Life Member of Water New Zealand, and a Board member and current Water New Zealand Delegate of the Water Environment Federation based in Washington DC.

He has also been on the Board of Trustees of the WEFTEC Technical Program Committee for several years, and chairs the Future Insights and Global Issues Symposium.

On the Board of Trustees of OXFAM New Zealand, Garry specialises in emergency response, disaster recovery and humanitarian development work in the South Pacific.

The IPENZ Fellows' and Achievers' Awards are an opportunity for IPENZ members to acknowledge and honour their peers. It celebrates technical achievements and recognises commitment to the Institution and contribution to the advancement of the engineering profession. ■

WATER July 2015

The next issue of WATER will be published in July.

The themes are **Wastewater Design; Water New Zealand Benchmarking Exercise; Small Water Systems** and **Trade & Industrial Waste**.

Please contact Alan Titchall if you have any story ideas, contributions, or photos. Please email them to Alan at: alan@contrafed.co.nz.

The deadline for the July issue of Water in Monday 8 June.

For all advertising matters, contact Noeline Strange on Phone: +64 9 528 8009, Mobile: +64 27 207 6511, or Email: n.strange@xtra.co.nz

To view the themes for 2015 visit waternz.org.nz and use the drop down links PUBLICATION/Water New Zealand Journal: WATER

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Gold in Sewage 'Worth Millions'

US researchers are investigating ways to extract the gold and precious metals from human sewage.

The group identified gold in waste from American sewage treatment plants at levels which if found in rock could be worth mining.

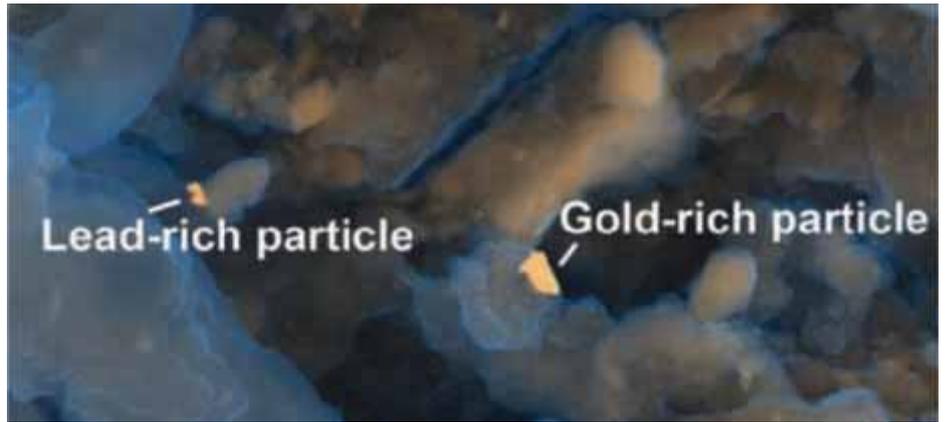
Details were outlined at the 249th national meeting of the American Chemical Society (ACS) in Denver.

Extracting metals from the waste could also help curb the release of toxic substances into the environment.

"The gold we found was at the level of a minimal mineral deposit," said co-author Dr Kathleen Smith, from the US Geological Survey (USGS).

In addition to gold and silver, human waste also contains amounts of rare earth metals such as palladium and vanadium.

"We're interested in collecting valuable metals that could be sold, including some of the more technologically important metals, such as vanadium and copper, that are in cell phones, computers and alloys," said Dr Smith.



The team estimates that seven million tonnes of solid waste come out of US wastewater facilities each year. About half of that is used as fertiliser on fields and in forests, while the other half is incinerated or sent to landfills.

The scientists are experimenting with some of the same chemicals, called leachates, which industrial mining operations use to pull metals out of rock.

While some of these leachates have a bad reputation for damaging ecosystems when they leak or spill into the environment, Smith says that in a controlled setting – they could safely be used to recover metals in treated solid waste.

In a previous study, another team of scientists calculated that the waste from one million Americans could contain as much as \$13m (£8.6m) worth of metals. ■

"In addition to gold and silver, human waste also contains amounts of rare earth metals such as palladium and vanadium."



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Changes to Standards on the Way

John Pfahler – CEO, Water New Zealand

In the coming months it is expected the Government will pass the Standards and Accreditation Bill, disestablishing Standards New Zealand as the body responsible for the development and maintenance of Standards.

Established following the Napier earthquake of 1931, Standards New Zealand was originally created to ensure a similar loss of life did not occur again from such widespread destruction of buildings. Over the years some 650 building related Standards were developed. Today the Standards New Zealand catalogue contains some 2500 standards covering a wide range of topics from building to health to electrical – 82% of which are joint standards with Australia.

The Bill will transfer standards development obligations to a new independent statutory board and statutory officer within the Ministry of Business Innovation and Employment (MBIE), the Ministry responsible for administration of the Building Act.

Numerous submissions to Government during the three years this Bill has been developed have expressed concern about the proposed arrangements. There is an unease within the wider building and engineering industry in New Zealand that locating Standards development within a Government department comes with certain risks.

The Government rationale for MBIE to manage the standards process is that there is a need to locate the development function in MBIE to ensure closer alignment with Government objectives such as economic growth, international trade, innovation and health and safety.

Historically, Standards have been developed in an independent, impartial environment where the resulting intellectual property (the Standard) was not subject to regulatory capture or for the primary use of Government.

Going forward will we have the assurance that Standards will be developed in such a manner? The Standards Approval Board to be established will be able to establish standards development processes that suit its own needs. There can be no assurance that there will be openness and access for all stakeholder groups with an interest in the subject being discussed, since the Board also decides who goes on Standards committees.

Nor will there necessarily be a need to adhere to the long established tradition of

consensus in producing standards. Where consensus cannot be reached what is to stop a Government from simply imposing an outcome which suits its needs, rather than those of the wider community?

“Going forward will we have the assurance that Standards will be developed in such a manner?”

I'd be the first to acknowledge that there are failings with the current Standards development process both here and overseas. Standards can be time consuming to produce and can reflect a “lowest common denominator” outcome where the document produced reflects only what the parties to the process could agree upon, not necessarily best practice.

Funding shortages have been an ongoing problem for Standards New Zealand and their counterpart organisation in Australia. While the New Zealand Government has funded the review and development of some standards under the current arrangements, there is little likelihood that bringing the process in house will result in a higher level of investment.

Going forward we may see only standards in which the Government has an interest in being funded. The current catalogue will inevitably be drastically reduced in size, or similar documents developed in house by officials as “compliance documents” which can be referenced in the Building Code without the requirement for the rigour of the Standards development process.

As the International Standards Organisation said in their submission on the above Bill: “Incorporating standards development activity carried out by the Standards Council into MBIE, is not a solution in itself to the problem facing standards development in New Zealand. That problem is funding for relevant standards activities in a small economy and having government acknowledge and financially support the benefit such activity brings to the whole economy and the citizens of the country.”

Successive Governments over the past 20 years have refused to adequately recognise the public good benefit of Standards to the economy. As a result the only Standards that get updated are ones the Government is interested in, or an external sponsor can be found to support.

That isn't likely to change. New Zealand will increasingly be a standards taker from Australia. Our input into those documents will be slight or non-existent. Voluntary trade groups do not routinely have the resources to send people to international meetings of Standards bodies, however deserving the topic up for debate.

As a consequence one might expect that the plethora of joint Standards with Australia that currently exist will progressively disappear. Industry groups are unlikely to stump up the money to ensure New Zealand is represented on Australian based committees. One wonders how many of these joint Standards committees the Government will contribute people to attend.

The process of developing standards inevitably leaves some around the table dissatisfied that they weren't listened to, or that insufficient weight was given to their point of view. There have been gripes about the time it takes, and, always, complaints that because of the public good nature of these documents – that Government should be playing a greater role.

The Bill is crafted in a way which could lead to better outcomes at a lower cost. Time will tell whether this review was simply a cost saving measure. A couple of useful metrics to gauge success might be how many Standards remain on the Standards catalogue in 10 years' time, and how many of the existing joint standards with Australia have disappeared. ■

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Collaborative Initiative to Restore Waikato River

Environment Minister Dr Nick Smith has welcomed the launch of the Waikato River Restoration Strategy, saying the new collaborative initiative will have an important role to play in ensuring the long-term health of the country's longest river.

"The size and location of the Waikato River means it has significance for not just the surrounding region, but for the rest of New Zealand. The Waikato River Restoration Forum brings together landowners, industry, iwi, and local and central government to develop a five- to 15-year strategy for

its restoration and ongoing well-being," Dr Smith says.

The Forum is chaired by the Waikato River Authority, an independent Crown-iwi organisation, and its members include DairyNZ, Fonterra, Genesis Energy, Mighty River Power, Waikato River iwi and the Waikato Regional Council, as well as other territorial authorities.

"There are a number of organisations that are currently involved in activities to restore the Waikato River, but there is scope for these efforts to be better coordinated

and integrated. The establishment of the new collaborative forum will address the risks of duplication and inefficiencies," Dr Smith says.

"The first priority for this new body will be to produce a strategy to help guide investment decisions for improving the health of the Waikato River, and to guide the Forum's members to ensure the most logical and effective approach is adopted to restoration activities. This will ensure the maximum benefits are gained."

The three strategy partners, DairyNZ, the Waikato Regional Council and the Waikato River Authority, have also made funding commitments towards the initiative. The Authority and DairyNZ are contributing \$200,000 each in direct costs while the regional council is due to put in \$75,000, subject to councillor approval. Other costs will be met by significant in-kind support, such as staff time, from DairyNZ and the council.

"I commend the work of all those involved in this new initiative, which builds on the Government's vision for the effective management of our freshwater," Dr Smith says. ■

Ruataniwha Irrigation Scheme Gets 15 Years to Sort Water Quality

Patrick Smellie – Scoop Business Desk

A revised decision from the board of inquiry considering the Ruataniwha Water Storage Scheme relaxes water quality conditions that were previously regarded as unworkable. It gives irrigators 15 years to find ways to manage nitrogen levels in the Tukituki River to very low levels.

The board's original decision, released last June, set a maximum level for dissolved inorganic nitrogen (DIN) downstream from the scheme of 0.8 milligrams per litre, a level consistent with the highest quality freshwater bodies under the government's recently updated National Policy Statement on freshwater management, and at odds with DIN levels in the river today.

To get around that, the decision created an exemption for some 615 farms to discharge higher levels of nitrogen, leading to successful appeals from a range of environmental groups who argued the board had created a "factual fiction" by setting a high standard that would not then be expected to be met.

Some 10 months later, the board has released a draft redetermination, proposing that land use be managed "in

a manner consistent with achieving a DIN concentration of 0.8mg/l by Dec. 31 2030."

That effectively gives parties 15 years not only to improve technology and farming techniques to reduce nitrogen leaching but also, potentially, creates a window of time for the Hawke's Bay District Council to make further changes to its District Plan in ways that advance environmental objectives without making agriculture unviable.

"We believe the decision gives us workable conditions and gives all parties a time frame within which to ensure that the scheme deliver on its positive environmental benefits as well as its economic benefits," said Andrew Newman, chief executive of Hawkes Bay Regional Investment Co.

"I believe that ultimately, we will end up in a place where the nutrient levels are manageable."

In a media statement, Newman described the reissued draft as a "major positive milestone for the scheme", which would cost an estimated \$265 million to build. The scheme is potentially a candidate for funding from Crown Irrigation Ltd. CIL is a government entity managing a revolving fund to help capitalise new water storage schemes where coordinated uptake by

"A revised decision from the board of inquiry considering the Ruataniwha Water Storage Scheme relaxes water quality conditions that were previously regarded as unworkable."

large numbers of farmers can be a barrier to schemes getting off the ground.

Infratil-controlled Trustpower pulled the plug on its involvement well before the original board of inquiry decision, prompting withdrawal also by the investment arm of the South Island's Ngai Tahu iwi. Their withdrawals, at the time, were regarded as making it unlikely that government funding would be available, since CIL will only get involved as a "reluctant" minority shareholder with a mandate to exit quickly once a scheme is established.

While many such irrigation schemes are targeted at more intensive dairying, the Ruataniwha scheme, on the Hawke's Bay's Tukituki River, would benefit horticulture and non-dairy sheep and cattle farming. ■

South Otago Couple Win ORC Water Quality Award

South Otago farming couple Wilson and Angela Wylie's commitment to improving water quality has won them the ORC Water Quality Management award at the Otago Ballance Farm Environment Awards (BFEA) in Wanaka recently.

They were among several award winners to be recognised for their contributions to environmental stewardship.

Mr and Mrs Wylie, who run a 270ha sheep and beef property Glenelgin at Tahatika, northwest of Owaka, also collected the Beef and Lamb NZ Livestock award.

They won the ORC award based on their:

- Commitment to enhancing water quality; fencing almost all of their Owaka River boundaries and some tributaries; and extensive riparian planting
- Monitoring of water quality with ORC; collaboration with Otago University and the Working Waters Trust for riparian planting advice
- Efficient nutrient management with whole farm soil testing; strategic fertiliser applications; and direct drilling to minimise soil loss
- Careful consideration of stock management around waterways and best practice winter management of soils and crops

The ORC award judges said the Wylies were "a motivated and driven couple with a strong desire to succeed, running an efficient, and well executed sustainable operation."

They had "an inherent understanding of the environment; wise use and consideration of natural resources; and early adoption of exemplary riparian management."

ORC director stakeholder engagement Jane Leahy said the council's sponsorship of a specialist water quality award as part of the BFEA Otago awards recognised the importance and necessity of community action to improve water quality in the Otago region.

"It is great to see landholders with a strong passion for the environment and a focus on improving water quality entering these awards," Mrs Leahy said.

"The judging panel takes a thorough look at each farm. This also helps entrants make a constructive assessment of the work they have carried out."

"As we implement our new water quality rules, we need landholders like the Wylies, who are demonstrating excellence in environmental management, to lead from the front," Mrs Leahy said. ■

Public Feedback Sought on Lake Tarawera

A plan to restore water quality in Lake Tarawera has just been released for public input.

The Rotorua Te Arawa Lakes Programme has released the draft Tarawera Lakes Restoration Plan and is seeking input from the community.

The Plan outlines the key challenges and proposes actions to be taken to achieve long-term sustainable water quality for the lake. Bay of Plenty Regional Council General Manager Environmental Delivery, Warwick Murray, encouraged people to have their say on the Plan.

"Lake Tarawera is one of our most pristine lakes, enjoyed by the Tarawera residents, local iwi, tourists and wider community, but water quality is declining," he said.

Water quality is measured using the Trophic Level Index (TLI), a number used to indicate the health of lakes in New Zealand calculated using total nitrogen, total phosphorous, water clarity and chlorophyll-a. For 2013/2014, Lake Tarawera had a TLI of 3.0, 0.4 units above its community-agreed water quality target of 2.6.

The main cause of declining water quality is an increase in nitrogen and phosphorous flowing into the lake from the catchment. The restoration plan identifies what actions are needed to reduce the amount of nutrients, including sewage reticulation, managing land use in the Tarawera and neighbouring lake catchments and controlling nitrogen-fixing plants such as silver wattle.

"Restoring Lake Tarawera is a unique and complex task, as it relies on the health of seven neighbouring lakes – Okoreka, Okataina, Rotokakahi, Rotomahana, Tikitapu, Rerewhakaaitu and Okaro – which drain into Lake Tarawera. It is important that the affected communities for these lakes, as well as people living in Rotorua, get involved in to how we go about remedying the situation," Murray said.

Feedback on the draft Plan is open until 20 June. Copies of the draft Tarawera Lakes Restoration Plan and a submission form are available online at www.rotorualakes.co.nz, from Bay of Plenty Regional Council, Rotorua Lakes Council and Te Arawa Lakes Trust offices, or by calling 0800 884 880. ■

Work Plan Agreed with Iwi Leaders on Freshwater

A programme of work on improving the management of freshwater has been agreed between the Government and iwi leaders.

"Freshwater is one of New Zealand's most important resources and the Government is committed to improving how it is managed. Iwi have long raised concerns about water quality, how water is allocated and want their kaitiaki responsibilities better recognised," says Environment Minister Hon Dr Nick Smith.

"We have committed to a work programme on engaging with the Freshwater Iwi Leaders Group, which will involve case studies, new local clean-up initiatives and policy improvements so as to better manage New Zealand's rivers, lakes and groundwater.

"The Government's policy is that nobody owns the water. Nor is a national settlement like that achieved on fisheries being considered. Freshwater issues, such

as nutrients, sediment, *E.coli* and allocation vary so significantly around the country that solutions have to be worked out on a catchment by catchment basis.

"Iwi have an important role to play in improving New Zealanders' freshwater management with rights and interests in water quality as well as economic development. This work programme is about developing a better way for iwi to be involved in freshwater planning, allocation, pollution control, storage, and clean-up.

"This latest work builds on the collaborative process led by the Land and Water Forum in which iwi played a pivotal role to produce New Zealand's first National Policy Statement on Freshwater. Our ambition with iwi is to publish a discussion document for wider public input later this year, which will set out the next steps on improving New Zealand's freshwater management." ■

We're all Water from Different Rivers: Managing Water and Pin-pointing Values

Helen Atkins – Partner; Vicki Morrison-Shaw – Senior Associate and Phoebe Mason – Solicitor, Atkins Holm Majurey

Introduction

On her 1972 album with John Lennon 'Some Time in New York City', Yoko Ono released a song called 'We're All Water' which celebrated the oneness of people:

"We're all water from different rivers. That's why it's so easy to meet. We're all water in this vast, vast ocean. Someday we'll evaporate together."

While 2015 is a fairly different society to that existing in 1972, it remains true that we rely on water, both for economic reasons such as energy-generation and sustenance, and spiritually as an important part of identity. The management of waterways remains a contentious issue because of this fundamental role which it plays in our economic, social, cultural and spiritual wellbeing.

Democratic processes play a large part in providing water users with fora to

have a say in the management of New Zealand's waterways. This article provides an update of water issues in the Proposed Auckland Unitary Plan, and an overview of the proposed governance structure for Environment Canterbury – both processes which will greatly impact water management at the regional level. We also provide an overview of the first iwi co-governance regime over a river in the Bay of Plenty, and pose the question of rights-based water management. We provide an overview of a Guideline produced by the Ministry for the Environment on the identification of freshwater values as required by the National Policy Statement for Freshwater Management 2014. We conclude with a summary of a successful judicial review case which prevented the over-allocation of a river.

Water in the Proposed Auckland Unitary Plan

The Proposed Auckland Unitary Plan process is continuing apace. Hearings of submissions on the Regional Policy Statement ("RPS") were largely completed by the end of last year and the Panel recently commenced the Regional and District Plan phase of hearings.

The Panel has indicated that it will not be issuing an interim decision or formal recommendations on the RPS at this stage. However, the Panel has issued a number of 'Interim Guidance' notes on its thoughts to date in regards to the content of the RPS (with the reservation that these may indeed change as the remaining plan processes are worked through). These notes relate to rural subdivision, urban growth/rural urban boundary, infrastructure and energy, general structure of the Plan, and general consent matters.

While one further guidance note has been signalled (in the area of high productive potential of rural land) there has been no specific guidance given (or signalled) as to the Panel's thinking on high level water policy issues. In our view, the absence of guidance does not mean that water is of lesser importance than the other issues for which guidance notes have been issued, or that the Panel necessarily agrees with the way in which water issues have been dealt with in the proposed RPS. It may simply mean that the Panel wishes to take a more holistic approach to the management of water and consider the policy issues and methods for managing such issues in the round.

The pre-hearing processes for the water topics in the regional and district plan began in mid-March with hearings of

submissions scheduled to begin in late May and continue into June.

Mixed-model Governance Structure for Environment Canterbury

On 18 March 2015 Environment Minister Nick Smith and Associate Local Government Minister Louise Upston announced the Government's proposal for a mixed-model governance structure for Environment Canterbury ("ECan").

The structure would involve seven elected members, and six government appointed members, which in the words of Minister Upston, would: "enable a local democratic say while also ensure stability and the specialist skills to deal with the very challenging issues, including water and earthquake recovery", particularly to implement the complex Canterbury Water Management Strategy.

"Democratic processes play a large part in providing water users with fora to have a say in the management of New Zealand's waterways."

The Regulatory Impact Statement ("the Statement") prepared by the Department of Internal Affairs and the Ministry for the Environment recommended further consultation before any legislation is introduced into Parliament, at which stage public and stakeholder input would be possible. The conclusion was that none of the options would require regulatory intervention, namely none would:

- Impose additional costs on businesses;
- Impair private property rights, market competition, or the incentives on businesses to innovate and invest; or
- Override fundamental common law principles.

Without a new structure, ECan's current seven Government-appointed Commissioners would be replaced by elected officials at the next round of local government elections in 2016. The Statement expressed concern that "ECan will revert to its irreconcilable and long-standing political divisions". The Statement particularly notes that anticipated dairying growth could lead to unacceptably increased nitrogen levels in waterways without robust management and mon-



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itoring. The Statement recommended either a permanent or transitory mixed governing body, which has formed the basis of the Government's proposal.

The Government's proposals and the Statement are set out in a discussion document which was released in March¹. The proposals were open for public submission until 1 May 2015. The Government is currently considering the feedback provided in those submissions and is expected to announce a way forward in June/July with legislation to follow in the last quarter of this year. We will keep you updated on further developments.

Te Ara Whanui o Rangitaiki – Pathways of the Rangitaiki

The first co-governance regime over a river in the Bay of Plenty, Te Ara Whanui o Rangitaiki Charter ("the Charter"), was released on 13 March 2015. The Rangitaiki River is 155km long, and its catchment covers approximately 3,000sqkms. The river is an important resource for hydroelectricity generation, agriculture, horticulture, forestry and tourism.

The Rangitaiki River has a long history. The Rangitaiki's longfin eels have been living

in New Zealand for more than one million years; and the Mataatua waka arrived 800 years ago. 100 years ago the Rangitaiki Plains were drained, and the Rangitaiki has been providing electricity services for more than 50 years. Concern about the poor state of the Rangitaiki River and growing discontent with existing management regimes was behind the call by iwi for a greater role in management of the river. Ngati Whare, Ngati Manawa, Ngati Awa, and Ngati Tuwharetoa collectively claim mana whenua in the Rangitaiki catchment.

The Charter ties together the Local Government Act 2002, the Resource Management Act 1991 and the Treaty of Waitangi. The co-governance arrangement is required by Treaty settlement legislation. The Bay of Plenty Regional Council will give effect to the Charter in future Regional Policy Statement changes, and the Regional Policy Statement will in turn be given effect to in Long Term Plans of the Regional and District Councils.

The objectives of the Charter relate to the health and habitat of longfin eels; water quality for recreation, food gathering, and drinking; and reconnection of communities with the water and its surrounds. These

“Without a new structure, ECan’s current seven Government-appointed Commissioners would be replaced by elected officials at the next round of local government elections in 2016.”

objectives are in turn supported by an Action Plan. The Charter can be found at www.rangitaiki.org.nz.

A Rights-based Water Allocation System?

Acknowledgement and formalisation of the kaitiakitanga which individual iwi hold over water bodies in their catchment is increasing in Treaty settlement deals. However water rights for iwi remain rare.

A report prepared in December 2014 for the Iwi Advisors Group considers that there would be significant economic

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benefits for all water users in a rights based system, by providing iwi a share of the allocable quantum of fresh water and in doing so shifting the allocation system from the current resource consent regime to a rights-based regime. Such a system is comparable to the Quota Management System which recognises iwi proprietary rights in fisheries alongside a revolutionary management regime for New Zealand's fisheries. The report lists the benefits as including: better pricing of water due to an easier 'path to market'; ease of awakening sleeper consents and consequently more efficient use of the water resource; ease of transfers making for less costly droughts; reduced cost in resolving over-allocated catchments; greater certainty resulting in fewer expensive conflicts; and improved incentives for investment and capital formation.

There are no murmurs of a change to the water allocation regime at the moment, but the report provides some food for thought.

Tools for Working with Freshwater Values

The Ministry for the Environment has recently released a report entitled 'Tools for Working with Freshwater Values'. The report outlines a number of 'tools' which may be of use to regional councils and their communities as they undertake planning processes to implement the National Policy Statement for Freshwater Management 2014 ("NPSFM"). The NPSFM directs the setting of objectives and limits in regional plans based on 'values'. The report refers to these values as complex concepts, and thus decision making tools are useful to determine the relevant values.

"There are no murmurs of a change to the water allocation regime at the moment, but the report provides some food for thought."

One of the most successful tools across the board was 'structured decision making'. The report considered that such deliberative methods "are designed to enable consideration of multiple and diverse objectives in a rigorous manner while promoting mutual understanding of values and creative solutions to complex problems."

The report also notes the difficulties of pure economic valuation using market prices. In

particular, economic assessments can miss contextual influence, which is particularly important in relation to intangible values such as a person or community's feelings toward a water body.

Examples of tools include: participatory values mapping in which community members identify sites on a map and explain why those sites are valued; Watershed Talks, which use photographs of catchments to promote dialogue and elicit values; Visioning, which is a process of engaging in a collective exercise to agree on a story about the future of a community or place; Expert Modelling, for example in relation to biodiversity outcomes, Bayesian networks of cause and effect; and Participatory Modelling to build a shared picture of how a system works.

As Councils implement the NPSFM 2014, it is likely that the Tools Guidelines will be thoroughly used and tested. The Guidelines are available on the Ministry for the Environment website.²

Illegal Consent: Sutton v Canterbury Regional Council [2015] NZHC 313

This judicial review action was initiated by the Suttons and Lone Star Farms Ltd ("the Applicants"), who held water take consents over the Hakataramea River and its tributaries. The Applicants were vitally concerned to ensure that the reliability enjoyed under their consents was not eroded by future applicants subsequently seeking water.

Infinity Investment Group Limited ("Infinity") had received a 93 L/s water-take consent for irrigation purposes on a non-notified basis, from the Hakataramea, which is a generally over-allocated catchment. The consent was granted on the basis that there were 93 L still available in the total allowable summer take of 500L. However this data was incorrect. The Council was aware of the potential mistake, but did not investigate, and continued to process the application on the basis of the incorrect data.

The Applicants sought judicial review of both the Council's decision not to notify them and also of the substantive decision.

The Court found that:

- The Council had "nowhere near enough information of a reliable kind" upon which to conclude that other users (including the Applicants) would not be adversely affected by the application, and so to make the decision to process the application non-notified;
- The AEE provided for the application appeared extensive, but was in fact limited in scope and unreliable;

"In our view, the absence of guidance does not mean that water is of lesser importance than the other issues for which guidance notes have been issued, or that the Panel necessarily agrees with the way in which water issues have been dealt with in the proposed RPS."

- Alleged data errors were red flags which the Council ignored, and those errors formed the basis of the Council decisions;
- The Applicants for judicial review should have been treated as adversely affected persons and been limited notified;
- The Council's errors were more than technical defects – they were serious;
- Due to the data errors, the Council wrongly considered the application as for a discretionary activity, when in fact it was a non-complying activity, and so applied the wrong substantive test; and
- Had the application been correctly considered as a non-complying activity it is by no means inevitable that the same outcome would result.

The Court said that "this case exhibits aspects of decision-making whereby the consent authority has displayed serious disregard for the resource management requirements that it is obliged to adhere to under the RMA."

The High Court found the consent to be illegal and that relief should be granted given the lack of alternative remedies available to the applicant, the close involvement of Infinity in the reviewable errors, the need not to effectively condone the errors and in the because overall fairness favoured relief. The Court accordingly quashed the Council's decision not to notify the application and remitted the matter back to Environment Canterbury for reconsideration. ■

Footnotes

¹Copy available from <http://www.mfe.govt.nz/sites/default/files/media/RMA/ecan-review-discussion-document.pdf>.

²Refer: www.mfe.govt.nz/sites/default/files/media/Fresh%20water/tools-for-working-with-freshwater-values.pdf, for a copy.



IRRIGATION SYSTEMS

FROM THE SOURCE TO THE FARM GATE

HYNDS

Assessment of Operational Water Effects for the Puhoi to Warkworth RoNS Project

David Sloan – GHD New Zealand Ltd and Tim Fisher – Tonkin & Taylor Ltd

Abstract

The Puhoi to Warkworth Project realigns the existing SH1 from the Northern Gateway Toll Road at the Johnstone's Hill tunnels via an 18.5 km four-lane dual carriageway road alignment that will tie into the existing SH1 north of Warkworth.

An Operational Water Assessment report formed part of a suite of technical reports prepared for the Transport Agency to inform the Assessment of Environmental Effects and to support the Resource Consent applications and Notices of Requirement for the Project.

The Further North Alliance was formed to develop the Transport Agency's applications to the Environmental Protection Authority. The Alliance included the Transport Agency, engineering consultants (GHD and Jacobs SKM) and lawyers (Chapman Tripp), plus a number of expert sub-consultants. The Alliance proved to be a vibrant working environment where an extremely demanding timeframe demanded efficient and innovative approaches to ensure sufficient assessment of effects were satisfactorily carried out.

A variety of measures to avoid, remedy or mitigate adverse environmental effects were designed into the Project's operational water systems based on a best practicable option approach. The mitigation measures were determined through a robust evaluation of options and drawing on the collective knowledge and experience within the Alliance.

The operational water aspects of the indicative design features 27 constructed wetlands, 40 culverts, seven large viaducts and five bridges, of which nine are required because of stream / river crossings.

Keywords

Alliance, Stormwater, Consenting, Assessment, Flooding, Mitigation, AEE

1. Introduction

Tim and I led an assessment of the operational water effects of the Puhoi to Warkworth Project (the Project), which is a section of the Ara Tuhono Puhoi to Wellsford Road of National Significance. Operational water effects are those arising from stormwater, streamworks and flooding associated with the operational phase of the Project.

We delivered the Operational Water Assessment Report to inform the Assessment of Environmental Effects (AEE) and to support the resource consent applications for the Project.

The report also describes the operational water systems, including the permanent stormwater management systems and modifications to streams/floodplains for the operation of the motorway.

We minimised effects by designing mitigation measures into the Project's operational water systems based on a best practicable option (BPO) approach. The extent of mitigation measures is based on consideration of the sensitivity of the receiving environment and our assessments of the potential unmitigated effects.

2. The Project

The Project realigns the existing State Highway 1 (SH1) from the Northern Gateway Toll Road (NGTR) at the Johnstone's Hill tunnels and joins back in to the existing SH1 just north of Warkworth. The indicative alignment will bypass Warkworth on the western side and tie into the existing SH1 north of Warkworth. It will be a total of 18.5km in length. The upgrade will be a new four-lane dual carriageway road, designed and constructed to motorway standards and the Transport Agency RoNS standards.

2.1 The Purpose

The purpose of the proposed Puhoi to Warkworth project is:

- To enhance inter-regional and national economic growth and productivity
- To improve movement of freight and people between Auckland and Northland
- To improve the connectivity between growth areas North of Auckland
- To improve the reliability and safety of the transport network between Auckland and Northland

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Other benefits of the Project include:

- Reducing congestion during peak periods
- Improving economic development and tourism opportunities in Northland
- Reduced travel times between Northland and Auckland

2.2 Project Features

Subject to further refinements at the detailed design stage, key features of the Project are:

- A four lane dual carriageway (two lanes in each direction with a median and barrier dividing oncoming lanes);
- A connection with the existing NGTR at the Project's southern extent;
- A half diamond interchange providing a northbound off-ramp at Puhoi Road and a southbound on-ramp from existing SH1 just south of Puhoi;
- A western bypass of Warkworth;
- A roundabout at the Project's northern extent, just south of Kaipara Flats Road to tie-in to the existing SH1 north of Warkworth and provide connections north to Wellsford and Whangarei;
- Construction of seven large viaducts, five bridges (largely underpasses or overpasses and one flood bridge), and 40 culverts in two drainage catchments: the Puhoi River catchment and the Mahurangi River catchment;
- Construction of 3,075 m of stream diversions with natural stream forms;
- Construction of 27 wetlands; and
- A volume of earthworks based on the indicative design (and likely to be refined) of approximately 8 Million m³ cut and 6.2 Million m³ fill within a proposed designation area of approximately 189 ha earthworks.

3. The Further North Alliance

The Further North Alliance is the Transport Agency's first planning alliance and is made up of the Transport Agency, GHD, Jacobs SKM and Chapman Tripp. Sub-consultants have been used for some

specialist tasks including Tonkin & Taylor, Ridley Dunphy Environmental Ltd, Bioresearchers, Boffa Miskell, NIWA and eCoast. The Alliance was tasked with preparing the Notice of Requirement and Resource Consent documentation for the project.

The Alliance has a clear vision:

- **Pathway to a strong North**

Enabled by key objectives:

- » Safety first
- » Deliver on or before time to be construction ready for August 2014
- » Deliver and demonstrate value for money
- » Create a positive legacy

Delivered with the strength of the following core Values and Behaviours:

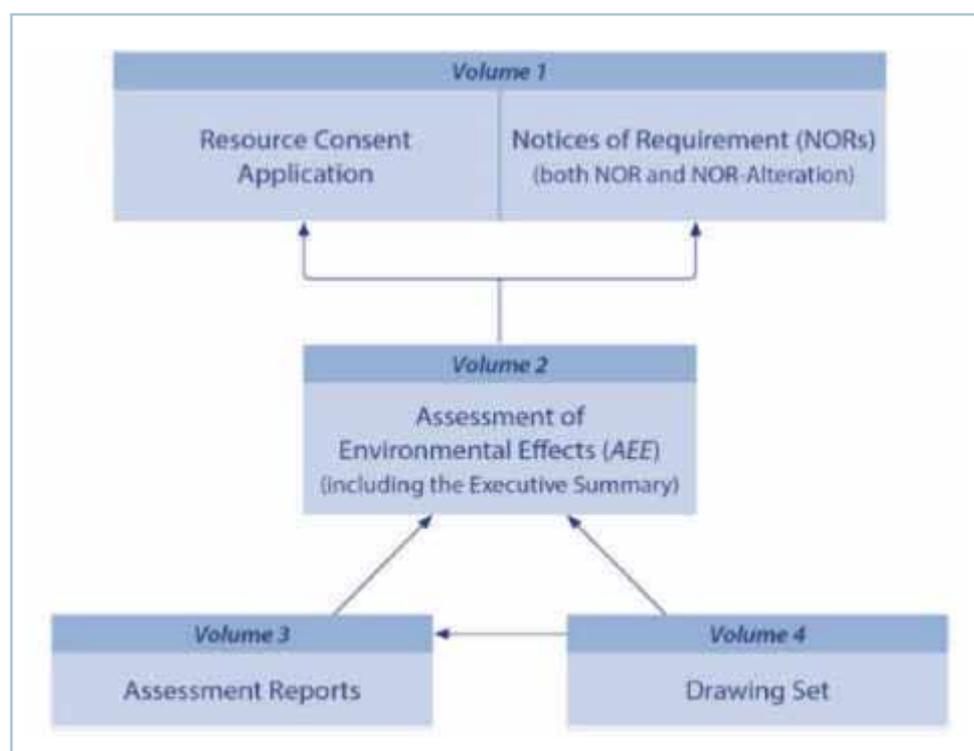
- **Support** – Promote and realise a strong alliance culture by actively supporting our people
- **Integrity** – Do what you say and be honest
- **Courage** – Challenge yourself and others and embrace change;
- **Respect** – Adopt a positive attitude. Listen and understand.

The Alliance created a special working environment where all disciplines shared a common working space. Having all technical specialists based in the one office promoted teamwork and provided a collaborative environment that achieved innovative breakthroughs needed to meet or exceed the project programme and goals. 'On the job' resolution of issues with relevant skills available for ad hoc as well as scheduled discussions produced speedy and continual resolution of issues and project refinements. Project tasks were completed in compressed timeframes with optimum efficiency and expenditure. As a result, there was very little if any duplication or replication of effort.

3.1 Structure

The Project's Resource Consent Application and Notices of Requirement are supported by the AEE. The AEE is informed by the Assessment Reports and Drawings. Figure 1 shows the documentation structure for the Project.

Figure 1 – Documentation structure



“We consider the Auckland Council models to be of relevance and of sufficient accuracy for our assessment of the Project effects on flooding, as our assessments are based on comparisons between existing and post-development i.e. the relative difference (the change).”

3.2 Programme

The programme was exceptionally tight with only 5 Months (22 Weeks) to complete a design and an assessment for a major transport project:

Start:	12th February 2013
First Draft:	31st March 2013
Design Freeze:	30th April 2013
Second Draft:	18th May 2013
Design change end of May – Adjusted approx. 40% of Alignment	
Final Draft:	18th June 2013
FINAL Final Draft:	18th July 2013

Management of design changes was important. Due to the timeframe constraints, it was important to have cut off points in the conceptual design programme that all disciplines bought into. We collectively recognised that a design change that is minor to one particular discipline has the potential to have significant impact on the assessments being carried out by another discipline. An example is a minor change to the extent of an area of fill for the motorway may impact on an existing stream and result in a stream diversion being required. That stream diversion requires assessment.

Design freeze milestones were identified from the outset and while design changes occurred beyond these dates an effort was made to stop design changes once there was an indicative design that could be assessed. Obvious design modifications such as to the cut to fill balance are left for future design refinement at later design stages.

3.3 Methodology Innovations

A fast tracked programme meant we were forced to work efficiently and focus on activities that we actually needed to do. Tasks that

needed to be done were those that were critical to the assessment of effects. 'Nice to have' tasks were challenged and only carried out if they would offer significant input into our assessments. A 'do it once – do it right' attitude was shared throughout the team. Due to time constraints, we sought out information which could help us and adopted it if relevant for expediency. An example of this is our use of Auckland Council's Rapid Flood Hazard Model for the Warkworth region, which is discussed later in Section 4.11.

The expert discipline leads within the Alliance had been there and done it before in previous flagship RoNS projects. Tim has previously worked on the Waterview and Transmission Gully RoNS projects, and the earlier adjacent NGTR. We drew on this vital experience throughout our assessments. We had the opportunity to make decisions based on Tim and other Alliance team member's experience and lessons learnt and then backed it up with analysis when required. This approach streamlined our assessment methodology.

The Project was focused on performance based resource consent conditions. Therefore, "in general accordance conditions" were avoided in preference for conditions that set performance limits to limit effects or mitigate adverse effects. The Transport Agency wanted to maximise the opportunities for value engineering at the detailed design and construction stages. For similar reasons a wide designation is being sought.

This approach enabled us to minimise the design and focus on assessment of effects and mitigation of these. As a result only an indicative design was provided with the consent application. Our approach was that innovation in the "design and constructability phase" will happen later and at this stage the focus should be on the assessment. This is deemed sensible, as from our experience,

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“The Further North Alliance was formed to develop the Transport Agency’s applications to the Environmental Protection Authority. The Alliance included the Transport Agency, engineering consultants (GHD and Jacobs SKM) and lawyers (Chapman Tripp), plus a number of expert sub-consultants.”

the consent design always changes at the design and construction stage.

The Alliance structure avoided the traditional approach of allocating project tasks, deliverables and risks to different parties. Alliance members share all the risks equally, and share the “Gain” if the targets are met or share the “Pain” if the targets are not met.

The ‘business as usual’ approach is to distribute tasks and each team and organisation goes away and does their own thing, working on the relevant tasks through to delivery. With this approach, consistency and integration of each component of the assessment can be compromised. At the Further North Alliance, we collectively invested time up front to develop and agree on our assessment methodology. The collective input from technical experts across all disciplines resulted in ‘buy in’ to the consenting strategy and therefore a united approach.

Chapman Tripp was included in the Alliance, which is a first for a legal firm. The involvement of a legal partner that specialises in environmental, planning and resource management law from the outset allowed key assumptions and ‘business as usual’ approaches to be tested. Our assessment report went through a number of reviews where the legal team checked to ensure our assessments were robust and efficiently prepared for the consent application submission. The reviews ensured that the report covered all aspects required, and also didn’t include anything that it didn’t need to.

The ‘business as usual’ approach for a major project like Puhoi to Warkworth is for the legal team to be introduced to the project after design development, and often after the briefing of consultants and specialists. The legal team often has to rework assessments with regards to RMA tests and evidentiary standards. With the involvement of Chapman Tripp from the outset in the Further North Alliance, we believe that extensive re-work and the potential for impacts on programme and budget were avoided or minimised. Similarly, the involvement of planning specialists throughout the project allowed for assessment criteria related to planning documents to be identified and the assessment methodology targeted to these matters. As a result of the legal and planning services being integrated into the team, the technical specialists and their assessments are concentrated on the key planning matters and RMA tests, and therefore the assessments are focused, specific and more effective.

The Alliance also developed a progressive alliance called Hokai Nuku with the mana whenua of the project area. Hokai Nuku has provided cultural advice and valuable input into many design and assessment aspects. This created an opportunity for collaboration of social, environmental and economic issues of mutual benefit.

We also gave thought to the planning and structure of the assessment reports and a number of reports were integrated into one. In past projects there have been different reports for hydrology, stormwater philosophy, water quality baseline, water quality

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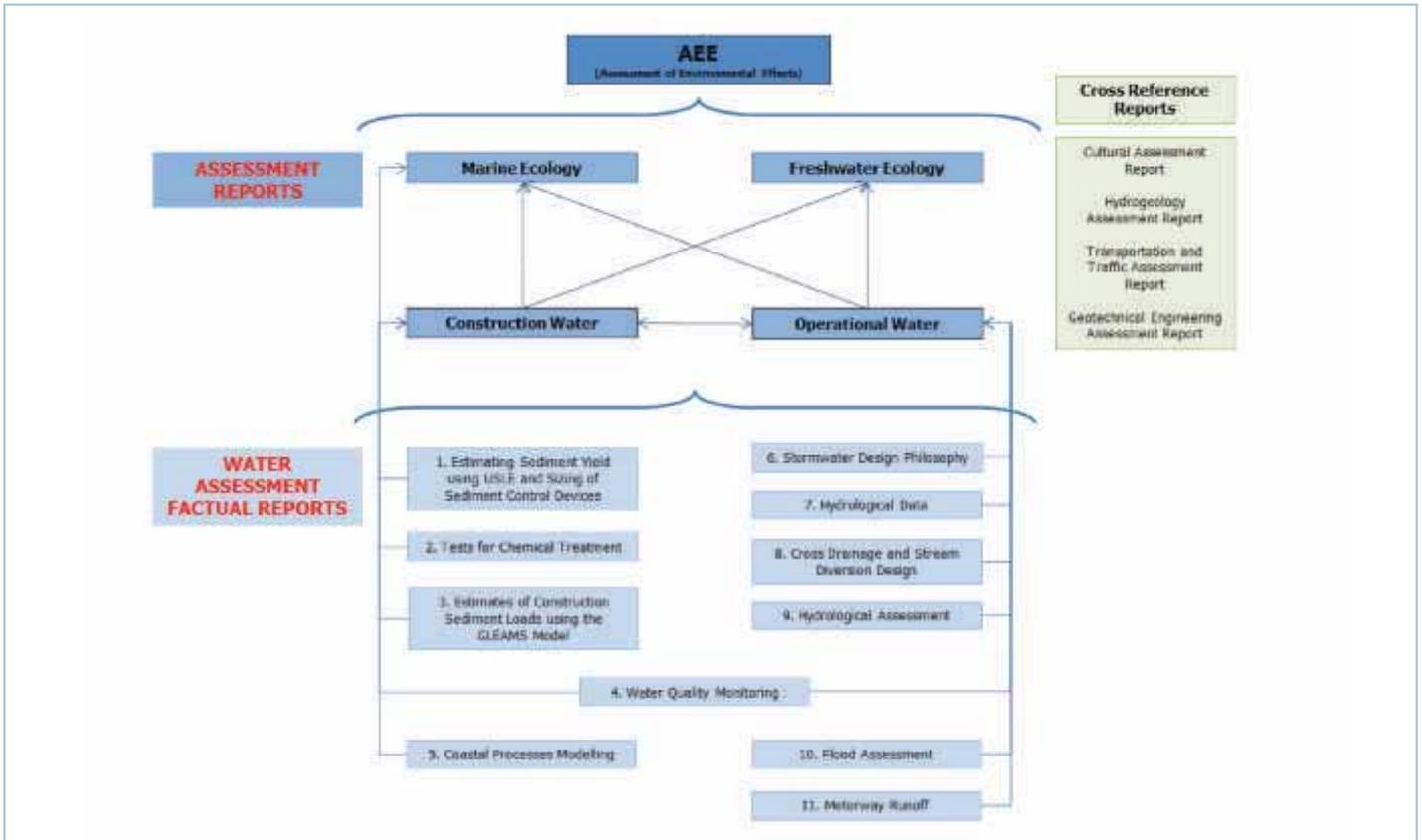


Figure 2 – Operational water assessment report – relationship to other reports

assessment, water quantity assessment, etc. We integrated these into one Operational Water Assessment Report, which led to a more integrated and readable assessment.

The presentation of our deliverables was designed to accommodate the diversity of expected readers and reviewers, from non-technical persons to technical experts. Our assessment report did not have the commonly used executive summary at the start of the document. Instead, the report is structured with summary boxes for each section, which collectively form an executive summary. By reading the summary boxes, the reader is provided with an overview of that particular section. For more detail, the reader can then read the relevant section.

We also produced a number of Water Assessment Factual Reports to supplement and inform the preparation of this Operational Water Assessment Report. These Water Assessment Factual Reports contain detailed calculations, design details and supporting information. Whilst they do not form part of the application documentation for the Project, they are available for review if required.

This approach allows the reader to access as much or as little detail as they wish / require.

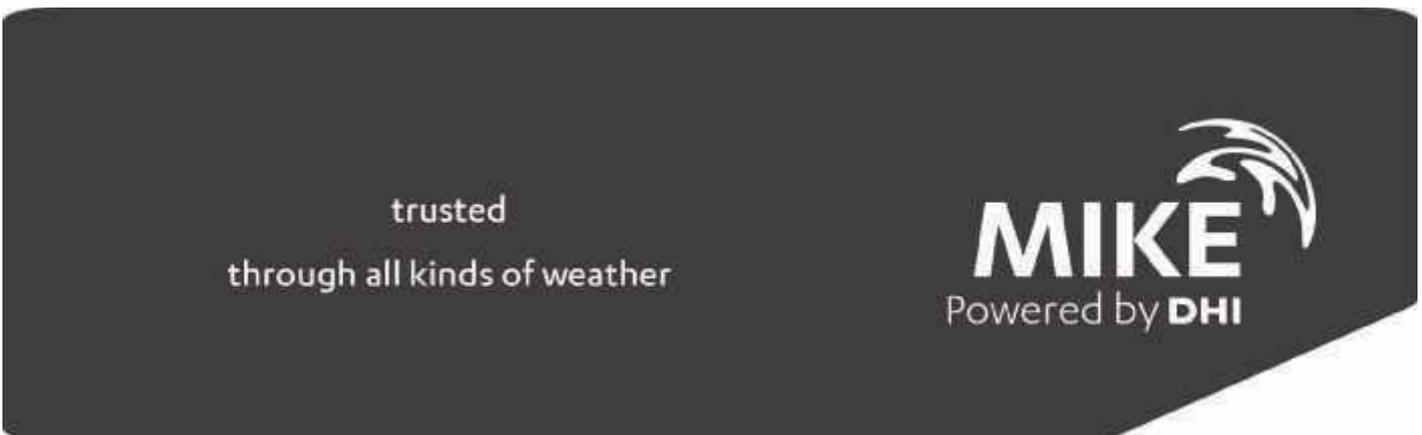
Figure 2 describes the interaction between some of the Project Assessment Reports and the background Water Assessment Factual Reports.

4. Stormwater Management and Flooding

4.1 General

Rainfall onto cuts and the motorway is collected and conveyed via stormwater treatment devices prior to discharge to streams which then drain to the estuary and harbours (Figure 1). Rainfall onto adjacent areas is diverted away from cuts and the motorway. Meanwhile streams that cross the motorway alignment are crossed by culverts or bridges. Culverts often require stream diversions to facilitate their construction.

Figure 1 provided a useful pictorial overview of how water is managed in the operational phase of the Project, and was used



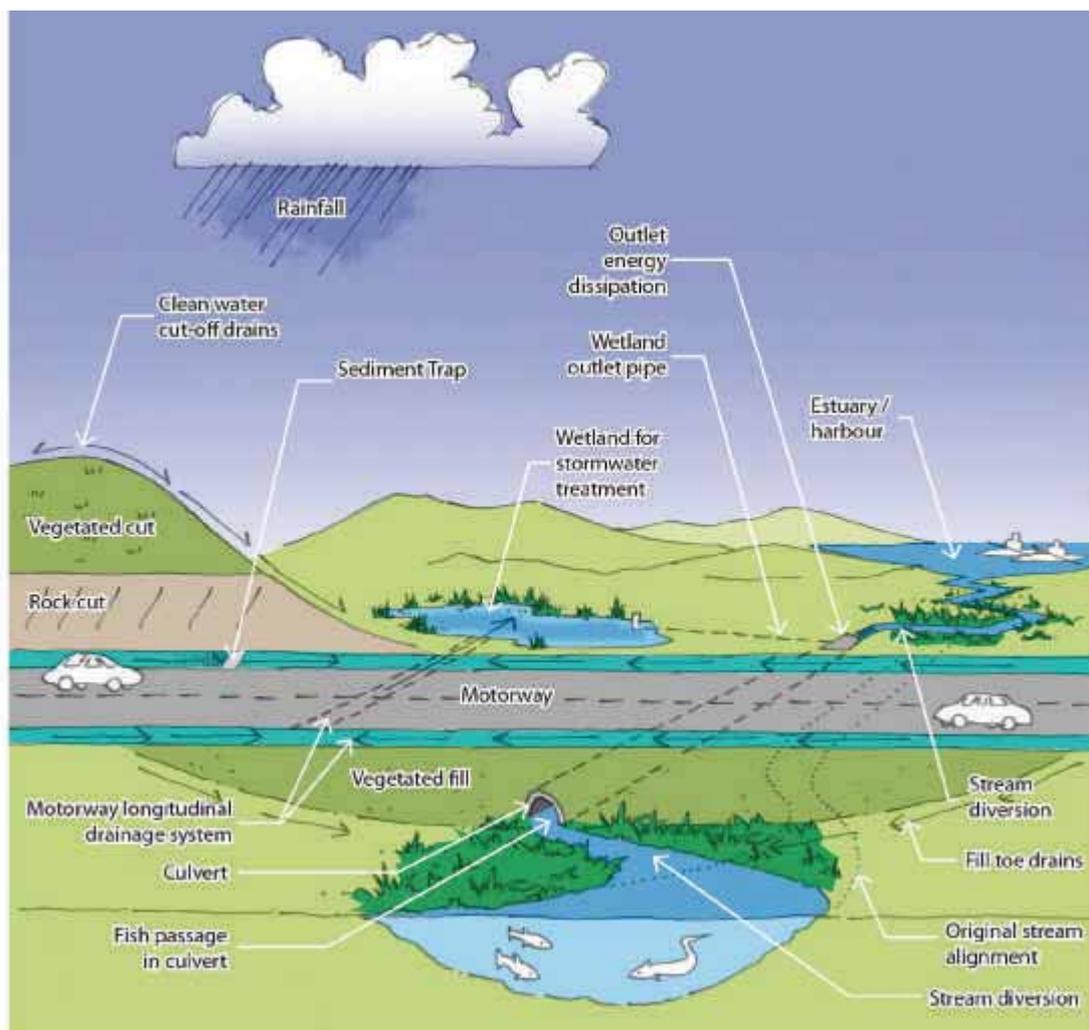


Figure 3 – Motorway Operational Water Systems and the Environment

for consultation with stakeholders. This simplified presentation of the water management systems was useful for non-technical persons to understand what was proposed and the language used in the assessments.

The following operational activities arising from the Project have the potential to create adverse effects on the environment:

- Stormwater from the road
- Diversion and culverting of streams
- Flooding

We adopted the following design principles for the operational water systems:

- The design will provide a best practicable option (BPO) to avoid, remedy or mitigate adverse environmental effects, determined through a robust evaluation of options
- The design will integrate the total operational water system (collection and conveyance network; treatment devices; culverts and diversions and consideration of the floodplain)
- The design will include full consideration of stormwater operational implications throughout the design life of the asset
- The design will best practicably mimic the existing hydrologic regime and setting, to deliver outcomes that avoid, remedy or mitigate adverse environmental effects
- The design will avoid or mitigate changes that might make the current flood issues in the catchment worse
- The design will provide for habitats in stream diversions where they existed prior to the Project. The designs will restore streams and

“The indicative alignment crosses a mixture of permanent and intermittent streams, and rivers. The streams vary from natural streams with good riparian vegetation to farm drains. The stream inverts have rock outcrops in places, but also consist of soft bottom streams.”

recreate habitats to replicate the natural state and habitats that existing prior to the Project

- The design will provide where possible for fish passage in culverts for all permanent streams with future upstream habitats, and for intermittent streams where there is potential for fish habitat upstream

4.2 Catchments

The Project traverses two major river catchments; the Puhoi and the Mahurangi. Moirs Hill Road represents the approximate catchment divide.

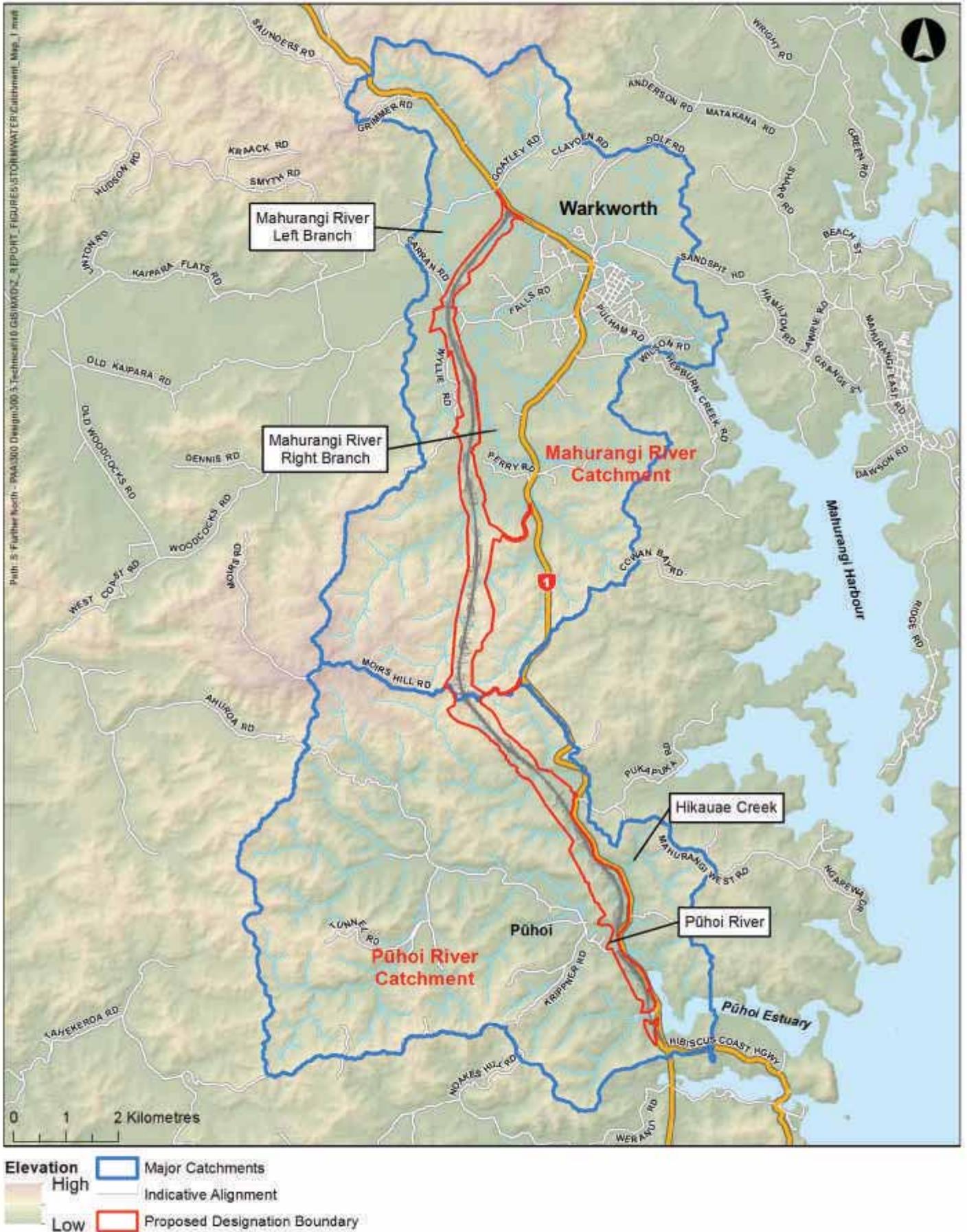
In the Puhoi catchment the receiving environments are the tributaries and main streams of the Hikauae Creek and Puhoi River, and ultimately the Puhoi Estuary.

In the Mahurangi catchment the receiving environments are the tributaries and main streams of the Mahurangi River left and right branches and ultimately the Mahurangi Harbour. The indicative alignment crosses a mixture of permanent and intermittent streams, and rivers. The streams vary from natural streams with good riparian vegetation to farm drains. The stream inverts have rock outcrops in places, but also consist of soft bottom streams.

The geology of the Project area consists of predominantly Pakiri Formation with some areas of Northern Allochthon, and alluvium in the northern sectors.

The catchments and Project alignment are shown in Figure 4.

Figure 4 – Pūhoi and Mahurangi catchments with proposed alignment



4.3 Stormwater Management

As described in Section 3.3, our design and assessment was focused on the aspects that were most important to the assessment, with 'Nice to have' tasks challenged and only carried out if they would benefit our assessments. The challenging timeframes ensured we focussed on key issues relevant to our assessment of operational water effects. As a wider team (with input from legal and planning specialists), we determined what matters and then went into more detail for those aspects. A summary of some of these key aspects is provided below.

4.4 Stream Types

Permanent diversions and flow channels are required to manage surface water for the Project. We have minimised the extent to which

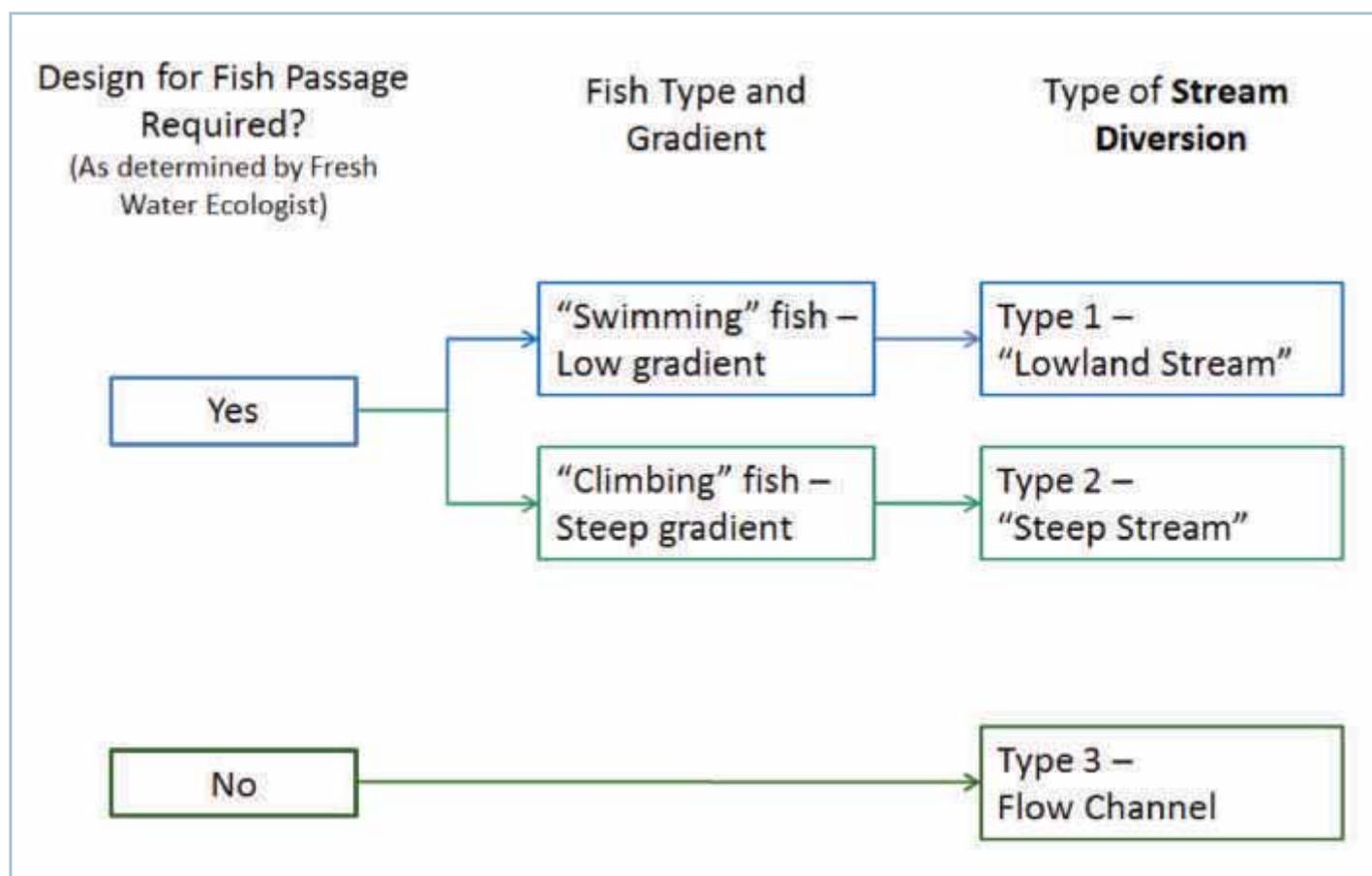
stream diversions of main streams are required via the overall route selection process.

Diversions are required:

- Where fill and spoil sites impinge on streams and/or flow channels; or
- Where proposed culverts are built off-line and require a diversion to and from the natural stream to convey the flow

As part of our BPO process to select a stream diversion type for each specific site, we developed a simple flow chart that selected the most suitable type of stream diversion based on fish passage criteria. Our flow chart is shown in Figure 5.

Figure 5 – Flow chart for stream diversion type



“Stream diversions with natural stream forms (referred to as “Type 1 – Lowland Stream” and “Type 2 – Steep Stream”) are proposed where the streams are permanent and support fish habitats, and also for those intermittent streams where there is potential for fish habitat upstream.”

Stream diversions with natural stream forms (referred to as “Type 1 – Lowland Stream” and “Type 2 – Steep Stream”) are proposed where the streams are permanent and support fish habitats, and also for those intermittent streams where there is potential for fish habitat upstream. The principal objective for stream diversions is to recreate streams and habitats to replicate the natural state of the streams that exists prior to the Project.

Stream type 1 – Lowland Stream

- Low continuous gradient; meanders; complexity (variety of logs and rocks that change flow patterns and provide resting places); and continuous low flow channel.

Stream type 2 – Steep Stream

- Steep gradients; pools and cascade sequences; complexity (variety of logs and rocks that change flow patterns and provide resting places); and continuous wetted surface for climbing species.

Stream type 3 – Flow Channel

- No requirement for in-stream habitat.

The Project’s freshwater ecologists identified the streams in the Project area requiring fish passage in the Freshwater Ecology Assessment Report. Fish passage is required where there is currently fish habitat in or near the streams being affected, or where there is potential for future fish habitat. We provide fish passage in all these instances for the Project with the exception of two culverts where drop structures are required at the upstream end.

We developed our three stream/channel types based on design requirements we developed in collaboration with the Freshwater Ecologists – an example of how we streamlined our methodology based on expert’s experience within the team. The stream diversion requirements include riparian planting 10 m to 20 m either side of the stream, populated with assorted species found in the Rodney Ecological District to replicate the natural planting in the area where the stream is lost. These measures will ensure colonisation of diverted streams by aquatic flora and fauna. We consulted with Hokai Nuku on the design requirements for the stream types. We proposed consent conditions should require for stream diversions with natural stream forms and riparian habitats where the streams are permanent and supporting fish habitats.

4.5 Wetland Feasibility

The indicative alignment for the Project is through similar geological terrain to the NGTR where a number of wetlands have been constructed. We visited the NGTR with the Auckland Motorway Alliance and looked at the performance and location of selected wetlands.

Our experience gained from the design and operation of the NGTR supports the feasibility of the wetlands we propose for the Project, in particular those in the hill country areas.

We did not model the earthworks associated with the proposed wetlands and associated cut and fill as we consider this is best done at the detailed design phase. Our experience from the design phase for the NGTR is that the wetland locations will be developed and refined once further site investigation and design is carried out. The majority of the proposed NGTR treatment devices were optimised during the design phase and have been moved from their specimen design locations. This is an example of the Alliance focus on activities that we actually needed to do.

An example of an observation we made during our NGTR visits was that while some wetlands have healthy vegetation, some wetlands have sparser planting. We therefore recommended a consent condition for the Project requiring establishment of healthy wetland plants. Consideration should also be given to riparian plants especially on northern aspects that would increase the shading of the wetlands.

It is less frequent than it should be that an engineer’s design is visited and physically observed in its operational phase. Our NGTR visits were an important reminder to us that design and maintenance are interdependent. We benefitted greatly reviewing what worked well on NGTR and what could be improved, and encourage our peers to seek feedback from their own designs as well as designs by others, in their operational phase. The opportunity to maximise lessons learnt is valuable.

4.6 Debris Flow and Management

We used a risk framework to assess the risk from debris to culvert blockage and determine mitigation measures for inclusion in the Project. Debris is carried by flood flows and by less frequent and more hazardous debris flows.

Debris flows are a fast flowing mixture of water with a medium or high proportion of solids, which moves down watercourses. Debris

flows are triggered by heavy rainfall and occur in conjunction with landslides within the catchment. Debris flows are potentially destructive and can encompass a wide range of objects, such as fallen trees, stumps, boulders, gravels and soils, plus water.

The risk associated with debris flow occurrence is a product of the likelihood of debris flows and culvert blockage, and the consequence of this culvert being blocked.

We qualitatively assessed the likelihood of debris being generated based on the size of and land use in the catchment. The consequence associated with a blocked culvert is related to the potential flooding impact on the upstream side of the motorway and the risk to downstream areas from failure of road embankments.

Where the risk of blockage of a culvert by debris is moderate or high, this risk needs to be mitigated by incorporating debris control measures. Table 1 lists the mitigation measures we propose for the Project for different degrees of risk of blockage of a culvert by debris flow.

Table 1 – Debris blockage mitigation measures

Risk	Mitigation
High	Debris rack upstream of culvert AND Culvert sized to pass 100 year ARI without heading up
Moderate	Relief inlet
Low	None

4.7 Energy Dissipation and Erosion Control

Wetland outfalls will incorporate erosion protection measures to minimise bed scour and bank erosion in the receiving waterway. Typically this protection will be through an energy dissipation device and/or rock aprons.

For works associated with culverts/streams the BPO approach is for energy dissipation to be in place at all culverts to minimise erosion. Our assessment of the effects of the Project on erosion has been supported by site visits to key culvert locations for example at the location of proposed concrete arch culvert 54,700 m. Bedrock was sighted in the existing stream bed at the approximate location of the culvert outlet, shown in Photo 1 below. Bedrock is resistant to erosion and if it exists in the bottom or sides of the stream channel, this provides protection against degradation. Thus we can be confident that there is low risk of erosion of the stream bed and banks at the outlet of culvert 54,700m.

Bedrock sighted at outlet of culvert 54,700



4.8 Stormwater Management

Stormwater systems need to perform reliably and minimise the generation of additional sediment.

Clear water cut-off drains are proposed at the top of all cut faces where flow from above would otherwise flow over the downstream cut face. These drains will reduce erosion on cut faces by interception of (clean water) flow.

Cut and fill faces (batters) are required as part of the Project and rainfall and runoff have the potential to erode new sediment from the batters and transport that sediment downstream. The potential for erosion of cut and fill faces post-construction will remain throughout the life of the Project. This sediment generation can be seen in rock cuts in the NGTR section of SH1 immediately south of the Project. The Project proposes the following measures to minimise generation or to control the sediment load:

- Vegetation cover on cut and fill slopes to minimise generation of new sediment; and
- Capture and treatment of runoff from cut slopes using;
 - I. Sediment traps proposed for drains at the base of rock cut faces. These sediment traps are bespoke treatment devices that will capture sediment generated from rock cuts. On the NGTR project, cut faces have yielded larger sediment loads than anticipated over the initial years since becoming operational in 2009; and
 - II. Wetlands – Stormwater collected in motorway drainage systems will be conveyed by roadside drains, swales or pipes to the constructed wetlands. The wetlands will be designed in accordance with TP10. During Project design, wetland locations will be refined with consideration given to landscape, constructability maintenance and ecological values. The

outlets from wetlands will be piped to adjacent streams. The wetlands will be constructed and located off-line, i.e. not constructed in or on the bed of an existing stream.

Wetland outfalls will be sized to convey the 100 year ARI flow rate. These flows will be piped to the adjacent stream.

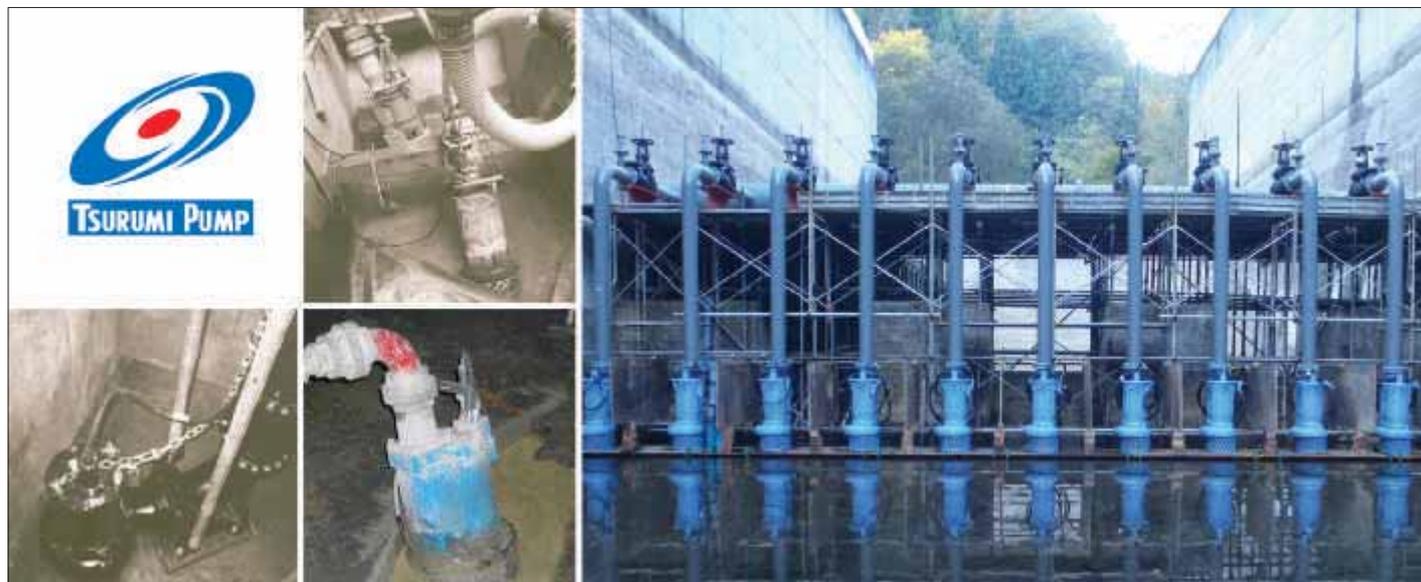
4.9 Fish Passage

The freshwater ecologist within the Further North Alliance team identified and named the streams and rivers crossed by the alignment that are permanent or intermittent and which of those have habitat suitable for a range of fish species.

As part of our BPO design approach, we have considered the type of fish passage for each culvert based on the characteristic of the site and the type of fish passage required.

The baffle design is based on Auckland Regional Council Technical Report Number 84, June 2009 (Fish Passage in the Auckland Region – a synthesis of current research). Plastic rectangular baffles create low velocity zones allowing fish to rest as they move through the culvert. These baffles are successfully used for fish passage in concrete pipe culverts for the adjacent NGTR section of SH1. We propose a baffle type fish passage for concrete pipe culverts where both swimming and climbing fish species are expected.

The natural bed type of fish passage replicates a natural stream bed by using raised baffles at intervals to hold sediment within the bed of the culvert. The alternating baffle openings and sediment basins create a low flow channel with low velocity zones to encourage fish passage through the culvert. We propose a natural bed type of fish passage in large concrete arch culverts where both swimming and climbing fish species are expected.



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4.10 Stormwater Reticulation

The stormwater reticulation has not been designed in this phase of the Project because it is not material to the consent applications. The stormwater reticulation is an engineering feature that is designed to convey stormwater from the Project carriageway and from the toe of cut (and fill) slopes to stormwater treatment devices. We only included stormwater reticulation in the cross-section drawings in order to adequately represent the Project area for assessment of effects and the designation requirements.

This is a very clear example demonstrating the Alliance attitude to only do the activities necessary and relevant to the consenting of the Project. This is a detailed design task that will be carried out in the design phase of the project to parameters not significantly influenced by assessments carried out during the consenting phase.

4.11 Flooding

Our approach to assess flooding has been to work cooperatively with Auckland Council and its modelling team who are actively assessing the flood risk in the Warkworth region. Auckland Council has a rapid flood hazard model built using InfoWorks ICM software, which was supplied for our flood assessment. The advantage of using this model is a consistent approach to flood planning and assessment. The rapid flood hazard tool is a high level type model used to screen for flood hazard issues.

By working with Auckland Council and using their rapid flood hazard model and maps, this saved us time and enabled collaboration with Auckland Council.

We undertook our own assessment of the Auckland Council rapid flood hazard models. We consider the Auckland Council models to be of relevance and of sufficient accuracy for our assessment of the Project effects on flooding, as our assessments are based

on comparisons between existing and post-development i.e. the relative difference (the change). In our experience however, the models are often conservative and over-predict flows and water depth, which is why Auckland Council used a rapid modelling approach to develop an understanding of flooding issues prior to development of more accurate models. We acknowledge that more detailed modelling and calibration of the model will more accurately define peak flood levels in the Project's detailed design phase and have suggested this as a condition of consent.

We added the indicative alignment into the Council rapid flood hazard model to create a post-development scenario. Only the motorway alignment between and inclusive of the Woodcocks Road Bridge and the Carran Road Flood Relief Bridge was incorporated into the post-development scenario as these locations are the only parts of the motorway that potentially impact on the main floodplains within the project footprint.

We ran the post-development scenario for a 100 year ARI rainfall event and included allowance for the effects of climate change. We compared the differences in floodplain extents and flood water levels between the pre and post-development situations.

The Carran Road Sector is a key area for flooding as the motorway crosses the Mahurangi floodplain at the proposed Woodcocks Road Bridge, and crosses a major secondary flow path between Woodcocks Road and SH1. Our BPO approach is to minimise the effects of flooding in these areas by changing the alignment of the motorway to avoid the floodplain where possible, and by using bridges to cross the floodplain where necessary to mitigate potential adverse effects where avoidance is not possible.

The Project design team revised the alignment in response to results from the Auckland Council rapid flood hazard modelling, which showed that the previous alignment occupied the secondary

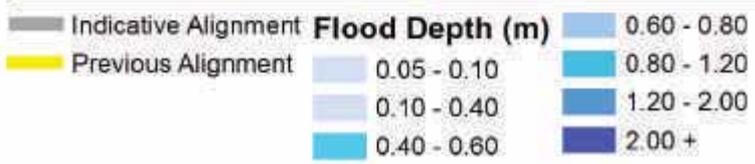
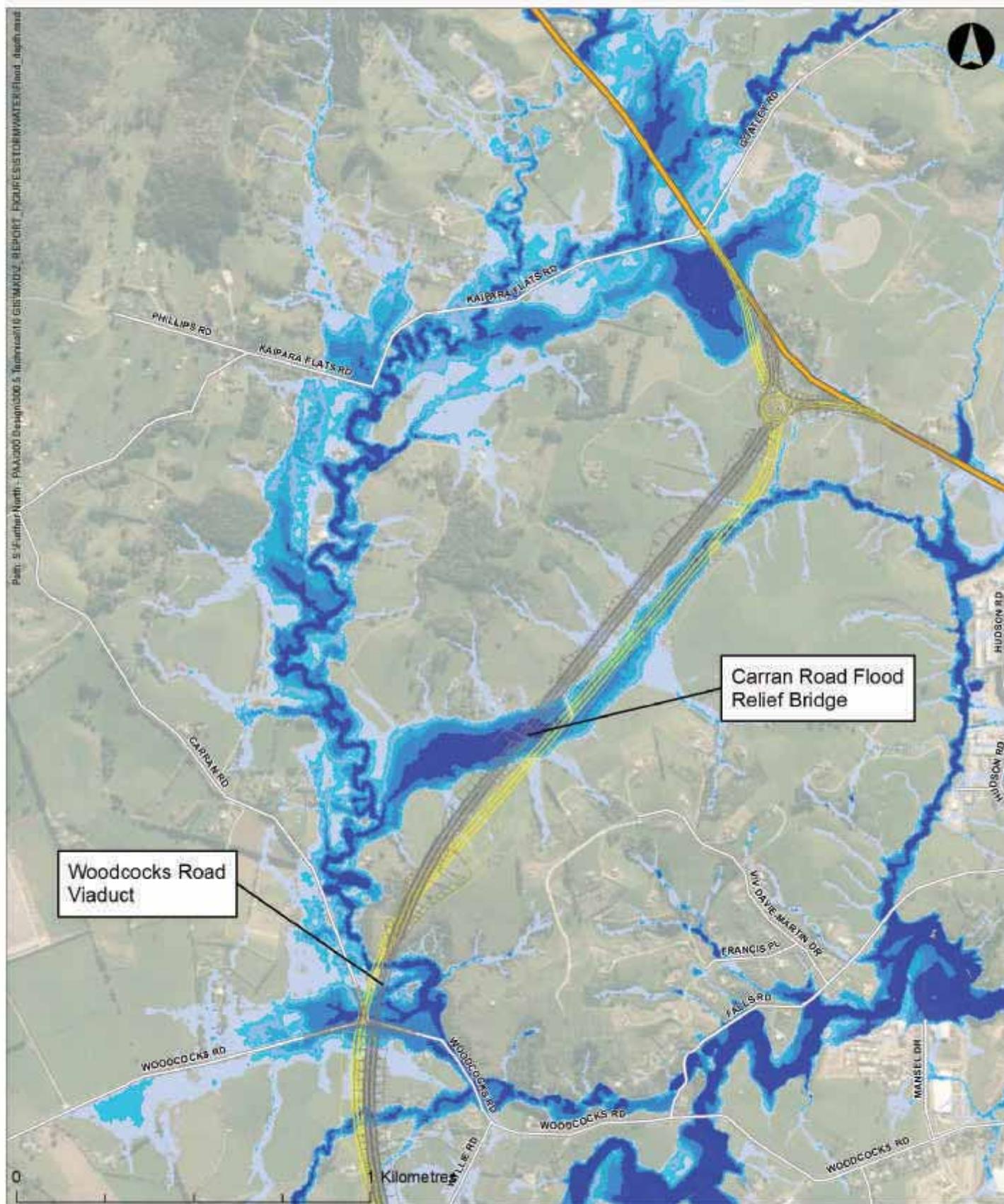
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Figure 6: Motorway alignment to avoid flood plain



“The Alliance also developed a progressive alliance called Hokai Nuku with the mana whenua of the project area.”

flow path. To mitigate effects of this impact on the secondary flow path, we moved the alignment to a position further west to avoid the floodplain.

Figure 6 is based on the Auckland Council rapid flood hazard model and shows the original alignment, the current indicative alignment, and the 100 year ARI floodplain for the Carran Road Sector.

The Carran Road Flood Relief Bridge is proposed and has been sized to pass the 100 year ARI flood where the motorway crosses the secondary flow path. We initially sized the Carran Road Flood Relief Bridge with a 28 m span and incorporated this into the rapid flood hazard model. The differences between pre and post-development flood flows for the Carran Road Flood Relief Bridge with a 28 m span showed that the bridge passes the secondary flow, but with an afflux of 250 mm upstream of the bridge.

To achieve a higher level of mitigation by a greater reduction of effect, we increased the bridge span at the Carran Road Flood Relief Bridge to 60 m, and incorporated this bridge span into the rapid flood hazard model. The differences between pre and post-development flood flows for the Carran Road Flood Relief Bridge with a 60 m span show that the bridge can convey the secondary flow with an afflux of less than 100 mm.

A 60m span Carran Road Flood Relief Bridge is the BPO that provides an afflux we consider acceptable.

With regards to Figure 6, it is worth commenting on how important a tool GIS was for our assessments. The plans produced were clear and understandable to all disciplines. The general public and laypersons were also able to read and understand GIS plans which was a great advantage during the consultation phase.

5. Assessments

We developed our assessment criteria and conditions from the RMA, ARP:ALW and Auckland District Plan: Operative Rodney Section. The key assessment matters concern stormwater quantity, stormwater quality, human impacts, ecological impacts and flooding. For each of the assessment matters, various criteria and considerations formed the framework for our assessment of effects.

Common to the RMA and all plans is the requirement for options to be assessed and the BPO selected. We therefore developed the operational water systems for the Project based on a BPO approach that considered alternatives and how to best practically minimise adverse effects on the environment.

We have assessed the effects of the Project based on our indicative design that incorporates BPO measures to avoid, remedy and mitigate effects.

The water quality effects are mitigated by stormwater treatment systems that include wetlands throughout the Project and sediment traps at the base of rock cuts. We propose vegetated roadside drains for ancillary roads.

The water quantity effects are mitigated by extended detention systems in wetlands to minimise stream erosion.

The human impacts are mitigated by the stormwater treatment systems. We have also considered the effects on the Warkworth potable water supply, amenity, recreation, water users and farm takes.

The operational water systems include bridges over streams, culverts with fish passage and stream diversions with natural

stream forms. These mitigation measures provide fish passage and restoration of stream habitats.

Flooding effects are mitigated for culverts by designing culverts to convey the 100 year ARI flood. Impacts on the existing floodplain of the Mahurangi Left Branch River are avoided by changing the alignment and mitigated by the Woodcocks Road Viaduct and Carran Road Flood Relief Bridge.

The recommendations we propose to mitigate adverse effects are likely to be applicable to other similar areas within the proposed designation boundary, subject to confirmation of their suitability at the detailed design stage. This enables flexibility in the design within the approved designation boundary. Similarly, we are confident our assessments apply to variations of the current concept design, where operational water systems are revised but kept within the designation applied for as part of this consenting process.

6. Conclusions

The Further North Alliance was formed as a planning alliance for the consenting and designation for the Puhoi to Warkworth RoNS. The Alliance proved to be a vibrant working environment with an extremely demanding timeframe which demanded efficient and innovative approaches to ensure sufficient assessment of effects were satisfactorily carried out. Our conclusion is that collaborative working via the planning alliance has led to new approaches to the consent design phase and assessment of the water aspects of this major transport project. ■

Acknowledgements

The authors acknowledge the support of the Further North Alliance, the wider Alliance team and water team members as follows:

- Tim Fisher – Tonkin & Taylor Ltd
- David Sloan, Christian Gamst, Simon Wang, Simonne Elliot – GHD New Zealand Ltd
- Michelle Sands, Ben Fountain, Wolfram Schluter – Jacobs SKM
- Wayne Donovan – Bioresearchers

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The “Journey” for Consent Compliance and Urban Catchment Management

M. Kneebone and W. A. Hodson

Abstract

In 2010 Hastings District Council obtained comprehensive discharge consents for the several hundred individual urban stormwater catchments that discharge to eighteen surface water receiving environments. Since that time Council has been on a journey of improving stormwater management, involving significant expenditure. This is continuing with initial catchment management plans due to be completed in 2015 for the Hastings urban area discharges.

Some key areas of this journey include:

- Collaborative relationship building between the District and Regional Council technical and compliance staff.
- Resolving the responsibility for investigations and improvements within the “grey area” between the important receiving environments and constructed or highly modified open drainage channels or streams.
- Investment in investigations through monitoring of watercourses (sediment, water quality, macro-invertebrates).
- Determining the value of this data for understanding issues, environment, improvement needs and making decisions for a management approach.
- Working through an adaptive consent process to make consent conditions more workable and allow compliance to be demonstrated.

- Determining appropriate development controls and mitigation measures in provincial urban areas with smaller scale developments.
- Developing a plan for the following years and expected outcomes.

This paper provides details of the journey so far that Hastings District Council has been undertaking, including lessons learnt along the way.

Keywords

Network Consent, Catchment Management Plan, SMARTER consent conditions, monitoring, relationships.

1. Where Are We Going?

Hastings District Council is on a journey of discovery to improve the understanding of the stormwater runoff from the urban areas in and around Hastings. The purpose of this journey is to develop sustainable and long-term solutions that are targeted to areas of specific concern. One major challenge will be in providing these solutions and avoiding any unnecessary and significant expenditure.

1.1 Hastings District Council Stormwater Network

The Hastings District Council (Hastings DC) stormwater network is made up of over 260km of pipeline and 12 pump stations with over 21,000 connections across the urban area. There are over 200 individual outlets around the urban boundaries, discharging into a variety of open drains, minor tributaries and streams.

The construction of an urban piped stormwater network began in the 1950's; prior to this the drainage system was a rural network of large, deep open drains. The main focus was on draining the stormwater as quickly as possible. There was no consideration of the quality of the stormwater runoff.



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Fifteen separate catchments have now been identified across the main urban areas of Hastings, Flaxmere, Havelock North and Clive. Various land use activities occur within these urban areas, with the main land use being general residential; however there are significant areas of industrial and commercial businesses contributing to the stormwater runoff. The industrial activities include a number of food processing companies such as Heinz-Watties, McCains and ENZA Foods. A large number of associated agricultural/pastoral

businesses provide produce to these and other companies.

The Hastings urban zones are located within the Heretaunga Plains. The topography is typically flat, with a slight fall towards the coastal areas to the east of Hastings. This means the stormwater runoff from the urban areas has to be conveyed through a series of open drains and waterways before being discharged into the wider receiving environment.

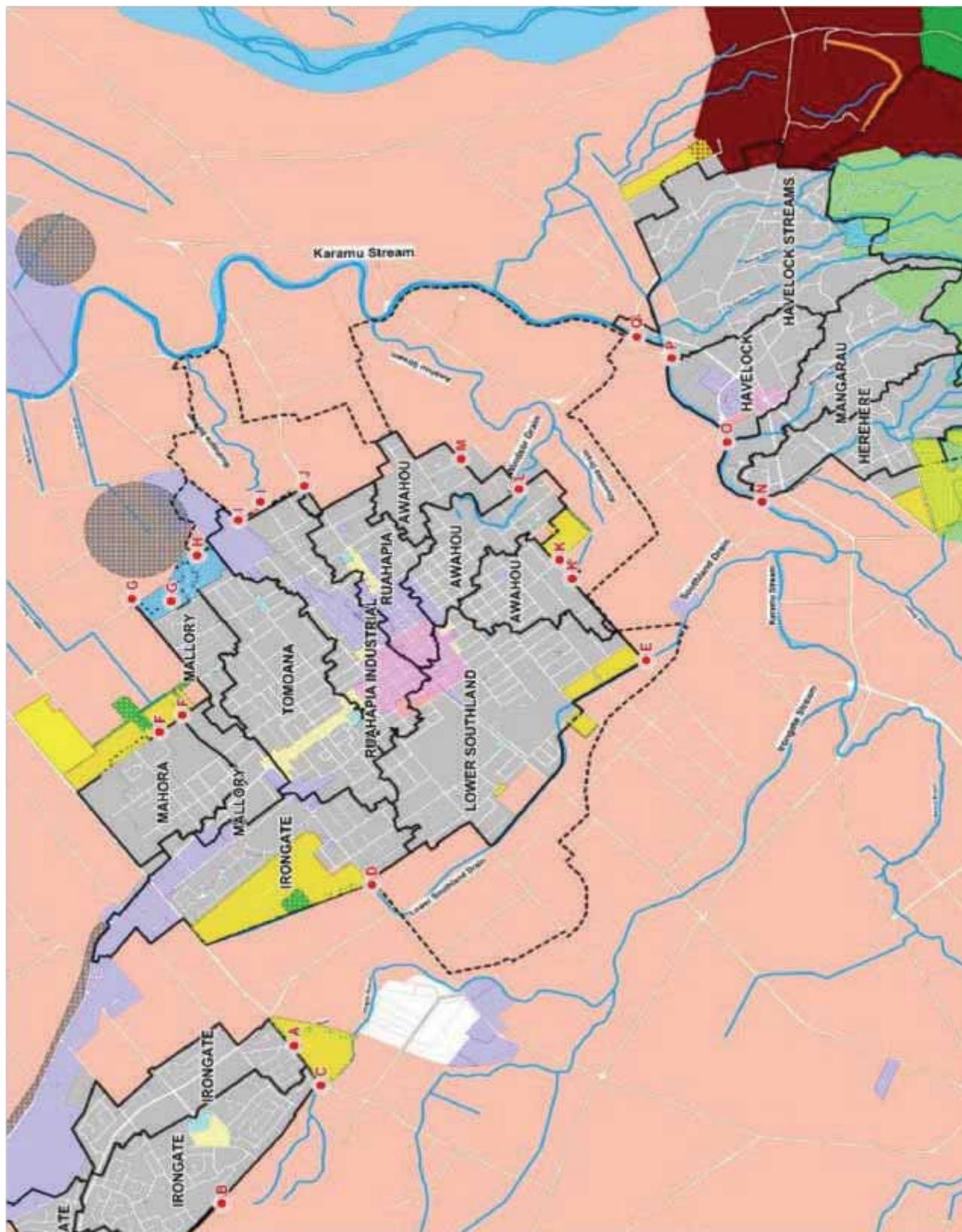


Figure 1 – Land use map showing urban, rural and future growth areas

“The Hastings urban zones are located within the Heretaunga Plains. The topography is typically flat, with a slight fall towards the coastal areas to the east of Hastings.”

1.2 Hawkes Bay Regional Council Stormwater Network

The main receiving waterways for Hastings, Flaxmere and Havelock North are the Irongate Stream, Ruahapia Stream, Awahou Stream and various other open drains and minor tributaries. The waterways are a mixture of highly modified natural streams, man made channels and natural waterways. The receiving water body for these streams and tributaries is the Karamu Stream.

Due to the low lying nature of the land there are capacity limitations along many of these waterways, including the Karamu Stream. The direct urban runoff rate has increased over time as a result of infill housing, greenfield subdivisions and this is compounded by the loss of greenspace and the associated increase in impervious areas. The historical way of dealing with stormwater runoff in Hastings has been to convey it to the urban edge as efficiently as possible, usually via large diameter pipelines. This has created additional problems in the rural drainage network which is managed by the Hawkes Bay Regional Council (HBRC).

In addition to these capacity limitations there is a perception, which is not limited to Hastings, that water quality in these receiving environments has declined over time. Urban stormwater runoff is often seen as a significant contributor to the decrease in water

quality, the loss of habitat and the reduction in recreational water use.

1.3 Stormwater Network Consent

In consideration of the quantity constraints and quality issues HBRC made a decision to consent the Hastings DC stormwater discharge via a global or network consent. The consent came with a suite of conditions that HBRC believed would deliver improvements in both quantity management and stormwater quality. The upshot of these conditions has resulted in significant expenditure but may not have necessarily delivered the expected outcomes.

Hastings DC held the view that there were no real issues with the way Hastings DC managed the stormwater network. There was also a belief that the impact of the urban runoff was minor, especially when compared with the entire catchment of the Karamu Stream.

This stance was unsupported by any real data and was not overly constructive. After 10 years of constant debate, HBRC issued the network consent which made Hastings DC front up to the issues surrounding overall stormwater management.

A more constructive approach, and acknowledgement that Hastings DC needed to be more proactive and take ownership, has led to better understanding and an improvement in the relationship between the two councils. The network consent will provide a framework for building this relationship and a collaborative understanding of what the real issues are and potential solutions.

A submission was received from Te Taiwhenua O Heretaunga on behalf of the Heretaunga marae/hapu. This submission laid out the aspiration of Maori for co-management of stormwater systems that affect local hapu and the ability to influence the impact of stormwater on the receiving environment and other natural assets.

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Provision has been made in the consent for Hastings DC to better understand areas of cultural or historic significance and how Maori can have a voice in the overall management of stormwater and the impact of urban runoff.

Hastings DC has had success with the establishment of a Tangata Whenua Wastewater Committee for the management of wastewater discharges to the environment. Hastings DC is exploring ways to establish a similar group to extend across the water, stormwater and wastewater networks.

2. How are we going to get there?

Hastings DC began this consenting journey from a position that the Hastings urban runoff was no different to any other provincial areas in New Zealand. From this starting position there was reluctance from Hastings DC to accept that the urban stormwater was a major contributor of contaminants (sediments included) entering the receiving environment, especially where the amount of urban runoff was considered minor in comparison to the wider contributing catchment to the Karamu Stream.

This proved to be a point of contention between the two councils and when HBRC requested information in support of that stance, Hastings DC did not have a monitoring regime in place to collect water quality data and was unable to demonstrate that contaminant levels in urban runoff were not contributing to the decline in the water quality of local streams.

What followed were a lengthy debate and a consent hearing, which led to a suite of consent conditions being developed to form the current network consent. These conditions require Hastings DC to carry out monitoring of specific discharge points to ascertain water quality, the sampling of stream sediments and macroinvertebrate/ecology surveys. The purpose being to gather data on the discharge quality, long term contaminant accumulation in sediments and an understanding of the aquatic life present in these waterways.

One aim of this consent was for Hastings DC to be responsible for the monitoring and management of the individual catchments to understand and if necessary reduce contaminant discharge and the impact of contaminants on the receiving environment. However there was a feeling that these conditions had been imposed on Hastings DC and were unnecessary/heavy handed. This is a direct result of not having data to support our proposition – something Hastings DC acknowledged at the hearing.

As part of a collaborative approach, a Project Steering Group was established to work through some of the concerns of both parties. This allowed a regular face-to-face forum for discussions around the interpretation and implementation of the consent conditions.

This process highlighted the importance of developing a trust relationship between the two councils, to understand what the intention was behind some of the conditions of the network consent, what Hastings DC were directly responsible for and how emotive some issues can become.

It has been almost four years since the consent was issued and a number of staffing changes have occurred within both organisations.

2.1 Catchment Management Study

More recently there has been a shift in focus from interpreting and debating the consent conditions to a more holistic approach, to better understand the impact various land use activities have on the quality of the urban discharge, what needs to be and can be done to improve the overall quality of discharge at source and ultimately how to minimise the impact of urban stormwater runoff on the downstream environment.

Through a collaborative approach to define the initial intention of the network consent, the current consent can be considered in terms of the following themes and intents.



- **Quality** – to manage contamination at source and improve the quality of discharge.
- **Quantity** – to manage discharge quantities from source through to the receiving environment.
- **Education** – to raise awareness within the community and to provide guidance to developers and industry users.
- **Management and maintenance** – to operate and maintain an efficient stormwater system to manage flows, minimise the risk of flooding and provide appropriate treatment.

Compliance and monitoring – to provide a robust link between data gathering, monitoring and the provision of targeted solutions.

This shift in focus has seen a significant improvement in the relationship between the Hastings DC and HBRC as well as a real drive to use the consent conditions to improve the overall quality of urban runoff and manage stormwater runoff from the urban areas.

Hastings DC is currently developing a catchment management study, to work through the various technical work packages and investigations to support the development of a Catchment Management Plan (CMP).

Collectively the five themes stated above will inform and provide direction for future developments within the Hastings urban areas. As more information and understanding of individual catchments is obtained, the CMP will be updated to ensure compliance is maintained and to monitor any improvements made within the Hastings urban area.

The CMP will in turn inform and provide further information to the stormwater asset management plan (AMP), Engineering Code of Practice, District Plan, Bylaws and Policy documents. This will allow for the inclusion of the five themes in providing for sustainable urban and industrial developments.

2.2 Sediment and Quality Monitoring

Significant monitoring work has been undertaken to better understand the characteristics and effects of urban stormwater runoff via the following:

- Sediment samples from various urban outlet points and waterways between the urban edge and the Karamu Stream.
- Water quality sampling from the Hastings DC pipe outlets during rain events.
- Ecology/macroinvertebrate surveys in various waterways in both rural and urban areas.

This will form the basis of the development of CMP to identify catchments with contamination issues and will lead onto more detailed catchment investigations to trace the source or to provide treatment solutions.

2.3 Importance of People and the Community

People have played a major role in this consenting journey, however at times the state of the relationship may have taken the focus away from the consent objectives. Conversely it is people who will ultimately provide the solutions to improving the quality of stormwater runoff. Not only will it be the people managing the stormwater network on behalf of the community, but it will be the community itself, whether via their actions or their desire for an improved environment.

There is currently a lack of stormwater awareness and understanding at a community level with respect to stormwater effects, management and control. Community understanding varies from assuming stormwater and wastewater are the same to 'not my problem' whatever the context. There is also some belief in the community that stormwater is treated at the same plant as domestic wastewater. These examples highlight the need to provide information to the community to assist in making future improvements.

In response Hastings DC has developed a webpage to provide general stormwater information for the public and also provides some self-help tools for stormwater users to better understand their impacts on the receiving environment. Work is ongoing to develop education programs in schools and involves collaboration with other local and regional councils.

The wider community will be key to any solution process as they have a dual role as recreation water users and people whose actions contribute to the make-up of all urban stormwater runoff.

The network consent includes conditions related to ensuring that cultural values are recognised and understood by HDC when considering the impact not only on the receiving waterways, but also the land the stormwater passes through. Local iwi representatives have carried out the first Cultural Health Impact assessment across the catchment. This information will continue to be gathered and included within the catchment management studies and plans.

Social change can be a slow process with only incremental gains at the beginning. As awareness is increased and improvements are

seen in local waterways, social change will provide further momentum towards more positive outcomes for the entire community and the receiving environment.

3 Where to From Here

3.1 Adaptive Consent Approach

The current network consents have provisions for the review and change of consent conditions over time. The initial consent period is for twelve years and the intention is to demonstrate compliance with current conditions and to identify conditions that could be adapted as more information is gathered.

There is a significant cost and time investment related to the monitoring provisions of the consent. Once a baseline can be established, it is hoped the monitoring regime can be adapted to focus on targeted solutions.

Hastings DC would like to be in a position where, with the collaboration of the councils and community, a long term consent can be put in place with realistic and achievable goals.

Any changes to the consent conditions will need to compare the environmental outcomes, the cost to the community and ensuring SMARTER conditions that can also clearly demonstrate compliance.

3.2 Outside the Urban Area – the Grey Zone

The current sampling and monitoring regime provides a suite of results showing the level of contamination within the receiving water sediments and from direct stormwater runoff grab samples. These results highlight contamination issues that can be common to individual and/or all catchments.

The current focus is on developing a CMP that will use this information to provide guidance for each stormwater catchment in terms of future development and implementation of treatment or flooding solutions.

There will be a need to expand the focus area to include the tributaries that convey urban stormwater to the Karamu Stream. This area could be referred to as the 'Grey Zone.' Discharges from other sources between the urban boundary and the Karamu Stream come from rural properties, agricultural/pastoral activities and small businesses, all of which are outside of the current Hastings DC network consent boundary.

Sampling is undertaken along numerous tributaries leading to the Karamu Stream in order to establish some comparison data to



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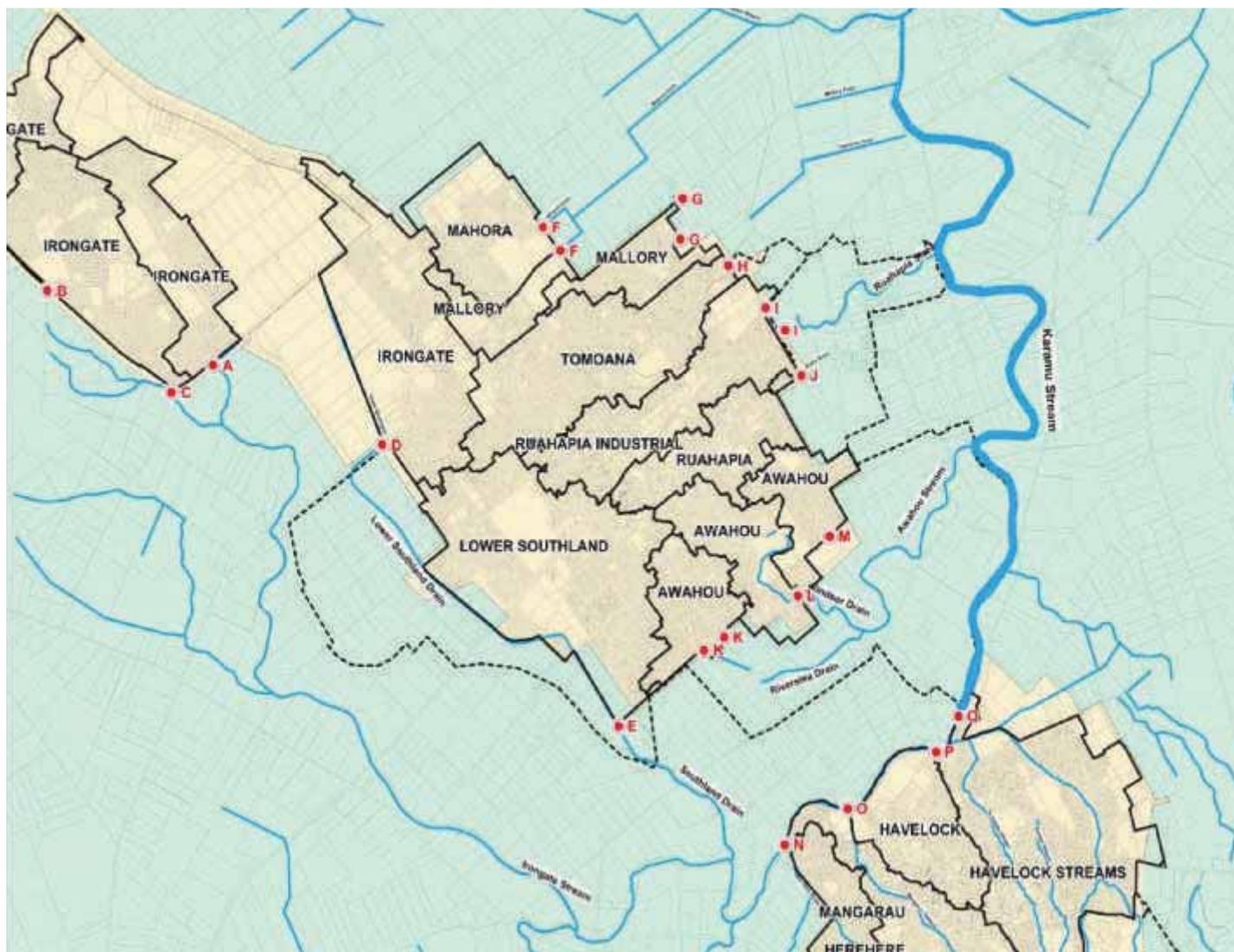
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Figure 2 – Plan of Hastings urban catchments and the location of receiving environment.



“The journey council is on is about moving from a position of ignorance to one of practical and sustainable stormwater management.”

understand the condition of these streams and what impact urban runoff may have between the urban edge and the Karamu Stream.

HBRC have been involved in Stream Ecological Valuation (SEV) surveys in a number of grey zone tributaries and streams. There is also some expectation that this area will become an important aspect for managing stormwater flows from both urban and rural sources. These SEV surveys and the information gathered as part of the Hastings DC network consent compliance can be used to investigate where real improvement opportunities may exist, and to increase the use and amenity of these waterways.

HBRC and various community groups are working together to improve the quality and visual aspects of the Karamu and Ruahapia Streams, which has already resulted in the creation of walk and cycleways along the streams and the return of aquatic and bird life.

3.3 First Generation Catchment Management Plan

The network consent requires that Hastings DC produce a Catchment Management Plan by May 2015. The consent has been structured such that the first three years of the consent relate to gathering information on the quality of the urban discharge.

In addition to the monitoring requirements, the consent requires a number of work streams to be progressed that relate to better

understanding the performance of the stormwater network, identification of overland flowpaths, impacts on the downstream receiving waters and recognizing areas of cultural interest.

The diagram below shows the process of integrating the various technical works streams into a comprehensive catchment management plan.

The format and content of the first generation catchment management plan is underway, with an ongoing parallel process to complete and collate the various technical support works. It has been identified early on this process that the improvements will occur overtime as there is no silver bullet that can provide instant results.

Therefore this first catchment management plan will include a comprehensive improvement action list to provide a way forward to ensure that any proposed mitigation strategies are monitored and checked against the original objectives of the consent and catchment management plan.

4. Conclusions

The journey council is on is about moving from a position of ignorance to one of practical and sustainable stormwater management. The beginning of the journey could be considered as a somewhat rocky start, however the establishment of the Project Steering Group has

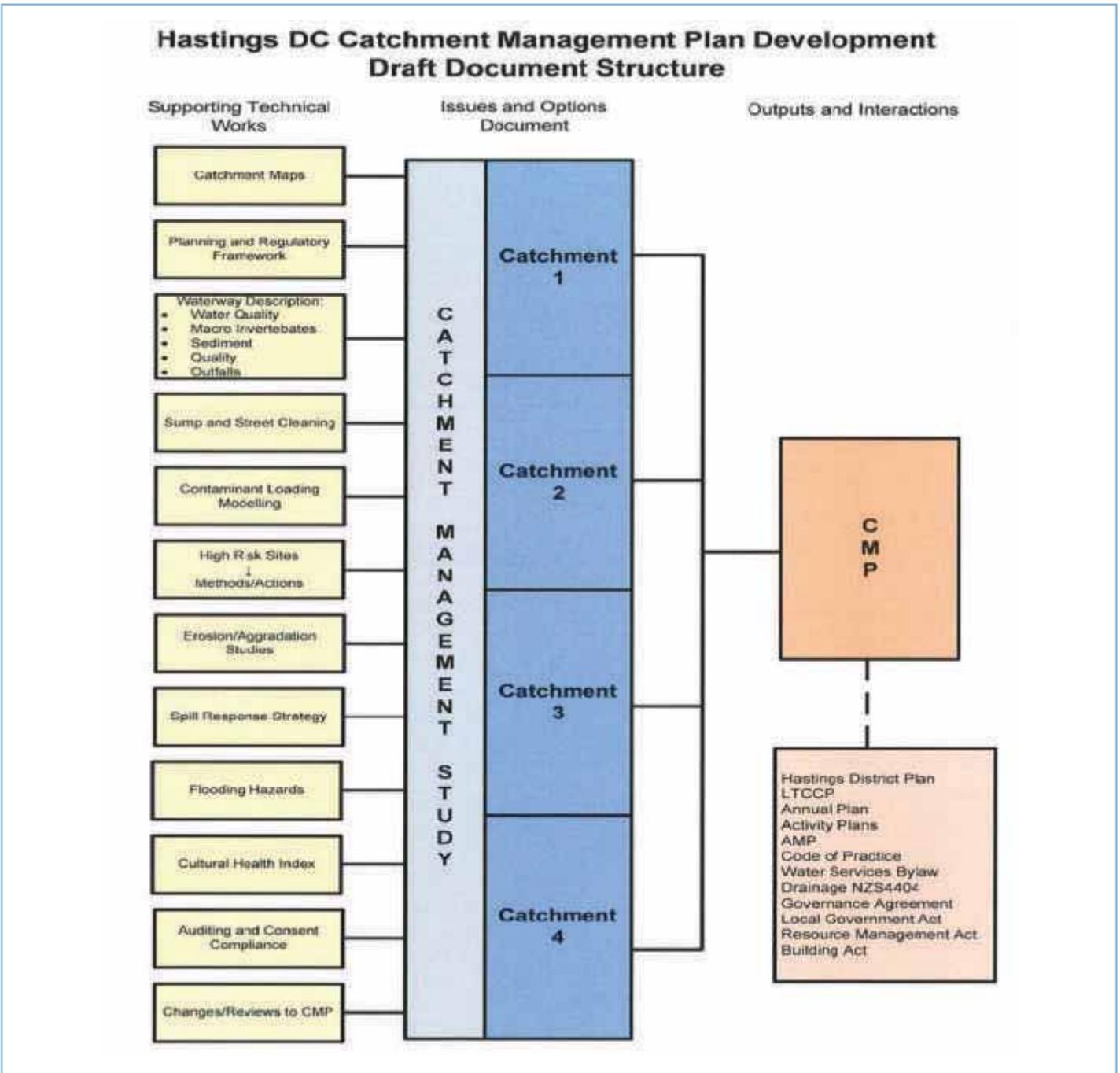


Figure 3 – Structure of Catchment Management Plan.

proven to be invaluable in providing a vehicle to help us to get over any perceived obstacles and has ensured that the journey would continue along a much smoother pathway.

Some important lessons were learnt early on, with the creation of a trust relationship being the most important. Matters critical to building up this trust relationship included:

- Demonstrating compliance with the current conditions of consent.
- Open reporting and discussion of monitoring results.
- Implementation of specific catchment investigations related to catchments that exceeded consent quality limits.

Given the current economic climate and the drive for local authorities to focus on core council business, there may be other monitoring options that will still deliver the intended outcomes.

Further investigation work is needed to assess the streams and tributaries downstream of the urban boundary to determine if there are potential solutions to mitigate the impacts of flooding and treat urban runoff prior to entering the Karamu Stream. ■

Acknowledgements

- Wayne Hodson – MWH
- Allan Leahy – MWH
- Adam Forbes – Forbes Ecology
- Brett Chapman – HDC

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Burkes Drain Flood Station – Ten years in the Planning

Charlie Schorr-Kon – Business Unit Leader – Water, Calibre Consulting Ltd

Alongside highway 56 near Himatangi in the low lying Manawatu, the Horizons Regional Council's (HRC) new \$3.6M Burkes Drain flood pump station has been under construction. Ten years in the planning, the Burkes Drain pump station is the largest of some 23 flood pump stations that HRC operate in the region to mitigate flood damage to low-lying high value farm land. HRC originally looked at the project in 2002, but deferred the project in the aftermath of the 2004 floods,

when other higher priority works took precedence. The 2004 flood was the worst on record since 1902 and indicated that the 100 year average return interval storm event was greater than anticipated. This led to the realisation that some significant upgrade works were required.

HRC adopted the Lower Manawatu Scheme (LMS) Rural Flood Protection Upgrade Project in 2008 and the project has three years left to run until its completion in 2017-18. The total value of the project is estimated to be in the order of \$44M at completion. While the Burkes pump station will be owned and operated by the Manawatu Drainage Scheme, a large proportion of capital costs has been funded by the LMS as an offset for adverse impacts arising from the periodic storage of flood waters in the Taonui Basin.

Prior to the construction of Burkes Drain pump station, Burkes Drain itself was substantially enlarged, firstly to improve gravity drainage from the Taonui Basin, through the large Burkes flood gates, but



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Wet Well Base Slab and Earthworks

also to improve the conveyance of floodwaters to the new pump station, now located alongside those floodgates. The pump station with a discharge capacity of 7.5m³/sec, is designed to lift water over a stop bank into the Manawatu River to the south west of Palmerston North. The pump station draws flow from a large wet well connected to the drain channel.

The 2,770 Ha Taonui Basin, which is at the lower end of a 19,000 Ha catchment comprising well developed farmland, has been subject to flooding since the land was originally reclaimed. The lowest land within the basin used for dairy production, can be subjected to 3m of standing flood water in larger events, which if left for a prolonged period, can cause significant damage to the pasture.

Combined with a number of other major gravity drainage works, the pump station will enable the clearing of floodwater from productive land more quickly, before significant damage to pasture occurs. It is anticipated that the pump station will operate on average for 3,300 hours per year across 20 flood events, during which the Burkes Drain floodgates are closed due to elevated levels in the Manawatu River, clearing more than 22 million m³ of flood water from the Taouni Basin annually. The pumping station will operate to clear smaller events quickly allowing greater productivity of the affected land.

The pump station was delivered to HRC via a 'design and construct' (D&C) contract with Whitaker Civil Engineering Limited taking on the prime contracting role, delivering the construction and Calibre Consulting delivering the design and supervision components with support from Coffey Geotechnical, providing the geotechnical aspects.

Calibre developed the concept for the pump station design around the site topography. The concept was to use the four large axial flow (low lift, high flow) submersible pumps, which lift the water into a large reinforced concrete surge chamber above the wet well. The water then flows by gravity from the surge chamber to the river via dual pipelines to a baffled energy dissipation structure.

The construction process was accelerated by the innovative use of precast reinforced concrete slabs, which were delivered to the site by truck from the precast works. The wet well base slab was site cast, with the wet well walls, roof and internal pump inlet bays being constructed from precast post tensioned concrete slabs; which were subsequently placed by crane and joined with site cast stitch joints. The discharge pipes were cut through the stop bank, which was then reconstructed with a filter collar around the new pipelines to mitigate the risk of a piping failure in the embankment when the Manawatu River is in flood. The construction included some

“The construction process was accelerated by the innovative use of precast reinforced concrete slabs, which were delivered to the site by truck from the precast works.”

significant earthworks with deep excavations being constructed to house the wet well base slab and the dual reinforced concrete 1350mm ID outlet pipes (see pictures).

The four Xylem Flygt axial flow submersible pumps, which together deliver the 7.5m³/sec flow, are mounted within four draught tubes, the outlet of the tubes connect to the surge tank. Xylem provided the hydraulic design parameters for the pump intakes to ensure the intake flow does not create adverse conditions at the impeller. The pumps are designed for fixed speed operation, but are each operated on a 200kW variable frequency drive to enable soft starting, reducing current spiking and to provide power factor correction in the local power network. The local Powerco electrical network was strengthened to accommodate the power requirements of half of the pump station and operates two of the 200kW pump motors. The



Discharge Pipelines under Construction

electrical works also included a diesel generator which provided the primary power source for the remaining two pumps.

Overall and by all accounts the project has been very successful, with the pump station being delivered on time and on budget by

the D&C team. The station was commissioned in February 2015 and now stands ready to deliver its widely anticipated benefits to the landowners who have advocated for its installation for many years, once present dry conditions come to an end. ■

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Burkes Drain Pump Station during Commissioning

“The station was commissioned in February 2015 and now stands ready to deliver its widely anticipated benefits to the landowners who have advocated for its installation for many years, once present dry conditions come to an end.”



Commissioning Outlet Flow



The Age of Resilience: Will the Paris COP 21 Become #timetoact?

Dr David Viner – Principal Advisor Climate Resilience, Mott MacDonald

'A new age – the era of natural disasters and environmental atonement – is upon us'. The alarming predictions for the Planet's future are now routinely heard from world leaders and scientists as part of wide ranging discussions on climate change. The increasing tally of recent extreme weather and climate events and our apparent unpreparedness to deal with them does little to dispel the pessimistic forecast. Europe sustained unprecedented heat waves in 2003 and 2010, Pakistan was deluged by floods in 2010; the US suffered a year of multiple billion dollar disasters and Australia endured an 'Angry Summers' of extreme weather in 2012/13 and 2013/14. 2014 was the warmest year recorded for the planet, on the back of successive decades being warmer than the previous ones.

The progress with climate change science has shed light on how and why these disasters are happening. Civil engineers have the knowledge and understanding to design environments that are

resilient to floods, heat waves, and storms. Yet with all this human knowledge and the certainty of the science, climate change is still taking humanity by surprise and claiming its victims.

Can we really be entering the Age of Catastrophe, powerless in the face of climate disaster? Or is the sum of what we have learned and achieved so far enough to let us steer the course of history onto a different path which presents us with opportunities to develop a more sustainable future?

The answer, as to some other pressing global challenges, lies in achieving understanding and active cooperation between scientists, engineers, politicians, financiers and civil society. It is a tall order but now, in the year leading up to the most significant opportunity for a 'global deal' in Paris at COP 21 event, there is an increasing recognition that as humankind we have little choice if we want the future generations to see and live on a planet similar to one we have now. We need to learn, collectively, to manage the planet's resources with full awareness of how it will impact the future, thus also respecting the work done by generations of scientists before us.

An Age of Investigation

Climate change is not as modern a concept as it might appear. The science has its origins back in 1824 when French physicist Joseph Fourier took the first theoretical steps toward understanding the

“Six years, tens of natural disasters, thousands of human lives and billions of pounds worth of destruction later, a globally binding international deal is yet to be signed. Despite the wealth of international activity, there was not one single message to unify the movement, and no convening leadership. NGOs’ success has been hindered by their disjointed approach, which has left them competing with each other instead of cooperating.”

greenhouse effect. John Tyndall in the 1860s demonstrated the radiative effect of the greenhouse gases. Subsequently Swedish geographer Svante Arrhenius was the first to conceptualise the role of industrialization in the greenhouse effect, in the 1890s. Without the aid of today’s sophisticated data sets, Arrhenius calculated that a halving of atmospheric carbon dioxide levels would lead to an ice age, while a doubling would cause the Earth’s temperature to rise by some 5–6°C – not a bad estimate when compared to our current thinking.

During the 20th Century scientific understanding increased and by the 1980s the international community, driven by political leaders such as Margaret Thatcher, was seeking a more robust evidence base for the human fingerprint on the observed changes that were underway.

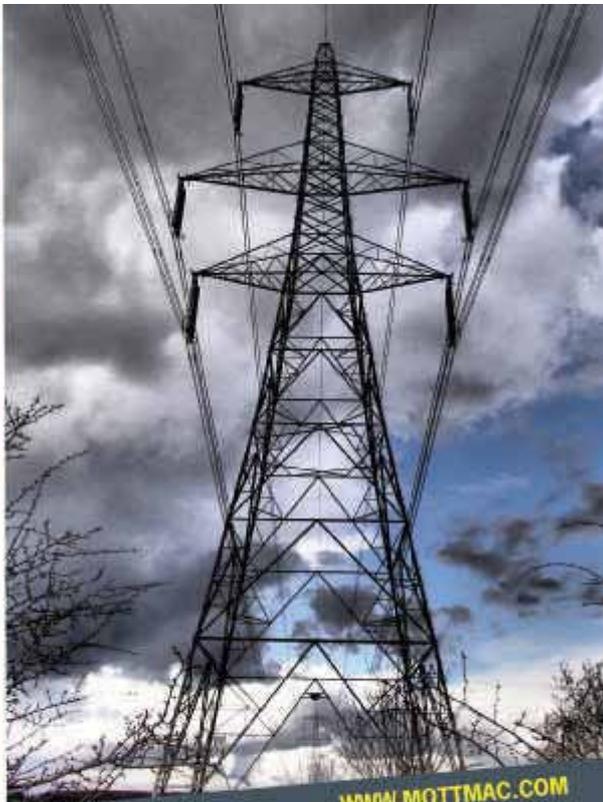
The formation of the Intergovernmental Panel on Climate Change (IPCC) provided a focal point for the scientific community. The publication of the IPCC’s First Assessment Report in 1990 was followed by a Second Assessment Report in 1995, which made the crucial and un rebutted statement that there was “a discernible human influence on global climate”. The fifth most recent report

of the IPCC, which reviewed nearly 10,000 papers, demonstrated without any credible scientifically-based counter-argument that warming of the world is unequivocal and is as a result of human activity.

The current body of scientific work on climate change is extensive, with causes and effects of those changes well described and widely accepted. The consensus of international academic community has a potential to become a powerful foundation for taking the catastrophe-averting actions. We have the data and modelling technology to make accurate predictions about the effects of climate change. We have compounding evidence of more extreme and less predictable weather patterns in different parts of the world. The engineering community has made major advances towards creating more resilient and sustainable infrastructure. Has enough been done to motivate political action and unlock funding for making the world more resilient?

An Age of International Cooperation

By the 1990s the international community was informed and enthused to lay the foundations for climate change progress on an

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international scale. Momentum began to gather apace. The UN Framework Convention on Climate Change (UNFCCC) was signed in Rio de Janeiro in 1992, followed by the seminal Kyoto Treaty signing in 1997.

As the turn of the millennium approached and receded, notable climate change events gave impetus to this political will. The extreme European summer of 2003 led to over 25,000 deaths across the continent, and in 2005 the most active Atlantic hurricane season ever recorded wrought widespread destruction, culminating in the USA's Hurricane Katrina disaster.

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All the energy in the early 2000s was geared towards the perceived 'ultimate goal' of creating a low carbon society. Worldwide, national and local efforts emerged to reduce carbon emissions by encouraging the uptake of renewable energy, primarily solar and wind. Global and local NGOs campaigned to engage society to act on climate change. Some, such as the British Council's Climate Change Programme, reached hundreds of millions of people worldwide and achieved considerable success.

In 2008 the UK took a landmark legislative stand by passing the Climate Change Act with unanimous cross-party support. The Act committed the country to legally binding targets to reduce greenhouse gases by 80% by 2050.

The seeds of international cooperation had been sewn. Global governments and NGOs proved their commitment to fighting climate change and set the diplomatic stage for action by establishing the COP and setting its annual meetings.

This period in recent history shows that with enough will, the mechanisms and opportunities to enact global change are in place – and that when the international community works in the same direction, concrete steps can be taken. The precedent for cooperative action on climate change has been set.

An Age of Incoherence

The 2009 COP meeting in Copenhagen had the global optimism running high. A legally binding successor to the Kyoto Treaty was expected to be signed, with national governments and leaders including President Obama expressing readiness to take firm action. In the face of these lofty ambitions, the event turned out to be a monumental failure. The positive intentions of individuals and countries were undermined by the weaknesses of the collective whole. Indecisive governments were unconvinced by confusing narratives from civil society organizations.

Six years, tens of natural disasters, thousands of human lives and billions of pounds worth of destruction later, a globally binding international deal is yet to be signed. Despite the wealth of international activity, there was not one single message to unify the movement, and no convening leadership. NGOs' success has been hindered by their disjointed approach, which has left them competing with each other instead of cooperating. As the

global economic downturn intensified, climate change and the environment were somewhat relegated on the global agenda, playing second fiddle to the rebuilding of economies.

Recently, however, the global climate change movement gained considerable political traction – United Nations Secretary General Ban Ki-moon, US President Barack Obama, leaders of the major European, African and Asian economies, and financial leaders had all made numerous public statements on the seriousness of the threat presented by the changing climate and the need to take major action to reduce the net CO₂ emissions into the atmosphere, create a more sustainable low carbon economy and build resilience against current and future negative consequences of climate change.

Increasingly frequent natural disasters damage societies and the environment worldwide. The horizon is within arm's reach: we do not mean the future anymore. We mean the recent past, we mean the present, we mean the next few years. The destruction caused by extreme weather events has forced the world into action: it no longer hugely matters why and 'whodunit' – all that matters is how we adapt to it and ensure humanity survives in the face of the changing reality.

The Next Age: the Resilience

The prognosis is not gloomy: the staggering progress made in climate change science, the evolution of public perceptions and the ongoing international negotiations all add up to a sufficient force to propel us into the Age of Resilience.

There is now time to recognise that drastic action is needed by all to deliver a low carbon society while also concentrate the efforts on being more resilient. We need to design and construct our buildings, infrastructure and communities in ways that allow life to go on as

normal when climate change takes hold, with little or no damage borne when extreme events happen.

An integrated landscape-scale approach to climate change resilience is key. All relevant stakeholders must be engaged to ensure that any decisions made take into account their possible impacts upon other sectors, and that every opportunity to increase resilience is taken. For example, road and rail construction projects can incorporate elements to improve resilience across other sectors – land management, flood management and biodiversity to name but a few.

The interest in making this resilient world into a reality is growing: while previously the prevailing attitude in the climate change movement prioritised mitigation and regarded adaptation as being somewhat defeatist, resilience is now coming to the fore of climate change discussions and projects.

It is now the norm for governments and organisations to account for climate change impacts and take actions to remain on the front foot and build a more robust future. The catalogue of climate science research is being compounded by new resilience-based areas of research, such as the cataloguing of adaptation and resilience case studies being prepared by Mott MacDonald Climate Change Portfolio for the UK's Environment Agency. The expectation on the world's leaders to sign a meaningful binding global deal on climate in December 2015 is overwhelming.

With this new momentum toward resilience in place, we can leverage the scientific endeavor, international enthusiasm and diplomatic mechanisms that had been established since the early Nineteenth Century to ensure that the coming era is not the Age of Catastrophe but the Age of Resilience. Have we really got a choice? ■

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Hach Launches 5500sc Ammonia Mono- chloramine Analyzer

Hach Company is introducing an important and innovative new technology for the Water Industry, the 5500sc Ammonia Monochloramine Analyzer. The 5500sc Ammonia Monochloramine Analyzer offers a reliable, easy-to-operate and low-maintenance solution to allow chloraminating water treatment facilities to continuously monitor their chlorine to ammonia ratio on-line and assure there is no free ammonia in the system that could lead to nitrification.

Continuous on-line monitoring with the 5500sc Ammonia Monochloramine Analyzer provides a more accurate and complete picture of the chloramination process, giving operators all the information they need to eliminate nitrification events and taste and odor issues. This analyser is easy to use, featuring a user-friendly interface, simple troubleshooting menu and color coded reagent bottles.

"Hach has been a front runner in this space for 15 years and we've learned a lot from our customers."

"Hach has been a front runner in this space for 15 years and we've learned a lot from our customers. We've taken our proven, existing measurement methodology and improved every aspect of the user experience," says Jeff Stock, Global Product Manager for Disinfection at Hach Company.

At-a-glance status lights are a convenient indicator that the instrument is up and running. PROGNOSSYS, the analyser's onboard predictive diagnostic software, provides early insight into the measurement reliability and service requirements of the instrument. The dual colorimeter design leads to faster results, while the state-of-the-art pressurized reagent delivery system eliminates the hassles associated with standard pumps.

With the 5500sc Ammonia Monochloramine Analyser, it has never been easier to monitor your chloramination process online. ■

Stormwater Free Sewers

The challenges of inflow and infiltration have plagued us for decades, but with a growing population, ageing infrastructure, changes in rainfall patterns due to climate change and a growing public awareness of the health problems associated with SSOs (Sanitary-Sewer Overflows).

Inflow has become serious business and simple-cost effective solutions are needed.

Inflow occurs when rainwater is misdirected into the sanitary sewer system instead of storm drains. Examples are: roof leaders, yard and area drains, manhole covers, and cross connections from storm drains. During heavy storms sewers can become surcharged and overflow.

There are basically two locations in manhole lids through which surface runoff can enter the manhole lid. One is by direct passage through open pick and vent holes, and the other is by seepage through the manhole lid and frame contact (bearing) surface along the perimeter of the manhole frame and lid. All of these sources would be affected directly by increased water head. In addition, the bearing surface itself will permit varying amounts of inflow

“Made of high density polyethylene or 304-stainless steel and have been proven to reduce and prevent 98% of rain and surface water inflow into the sewer collection system, through the manhole lid.”

depending on the quality of the seating surfaces and whether that surface is ground or commercially machined.

Manhole covers have been estimated to amount to 30% or more of the inflow from rain and stormwater. A single manhole with 2mm head of water over it can allow 50,000 litres of inflow in a single day.

Water Head Over Cover	Bearing Surface Only-concealed Pickoles, no gasket (lt/m)	Inflow (lt/Day)
2mm	40	57,600
6mm	48	69,120
12mm	56	80,640
25mm	68	97,920
100mm	92	132,480

Figure 1 – manhole covers /lid inflows based on the Neenah Foundry report

Savings

Basing the average cost to treat influent at the plant a \$1.00/Kl an event of 100mm in one day, affecting 100 manholes with 2mm of ponding or overland flow will yield 5 ML of extra influent in the system at a cost of approximately \$5,000 per event.

Such an event can be repeated multiple times in a year. Assuming it happens 10 times per year the cost is \$50,000 per annum.

The cost to install 100 Rainstopper inserts can be as low as \$15,000 giving a saving of \$35,000 in the first year and \$50,000 every year thereafter.

Rainstopper Manhole Inserts:

Made of high density polyethylene or 304-stainless steel and have been proven to reduce and prevent 98% of rain and surface water inflow into the sewer collection system, through the manhole lid.

Rainstopper Manhole Inserts have been proven effective in not only reducing or preventing surface water inflow to the collection system, but also in reducing operating and maintenance costs for plant and equipment pumping is minimized, due to reduced inflow during heavy rainfall, utility power costs are reduced because machinery is not operating for extended periods of time.

And the reduction of sewers popping, wet weather by passes and the risk associated to people's health with SSOs and the release of untreated or only partially treated effluent.

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Flygt N Pumps Providing Sustained Operating Efficiencies

The key operating requirement for any sewage handling pump is its ability to pass solids without clogging. Clogging consists of either a full or a partial clog of the impeller and or volute. A full clog exists when the pump has ceased to pump, this condition is easy to detect and highly undesirable. An immediate service call is needed to remove the pump and manually clean out the clog.

A partially clogged pump however, is harder to detect because the pump still delivers flow at a varying reduced rate. This can go unnoticed for long periods of time, resulting in a number of adverse operating conditions. These include increased energy usage, reduced Q / H performance, longer run times and vibration. If the pump is operated continuously, the pump efficiency will gradually decline to levels as low as half of the clean water efficiency or lower. This issue of the pump operating for extended periods of time at substantially reduced overall efficiencies results in much higher consumed power and running costs.

“A partially clogged pump however, is harder to detect because the pump still delivers flow at a varying reduced rate. This can go unnoticed for long periods of time, resulting in a number of adverse operating conditions.”

Impeller design is fundamental to how well sewage pumps can operate without clogging. Traditionally it was assumed impellers with large throughlets would eliminate clogging. Throughlet size is determined by the largest diameter of a hard, solid, spherical object that can pass through the pump. The concept is old, dating back to 1915, and was developed at a time when energy costs were not of significant importance.

Pump manufacturers and operators intuitively believed that pump clogging could be avoided simply by having an internal pump throughlet equal to or larger than what the toilet of the day could pass. The last few decades of research and development coupled with experience from hundreds of thousands of pump installations, have proven that this simplistic logic of throughlet size is incorrect

“In recent years options have been further developed to provide operators the ability to customise the Flygt N Pump to suit their on-site conditions.”

and misleading. It has been found that the vast majority of full and partial pump clogging occurs from long fibrous material such as rags accumulating on the leading edge of the pumps impeller and or between the rotating and stationary wear rings. The practice of specifying a minimum throughlet size for wastewater pumps within requests for tender specifications is still prevalent today.

The Flygt N Pump utilizes a completely different hydraulic design to that of traditional sewage handling pumps, such as the closed channel and vortex impeller designs. The Flygt N Pump has been designed with a semi-open impeller with back swept leading edges working together with a relief groove located in the lower section of the pump volute. This patented design allows the impeller and hydraulic areas to clear itself of any buildup of rag or fibrous materials. This self-cleaning function of the Flygt N Pump ensures the hydraulic profile of the impeller is maintained, resulting in the pump being able to operate with sustained high operating efficiencies.

The Flygt N Pump was first introduced into the Australian and New Zealand markets more than 15 years ago, quickly proving itself as the market leading solids handling sewage pump. “This fundamental design change to a self-cleansing Impeller was adopted quickly by our customers” explains Terry Gralton, Xylem Oceania’s Wastewater Manager. “Operators found they experienced fewer pump chokes and reduced electrical power costs when using the N Pump.

In recent years options have been further developed to provide operators the ability to customise the Flygt N Pump to suit their on-site conditions. Impeller material options include Hard Iron and Duplex Stainless Steel materials, providing increased service life when high corrosion and erosion conditions are present. In addition to material options the N Pump can also be equipped with new impeller designs to better handle sewage with abnormally high concentrations of rag and solid materials. These include the unique Adaptive N Impeller which provides the ability for the impeller to move axially when needed, allowing bulky rags and debris to pass through the pump. Also available is the option of a chopper impeller to reduce clogging in heavily ragged sewage pumping stations. High efficiency IE3 drive motors are also available when required to minimise the drive motors consumed electrical power. ■



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thank the team at Avenues for their great work over the
past nine years.

WATER will now be produced by Contrafed Publishing,
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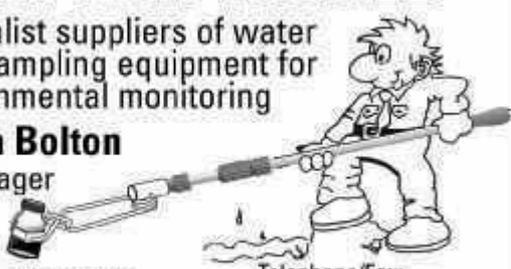
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