

NAVIGATING THE COMPLEXITIES OF THREE WATERS MANAGEMENT: INSIGHTS FROM WELLINGTON WATER'S FRAMEWORK

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ABSTRACT (500 WORDS MAXIMUM)

Wellington Water manages three waters services on behalf of six client councils. While water supply and wastewater services have been well-defined, stormwater management involves multiple parties with overlapping roles and responsibilities, often with conflicting priorities. In addition, managing stormwater services involves dealing with the inherent complexity of stormwater systems themselves.

To address these challenges and prepare for the transition of these stormwater services to a new entity, Wellington Water developed a Stormwater Management Framework. This paper discusses the framework and provides insights into the Wellington Water model for stormwater and flood risk management for local council owners and how these can inform the transformation of our industry.

The paper starts with an overview of the process Wellington Water undertook to develop the Stormwater Management Framework, highlights lessons learned and then how they can be applicable to water reform. The paper touches on the future of stormwater and flood risk management and the three waters industry in Aotearoa New Zealand.

Through the development of the framework, it became clear that there were variations between each council's approach to stormwater management. This highlighted the complexity of stormwater management across multiple councils and the need for clarity in roles and responsibilities. It also reinforced the need for a governance model with a community-based and location-specific approach.

The recent changes and ongoing uncertainty over the water reform programme do not change two fundamental factors: reform as currently proposed will require local councils to come together to deliver water services and whatever happens in relation to stormwater, the entity will not be responsible for all aspects of stormwater management and therefore a line will have to be drawn somewhere. The key takeaways from Wellington Water's development of the Stormwater Management Framework document are the complex roles and responsibilities for stormwater management and how that emphasises the need for courageous conversations with councils and the community as we transition to a new governance model for the three water services.

The paper highlights the complexities and opportunities from the Wellington Water model and emphasises the importance of collaboration with councils, iwi, and the community to ensure effective and sustainable three water services for all.

KEYWORDS

Reform, stormwater, governance, collaboration, transition, water services model

PRESENTER PROFILE

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Jane is a Senior Project Engineer at Holmes. She is passionate about water and innovation, fulfilling numerous roles during her 10+ years' industry experience. During a recent secondment to Wellington Water, she applied this passion and natural curiosity to deep dive into their stormwater operations to inform water reform.

1. INTRODUCTION

Stormwater is defined as rainwater that runs off the land, including land that is covered by impervious surfaces such as roofs, roads, driveways, and footpaths. Stormwater then runs over the land either directly, or through pipes and drains, to our waterways and finally the sea.

Wellington Water manages stormwater on behalf of five of the six Client Councils; Wellington City Council, Hutt City Council, Upper Hutt City Council, Porirua City Council, and South Wairarapa District Council. This includes the management of stormwater infrastructure, overland flow paths and stormwater flood risk, plus stormwater water quality.

As we move into water reform, Wellington Water wanted to document all activities currently undertaken to manage stormwater for the Councils. This would enable informed discussions and form the basis of the transition of stormwater management services to the proposed Entity G. Understanding the complexities and differences between each Council led to the development of the Stormwater Management Framework and through its development, Wellington Water identified key challenges and learnings that are relevant for the wider industry.

The purpose of this paper is to summarise the methodology completed to develop the Stormwater Management Framework, discuss its key findings and outline how these are relevant to water reform, both within the Wellington Region and nationally.

2. BACKGROUND

Wellington Water as a three water service provider for the six client councils, manages eight water treatment plants, eight wastewater treatment plants, and

around 7000 kilometers of pipes servicing the needs of over 400,000 people in the Wellington region.

The councils own the assets and decision-making authority for investments. Wellington Water acts as the asset managers on behalf of the councils and provides advice on where investments are needed for councils' decision.



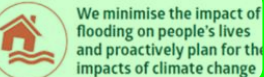

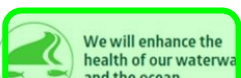
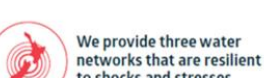

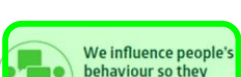
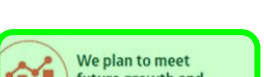

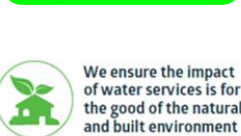

However, stormwater management extends beyond the physical components like pipes and treatment plants. It encompasses the complexities of how stormwater behaves, its implications for communities, and its cultural significance. Improving the quality of stormwater network discharges into the environment and giving effect to Te Mana o te Wai are also integral parts of this comprehensive management.

Notably, not all the stormwater assets owned by the five councils (Greater Wellington Regional Council excluded) are managed by Wellington Water, as most are roading and recreational assets and are managed by the council's roading or parks departments. Other stormwater assets in the Councils are either private owned or managed by regional or central government organisations.

Given these complexities and the distribution of responsibility, a holistic understanding of stormwater management activities for the councils was needed. The Stormwater Management Framework provides an overview of the management activities, clear delineations of roles and responsibilities, helps identify gaps in service and aims to facilitate transition of these services under water reform.

Wellington Water's role for the three waters is underpinned by 12 service goals shown in Figure 1. Those of relevance to the management of stormwater have been highlighted.

Figure 1: Wellington Water Service Goals

Safe and healthy water	Respectful of the environment	Resilient networks support our economy
 <p>We provide safe and healthy drinking water</p>	 <p>We manage the use of resources in a sustainable way</p>	 <p>We minimise the impact of flooding on people's lives and proactively plan for the impacts of climate change</p>
 <p>We operate and manage assets that are safe for our suppliers, people and customers</p>	 <p>We will enhance the health of our waterways and the ocean</p>	 <p>We provide three water networks that are resilient to shocks and stresses</p>
 <p>We provide an appropriate region-wide fire-fighting water supply to maintain public safety</p>	 <p>We influence people's behaviour so they are respectful of the environment</p>	 <p>We plan to meet future growth and manage demand</p>
 <p>We minimise public health risks associated with wastewater and stormwater</p>	 <p>We ensure the impact of water services is for the good of the natural and built environment</p>	 <p>We provide reliable services to customers</p>

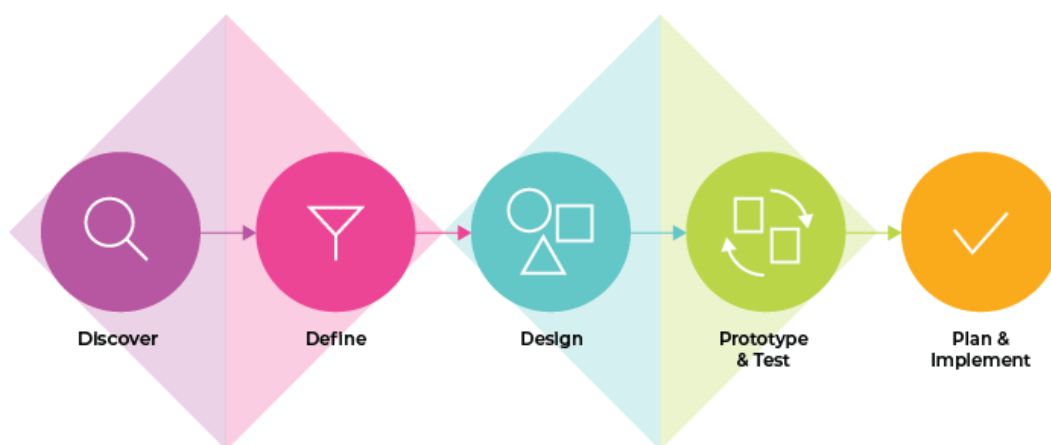
3. DEVELOPMENT OF THE FRAMEWORK

The development of the Stormwater Management Framework applied techniques from Human Centered Design (HCD) (Outwit*ly, 2019) for a comprehensive investigation into the organisation. This supports Wellington Water’s ethos that people are at the heart of Wellington Water and everything they do. The key elements adopted from HCD are outlined below.

3.1. DESIGN THINKING DOUBLE DIAMOND

HCD uses a Design Thinking double diamond, Figure 2, to apply divergent and convergent thinking to first understand and define a problem and then identify and develop solutions to the defined problem. The first steps, Discover and Define, were adapted to develop the Stormwater Management Framework as these introduce techniques that help the user apply divergent thinking to explore the area they are investigating. Techniques adopted included using empathy interviews and desktop research to discover current practices. A full picture of stormwater management at Wellington Water was developed through initially spreading the network wide (divergent thinking), and then delving into comments and chasing down leads. The framework document then brought together what was discovered (convergent thinking) to help define the findings and structure the document. All interviewees then had an opportunity to review the document to ensure key insights were included.

Figure 2: Design Thinking Process (Outwit*ly, 2019)



Copyright 2019 | Outwitly Inc. | HCD Process

3.2. EMPATHY INTERVIEWS

A key technique adopted from HCD during the discover phase was the use of empathy interviews to understand an individual’s perspective on the issue being investigated. This puts a human lens on the problem and helps to develop people-first solutions. A key feature of empathy interviews is their open nature, with typically 2-3 open-ended questions for a half-hour interview. This allows the interviewee to lead the interview and encourages the interviewer to ask probing, open questions that are tailored to the interview instead of having a long list of closed questions that may restrict responses, and therefore findings. This

technique was adopted for the development of the framework, with interviews being conducted with representatives from each team within Wellington Water to understand their role in the management of stormwater. The content of the framework was driven by the outputs from these interviews. The findings from the interviews were supplemented with desktop research. This included reviewing documentation and intranet sites that provided details on business processes, standards and frameworks, as directed by the interviewees. This helped the Stormwater Management Framework to become a true reflection of Wellington Water's role in the management of stormwater.

3.3. MINDSET

A key component of successful HCD is the mindset of those applying it. This is because to hold successful empathy interviews the interviewer needs to be open and accepting of what is being said and show empathy to the interviewee. Interrupting, being critical or steering the interview too much can mean important information might not be said or could be missed. In addition, to successfully complete the discover phase requires divergent thinking and keeping an open mind to what may be discovered. By adopting these mindsets, a full picture of stormwater management practices was developed and this led to identifying the key learnings detailed below.

During the define phase, convergent thinking was used to structure the material obtained during the discover phase and convert the mass of information into a structured document. This helped the Stormwater Management Framework become a useful document that would support conversations moving forward.

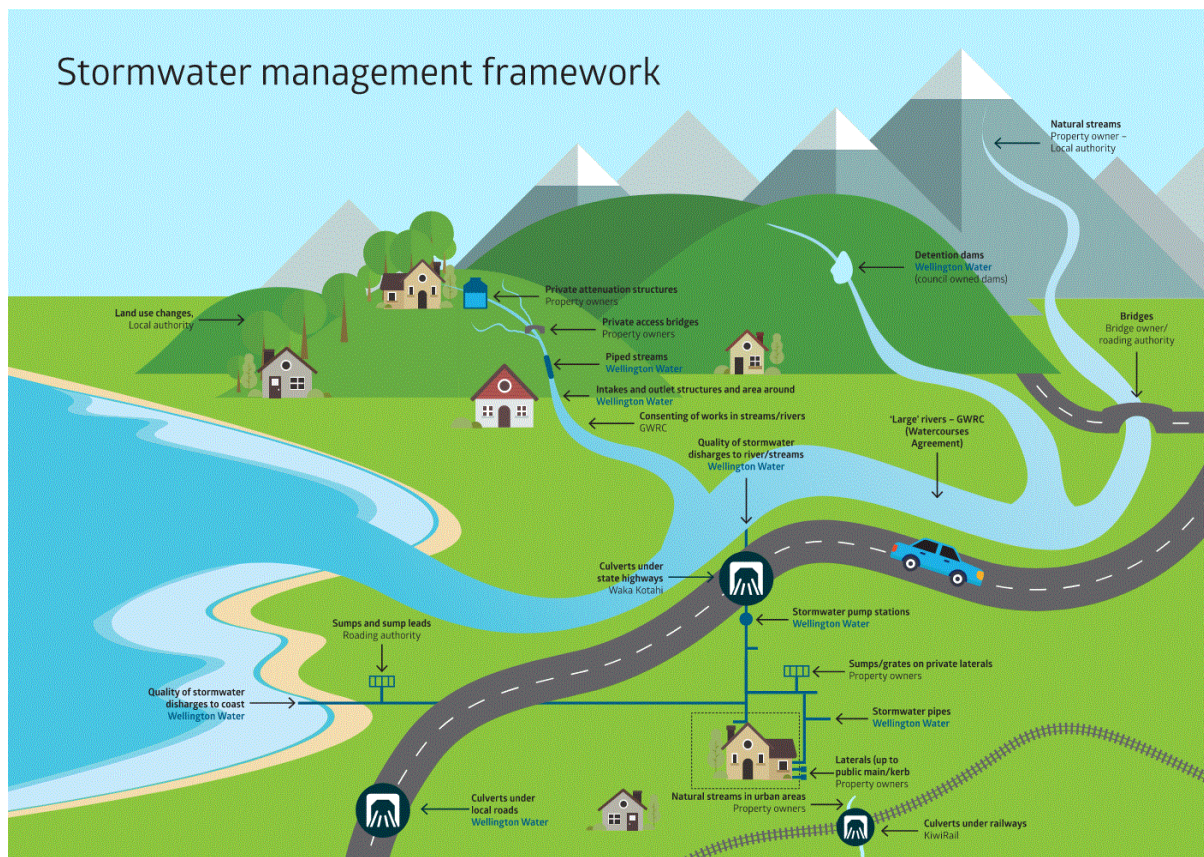
4. WHAT WAS DISCOVERED

Through development of the Stormwater Management Framework, the following are some of the key learnings that were identified:

4.1. EVERYBODY HAS A PART TO PLAY

Lifting the lid on how Wellington Water fits into the management of stormwater identified the other involved parties and their roles and highlighted the complexity of stormwater management. On its journey from first reaching the ground to eventually becoming part of the ocean, stormwater touches a lot of areas, is managed by and affects a lot of people. Figure 3 summarises the journey stormwater takes and the individuals or organisation it touches, noting this has been developed for Wellington Water's role and there are subtle differences between each local council area.

Figure 3: Stormwater Management Roles and Responsibilities



4.1.1. WATERCOURSES AGREEMENT AND STORMWATER

Greater Wellington Regional Council has regulatory control over all watercourses across the Wellington Region. However, the "Watercourse Agreement", which arose out of the December 1976 flooding in the Hutt Valley, defines the responsibilities for watercourse administration across most of the Wellington Region. This applies the general rule that the care and maintenance of all urban watercourses is the responsibility of the landowner or the local council, as shown in Figure 3 above.

However, Wellington Water's role in managing some aspects of the stormwater network for the councils, adds complexity and confusion to this Watercourse Agreement, especially for parts of streams that are channelised and/or on private property. This affects the maintenance and use of the waterways and can lead to confusion of roles and responsibility when issues arise.

4.1.2. COMPLEX INTERNAL RELATIONSHIPS

The management of stormwater within Wellington Water involves teams from across the organisation. The relationships between these teams are complex, with information flowing along different pathways and multiple teams contributing to each area. Figure 4 summarises the different parties and the key interrelationships within Wellington Water for the management of stormwater, with role descriptions below. This highlights the complex relationships for stormwater management at Wellington Water.

Figure 4: Stormwater Management Internal Roles and linkages



Descriptions of the key team are:

- **Growth Planning** -Ensuring predicted growth is incorporated into future service planning and network constraints are fed back into growth planning
- **Modelling** - Owner of stormwater catchment models. Liaison with Council district planners on hazard planning and mapping. Home of hydrology expertise.
- **Network Engineering** - Investigation of issues and scoping projects. Home of technical stormwater expertise and provides support to Chief Advisor
- **Network Management Group** - Management of the Stage 1 Global Stormwater Discharge Consent
- **Project Delivery** - Management of stormwater capital works programme and delivery of stormwater capital projects
- **RMA** - Accountable for obtaining RMA consents to operate stormwater networks including providing advice and guidance on the RMA
- **Risk & Assurance** - Responsible for tracking risk, emergency response procedures and managing flood incidents
- **Service Planning** - Identifying and obtaining funding (CAPEX and OPEX) from Client Councils, and prioritising funding areas.

4.1.3. MULTIPLE EXTERNAL TOUCHPOINTS

The complex nature of stormwater and its management means there are also multiple touchpoints between Wellington Water and external organisations. Figure 5 summarises some of these key relationships and illustrates the complicated nature of stormwater management.

Figure 5: Stormwater Management Internal and External Roles and Linkages



The relevant descriptions for these roles are:

- **Client Councils** – These are the five Local Authorities that Wellington Water provide stormwater services to under the Services Agreement.
- **Client Councils (Infra)** - Infrastructure team within each council who manage other council infrastructure.
- **Client Councils (IP)** - Investment Planning team within each council who manage that councils’ investment planning activities
- **Client Councils (Planning)** - Planning team within each council who manage district planning, growth plans and consents for new developments.

- **Client Councils (Roading)** - Roading team within each council who operate and maintain roading assets, such as sumps
- **Community / Public** - The general public
- **Consultants** - Professional services and engineering consultants that support Wellington Water. Includes those on the Consultancy Panel
- **Contractors** - Construction and maintenance contractors that support Wellington Water. Includes those on the Contractor Panel
- **Customers** - The general public when interacting on specific issue or project
- **Developers / Property Owners** - Individuals or organisations who want to develop land
- **GWRC** - Greater Wellington Regional Council the regional council within Wellington Water's council area
- **GWRC (EReg)** - Environmental Regulation team within Greater Wellington Regional Council and regulate activities that impact on environmental freshwater including streams, rivers and aquifers
- **GWRC (FP)** - Flood Protection team within Greater Wellington Regional Council who manage flooding from main rivers.
- **Local Authorities (Nationally/Outside)** - Other local councils outside of Wellington Water's Council geographic area
- **Mana Whenua** - Iwi representation. For Wellington Water's Councils area, these are Rangitāne o Wairarapa, Muaūpoko, Ngāti Toa Rangitira, Te Atiawa and Taranaki Whānui ki te Upoko o te Ika.
- **NTU / Entity G** - National Transition Unit overseeing transition under water reform. Entity G is the proposed new water entity that Wellington Water councils will be transitioning to.
- **Other Third Parties** - External parties that, through other projects, are making changes to the public stormwater network

4.2. AN EMPHASIS ON CONVEYANCE

Most of the existing stormwater network operated for the councils is hard infrastructure, reflecting a design philosophy centred on the principle of 'capture and convey' and 'out of sight, out of mind' with a significant number of catchpits, underground pipe networks and piped streams. This approach has led to ongoing capacity issues, particularly in areas where urban expansion has reduced the network's ability to handle stormwater effectively. Additionally, this approach has led to alterations and blockage of some natural pathways where stormwater would naturally flow during rainfall. With the increase in rainfall intensity and extreme events due to climate change, these networks that historically may have successfully conveyed stormwater, are now under capacity, more frequently overwhelmed and contributing to flooding.

This challenge is prevalent across all five councils and particularly in Wellington City, where most of the streams in urban areas of central, southern and eastern Wellington are piped, as shown in Figure 6 below. This means when walking around Wellington CBD, there are some significant watercourses hidden away. An example is Kent/Cambridge Terrace, which was a natural stream that is currently

conveyed via two stormwater pipes approximately 1m and 1.8m in diameter. This major transport route that connects Wellington CBD to the hospital and airport is predicted to flood along its entire length in a 1% AEP (1 in 100-year) event including an allowance for climate change. The depth of flooding, which is between 0.5m and 1m, would make this thoroughfare impassable to vehicles. To upsize these pipes to convey the predicted flow rate would involve both pipes needing to at least double in diameter, which is costly and challenging in an area congested with services. Therefore, new approaches to managing stormwater are needed that address these types challenges.

Figure 6: Streams in Wellington City Area (GWRC, 2022)



4.2.1. BUT QUALITY IS BECOMING MORE PREVALENT

Legacy issues created by the combination of urban expansion and blocked natural flow paths are also allowing pollutants from stormwater to enter freshwater and coastal ecosystems, contributing to their degradation. In 2018, revisions to the Regional Plan (Natural Resources Plan for the Wellington Region) required Wellington Water to obtain a global discharge consent for stormwater discharges. This consisted of two stages, with the first 5-year consent centred around data gathering and baselining the current quality of stormwater. The second stage of this consent will require the adverse effects of stormwater discharges to be minimised so that the health of receiving waters is maintained or improved.

Implementation of the first stage of the global consent has highlighted the linkages between wastewater overflows and stormwater quality. Therefore, Wellington Water has proposed a separate consent for wastewater network overflows. This will enable the global stormwater network consent to focus more on chronic sources of contamination like zinc and copper.

The second stage of the consent will require a large programme of work to deliver improvements in stormwater quality. This will include the development of stormwater catchment management plans to implement actions and mitigations at a local catchment level. This will be significantly different than what Wellington Water is currently doing in terms of capability and capacity required and will require significant investment from councils and upskilling by Wellington Water and the subsequent Entity.

4.2.2. STORMWATER ASSET PLANNING IS STILL TRICKY

Even in its current state, with a focus on conveyance via hard infrastructure, stormwater asset planning is still challenging. Asset planning requires understanding the issues, prioritising and integrating them into an asset planning and prioritisation process for investment. For water supply and wastewater, where the majority of the assets are constructed assets with well-defined expected conditions and levels of service, this is relatively straightforward for investment planning. However, stormwater is more complex because the reliance on hard infrastructure, such as pipes, necessitates capacity assessments to ensure adequate level of service primarily for flood protection. This planning must consider not only pipe capacity but also the interplay between constructed assets and natural drainage pathways, including overland flow paths, outfalls to streams, and coastal areas that are already experiencing the impacts of climate change. Many of these elements are beyond the direct control of Wellington Water. Balancing flood protection, which often depends on these natural features, with the management of constructed assets presents a challenging task. This complexity makes stormwater asset planning difficult to integrate into the asset planning and investment process for the councils.

As blue/green stormwater infrastructure solutions become more widespread, these asset planning activities are going to become more complex. Currently, the majority of the responsibility for blue/green infrastructure generally does not sit with Wellington Water as these assets are typically located in the roading corridor or in areas managed for recreation. Discussions are underway on what this responsibility will look like in the future. The recently completed Te Kukuwai o Toa wetland in Porirua emphasised the need to engage early with the maintenance team and ensure appropriate increases in operational funding for stormwater

quality assets are prioritised by the planning team. This highlights that operational planning and ongoing investment will become more important into the future.

4.2.3. INFLUENCE ON STORMWATER MANAGEMENT

Adding to the complexity of stormwater planning and investment prioritisation are the involvement from influential groups. Communities with resources and influence can exert pressure on their Council to prioritise their stormwater concerns, at times deviating from the usual prioritisation process. While Wellington Water provides recommendations to councils regarding investment priorities, the ultimate decision rests with the councils themselves. In certain cases, councils may allocate funds and alter project outcomes due to community pressure, which may deviate from Wellington Water's recommendations. This dynamic highlights the impacts of influential groups on stormwater management.

4.3. THERE IS A CONFLICT BETWEEN GROWTH AND STORMWATER MANAGEMENT

Development impacts stormwater management by increasing the impermeable area for stormwater runoff. This reduces the quantity of stormwater being absorbed by the ground and quickens how fast the rainfall runs off, thus increasing the total volume and peak flow rate of runoff. For greenfield developments, the change in land use also impacts stormwater quality by introducing flow paths through areas of potential contamination such as roads and roofs.

Wellington Water currently requires developments to manage their site stormwater so the peak runoff matches pre-development levels, which is termed hydraulic neutrality. However, there are challenges associated with this approach, as discussed below.

4.3.1. A REGULATORY GAP FOR SMALL DEVELOPMENTS

Small developments, that only require a building consent under the Building Act and not a resource consent under the Resource Management Act, sometimes slip through the regulatory net. This is because there currently isn't anything in the Building Act about hydraulic neutrality. Wellington Water has a limited role during the building consent process related to assessing connections to the stormwater network. It is typically limited to assessing if there is capacity in the existing primary stormwater network that the new or renovated building discharges to. This is typically for the piped network that is designed for the 10% AEP (1 in 10-year rain event), and connections that require a permit under the Local Government Act. Under the Building Act it is difficult and often impossible for Wellington Water to ensure new or renovated buildings don't result in increased flooding during the more extreme rain events.

One regulatory lever is the Resource Management Act provisions in district plans. Wellington Water is currently working with each council to fill this gap through standards and requirements around stormwater for developments within their district plans.

4.3.2. HYDROLOGY IS COMPLICATED AND DEVELOPERS NEED SUPPORT

Wellington Water has developed and calibrated a hydrological methodology for calculating stormwater runoff based on the SCS Curve Number methodology. This

includes the development of curve number map layers to feed into the runoff calculation and a reference guide to provide guidance on the application of the methodology. However, this methodology is still more complicated than more basic methodologies historically used and developers need help applying it correctly.

To help with this, Wellington Water is creating tools to support developers. This includes a hydrology calculation spreadsheet to help developers complete runoff calculations against Wellington Water's methodology and demonstrate hydraulic neutrality. This is currently being expanded to include automated input from the hydrology map layers and output a report in a standard format. This aims to make complying with the hydraulic neutrality requirement less onerous so it does not become a barrier to development and encourages developers to apply stormwater best management practice.

4.3.3. THERE IS NO SINGLE APPROACH

Despite the theoretical benefits of hydraulic neutrality in practical application, it does not allow for full capture of the stormwater and so limits its effectiveness in flood reduction. Modelling future scenarios with the hydraulic neutrality requirement assumes growth does not need to be accounted for because the post-development runoff will be the same as the pre-development runoff. However, hydraulic neutrality currently only applies to the peak runoff flow rate and is most commonly mitigated through providing on-site storage. This limits the peak discharge from the site and spreads this runoff over a longer period. This means the volume of runoff remains the same. If flooding in the catchment is caused by volume of stormwater, not peak runoff, then this can still contribute to increased flooding. Also, there is a risk that the revised time of concentration of the site coincides with other sites so the peak flow for the catchment still increases. To help address this, Wellington Water is working with councils and GWRC to propose a move away from hydraulic neutrality and towards using hydrological controls that considers catchment response.

4.3.4. GROWTH CAN HELP

Where significant growth is predicted in a catchment or there are existing flooding issues, Wellington Water has included stormwater as part of growth studies and has developed a methodology for incorporating growth into the stormwater catchment management. This enables the impact of growth on the whole catchment to be assessed and can lead to catchment-wide solutions to be implemented that address both current and future flooding. In these cases, developers would contribute to the cost of the catchment scheme in a similar way to development-initiated water supply or wastewater upgrades. This can be more cost effective and lead to better outcomes for the whole catchment.

In addition, growth can be a lever to address existing stormwater issues. For example, in Porirua City, certain areas where there is significant development predicted are being prioritised for mitigation of existing stormwater issues. The growth studies that are being completed, are quantifying stormwater flooding issues, developing solutions and cost estimates to mitigate the problems, and increasing Wellington Water's understanding of resources needed to address stormwater flooding for the councils.

4.4. THERE'S HIDDEN VALUE IN STORMWATER MODELS

Over the last 8+ years, Wellington Water has completed a comprehensive programme to build stormwater models for all urban catchments within four of the council areas: Hutt City, Porirua, Upper Hutt and Wellington. This has provided a step change in how stormwater flood risk is assessed in these cities by enabling it to be quantified in a consistent manner across all catchments. The purpose of the programme was to develop flood hazard maps for inclusion in the district plans. However, the programme has had wider benefits, as outlined below.

4.4.1. SUPPORTING THE MANAGEMENT OF STORMWATER FLOOD EVENTS

Outputs from the stormwater modelling programme are supporting the management of stormwater flood events. This includes having the flood hazard maps, which also supports district plans, appended to the emergency response plan for stormwater flooding. This enables the operations staff that respond to flood events to understand the areas of greatest potential impact so they can concentrate their response efforts. This becomes particularly important during larger events, where issues need to be triaged and prioritised.

The modelling programme also included running sensitivity blockage scenarios of large culverts within the stormwater catchment models. The results from these have helped to identify culverts with the greatest impact if they become blocked. This has fed into a list of key culverts that are proactively checked prior to high rainfall events, to reduce potential flooding issues. For very high-risk culverts, these are checked daily during high rainfall to ensure they remain free from blockage.

The flood maps and high-risk culvert list have enabled Wellington Water's operations staff to concentrate their limited resources on the areas of greatest benefit to their customers when responding to high rainfall events.

4.4.2. IDENTIFYING THE NEED FOR INVESTMENT

Results from the stormwater catchment models enable effective project identification and prioritisation. Wellington Water has combined the flood hazard maps with information on network age, material and condition as well as details on customer flooding complaints to create a spatial plan of all stormwater issues to understand where to focus effort. This map also includes information from stormwater catchment management plans and growth studies, where these have been completed, to provide information on system performance and mitigation options including cost estimates. The purpose is to provide a comprehensive picture of all stormwater flooding issues and options to mitigate and costs to support investment decisions.

4.4.3. LEADING THE WAY IN PROJECT DELIVERY

The stormwater modelling programme is delivered by Wellington Water and a panel of four consultants that work collaboratively to develop the modelling methodology, specifications and models. The approach of the panel, included allocating work equally based on availability and setting up regular panel sessions so all consultants could share knowledge and learnings across the panel. This improved the overall delivery of the programme and provided a test case for Wellington Water's consultancy panel, which was established a year after the

modelling panel, with several of the consultants in the panels adopting similar approaches. This has contributed to a more collaborative relationship between Wellington Water and the consultants, which has led to successful delivery of an increasing programme of work.

The stormwater modelling programme has also led the way in delivering joint projects. The Waiwhetū stormwater catchment model was a joint model between Wellington Water and GWRC, who manage the Waiwhetū stream. Due to the interlinked effects of the stream and stormwater catchments, the joint model provides an overall assessment of flood risk in the catchment, leading to better understanding of the issues and identification of holistic solutions. The learnings gained from the delivery of this project will support the delivery of joint projects in the future.

4.5. NATIONAL STANDARDS NEED A LOCAL LENS

Wellington Water has put a lot of effort into the development of stormwater methodologies and standards over the last 8+ years. This has included the development of a hydrology methodology calibrated to the region. A number of Wellington Water's standards and guidelines were developed in collaboration with external parties. This includes the Fish Passage Guidelines, which is owned by GWRC. Wellington Water sits on the fish passage advisory group, which is responsible for the development and application of this guideline.

Due to the complexity of stormwater and the number of different organisations and individuals involved in its management, the development of standards at Wellington Water has shown this needs to be completed in collaboration with other parties. To do this at a national level would increase the number of parties involved and would need to consider the differences in local and regional council responsibilities to ensure the National standards are applicable for all.

4.6. EMERGENCY MANAGEMENT IS A SEPARATE KETTLE OF FISH

Flooding is New Zealand's number one hazard. There are three common flood types: fluvial floods, also known as river floods; pluvial or flash floods (stormwater floods); and coastal floods, which are often called storm surge. The Wellington Region has significant areas of flood risk, where many of the towns are located on the floodplains of major rivers.

Several organisations have roles and responsibilities for responding to flooding emergencies across the region. The management of river and stream flooding is divided among the Regional Council, the local council, and landowners. In the context of stormwater flooding in the urban areas, Wellington Water, serving as the stormwater service provider for the local council, plays a significant role. During flood events, these responsibilities fall under the domain of emergency management. Wellington Water has established a comprehensive set of emergency management processes and procedures and conducts various activities to assist the councils in managing flood situations caused by rainfall. Nevertheless, several challenges in this regard are outlined below.

4.6.1. INTEGRATION WITH REGIONAL COUNCIL AND NATIONAL BODIES

The complex internal relationships shown in *Figure 4 Stormwater Management Internal Roles and Linkages* and the interconnectivity with different external parties shown in *Figure 5 Stormwater Management Internal and External Roles and Linkages* are also applicable to emergency management. During a flood event there are many parties involved, and the number increases as the severity of the event increases. Small events, where pluvial flooding is limited to the stormwater network and often localised, are managed by Wellington Water and the local councils. However, as events grow larger and more widespread, like river flooding (GWRC responsibility), Wellington Regional Emergency management Office (WREMO) becomes involved and the National Emergency Management Agency (NEMA), depending on the severity.

Wellington has been fortunate, with the major rainfall events over the last few years not having significant impacts on the region. However, due to the complex relationship with the various organisations involved, response in a major event will need to be well coordinated to ensure success.

4.6.2. PRIVATE PROPERTIES ADDS TO COMPLEXITY

Wellington Water's flood management role includes responding to customer complaints about overland flow paths and flooding of private properties. Dealing with these issues can be challenging as they are frequently caused by private property owners not maintaining stormwater assets and watercourses on their property or changing, diverting or infilling flood plains. As the responsibility of most stormwater assets and streams on private property sits with the landowner, there is limited involvement Wellington Water can take, which generally involves educating the property owner. However, due to the sensitivities around stormwater issues, these matters can get contentious. In some cases, Wellington Water may get involved in the maintenance of watercourses and stormwater network on private land.

5. RELEVANCE TO WATER REFORM

Development of the Stormwater Management Framework has highlighted the complexity of stormwater management and the number of stakeholders involved, internally within Wellington Water and externally. Under water reform, the nature of this complexity may change, with different parties involved and different relationships. However, as the responsibilities in *Figure 3 Stormwater Management Roles and Responsibilities* show, the new entity cannot be wholly responsible for all aspects relating to stormwater management. The development of the Stormwater Management Framework has highlighted some key insights that are relevant as we transition into the new entities.

5.1. EVERYBODY IS RESPONSIBLE

Stormwater management is a collective responsibility that transcends individual roles and jurisdictions. From local councils and regulatory bodies to water service providers to community members, property owners and individuals, everyone plays a part in ensuring effective stormwater management. Local councils play a crucial role in policy formulation, land use and infrastructure planning, while regulatory bodies ensure compliance with established guidelines. Water service

providers like Wellington Water contribute by maintaining and enhancing stormwater infrastructure. However, the community's active participation in sustainable practices, like reducing runoff and preserving green spaces, is equally vital. Additionally, property owners contribute by implementing proper drainage systems, maintaining their properties, and adhering to regulations. The complexity of stormwater management necessitates a collaborative effort, underscoring that each entity and individual has a vital role to play in safeguarding our environment and communities from the impacts of stormwater runoff.

5.2. COLLABORATION IS VITAL

The Stormwater Management Framework's development highlighted the complexity and the diverse stakeholders involved. While no single entity can shoulder the entire responsibility, establishing clear boundaries and open dialogues with all stakeholders will be vital for successful transition to a new service provider. Engaging in constructive discussion with all groups is necessary to ensure equitable service distribution across all communities. And continuing these discussions after reform will be essential. Additionally, the impacts of developments on existing communities stresses the need for collaboration with local councils and engaging local voices to highlight the stormwater concerns of affected communities. This fosters more efficient and effective stormwater management solutions through collaboration.

5.3. ADAPTABILITY IS IMPORTANT

Stormwater management is evolving from a focus on hard infrastructure conveyance to more nature-based strategies that consider quality as well as quantity. We need to be adaptable and take reform as an opportunity to improve stormwater services. This includes continuing to work with regional councils to improve the quality of discharges into the waterways within integrated catchment programmes. The current proposed entities, along Regional Council boundaries, will support this collaboration and will help to adapt the entities' role in the management of stormwater.

5.4. RECOGNISE LOCAL WISDOM

The Stormwater Management Framework highlighted the significant effort needed to align practical stormwater asset management with the principles of Te Mana o te Wai. For the new entity, early and meaningful collaboration with mana whenua iwi partners is essential. Integrating indigenous knowledge, values, and perspectives into stormwater management practices, and involving the local catchment groups will enable holistic approaches to address localised challenges and solutions, and will better ensure they align with the principles of Te Mana o te Wai. The key takeaway for the new entity is that embedding these collaborative approaches will not only bridge existing gaps but also cultivate more inclusive and sustainable stormwater management that reflects the interconnected relationship between people and the environment.

5.5. ELEVATING LEVEL OF SERVICE

Section 4.2 highlights the need to address stormwater level of service and flood protection which involves confronting existing system capacity and legacy issues. While many Councils new standards require stormwater networks to handle larger rain events, such as 10% AEP (1 in 10-year rain event), older systems often can't

meet these standards. Elevating these systems to the updated standards is a daunting task and can incur substantial costs. To effectively, address the network capacity issues, an aggressive stance on reinstatement of overland flow paths and flood plains should be considered, as overland flow paths, obstructed by urbanisation, are a major cause of ponding and flooding. Restoration of these natural flow paths is pivotal to address these network capacity issues and can provide improvements for some existing flood areas.

The amalgamation of stormwater management within a larger entity offers the advantage of unifying fragmented infrastructure, services and strategy for addressing legacy stormwater issues. This will also improve the efficient use of resources and bolster resilience to climate change.

5.6. TAKE A STAND ON CLIMATE CHANGE

Our climate is changing and more extreme weather and sea level rise will increase flooding, pollution and damage to the built and natural environment. Sea level rise and projected future erosion of the coastline will also significantly impact the ability of the stormwater system to discharge to the waterways and the sea.

To address the implications of climate change, difficult and courageous conversations are needed with councils and vulnerable communities. Drawing a line in the sand, by defining a threshold for managing stormwater in high-risk flood zones is necessary in responding to climate change. Strategies like managed retreat and buy-back programmes need consideration. In addition, aligning the climate response with that of insurance companies will be of paramount importance. As an increasing number of insurance companies are forcing societies to respond, by frequently adjusting their premiums and declining coverage for properties with history of flooding. Properties located in these high flood risk areas are becoming an increasing liability for society and this disproportionately affects some of the most vulnerable communities.

5.7. EMPOWER CITIZENS TO HELP

Empowering communities to take charge of stormwater runoff from their areas, recognising its direct impact, is pivotal. Encouraging communities to proactively clear private drains during rainfall events will mitigate flooding and reduce pollution in the waterway. This effort requires robust education and engagement to demonstrate the substantial role each individual can play for management of stormwater.

Maintenance of stormwater assets including overland flow paths is a challenge. Even with dedicated maintenance crew, addressing all issues promptly to meet the community expectations is difficult, particularly during widespread rain events. As discovered in the development of Wellington Water's Stormwater Management Framework, during rain events, many of the flooding complaints are associated with blocked roadways or private drains. Empowering property owners with knowledge about drains, safe clearing methods, and broader consequences is essential.

A useful tool to empower citizens includes the "adopt a drain programme". This programme has proven effective in stormwater management overseas, reducing

flooding and encouraging private property contributions to system maintenance, benefiting local waterway health.

5.8. GET A CERTIFICATE

Managing stormwater discharge from new and redeveloped projects across various councils with diverse building consent processes presents intricate complexities, as highlighted in Section 4.3. Beyond ensuring compliance with standards, the timing alignment between application, construction of the development, installing stormwater management devices and for some devices, verifying they are functioning as intended, compounds the complexity due to the nature of stormwater discharge. A stormwater certificate could alleviate some of these challenges arising from the Building Act, diverse council procedures, and development timelines.

A [stormwater discharge certification](#) programme, like that implemented by the Timaru District Council, has proven instrumental in bridging the gaps. This programme expedites consent reviews, offers clear guidance to developers and council staff on managing stormwater discharge from new projects, and promotes compliance. Such a certificate not only ensures compliance but also facilitates enforcement in addressing catchment-specific requirements, particularly relevant as guidance on Te Mana O te Wai's application to specific water bodies becomes more defined.

6. LIMITATIONS

Development of the Stormwater Management Framework applied Human Centred Design methodologies, which provided insight into Wellington Water's current stormwater management activities from the perspective of the employees. However, by only completing internal interviews the findings were limited to those from within the organisation. One of the learnings from the development of the Stormwater Management Framework includes the interplay between multiple organisations, individuals and stakeholders and therefore a wider interview base would provide a more comprehensive picture.

7. CONCLUSIONS

The Stormwater Management Framework's development highlighted significant challenges in stormwater management and areas where Wellington Water's efforts deserve recognition. The future for stormwater management across Aotearoa New Zealand is still unclear. However, drawing on the insights gained from the Wellington Water Stormwater Management Framework—such as the inherent complexity of managing stormwater and the involvement of multiple organisations—can be useful for fostering collaboration among and within the new water services entities and communities, especially with the separation of stormwater services from local authorities into the new entities. The creation of the Stormwater Management Framework is a pivotal step in Wellington Water's journey toward transition and for management of the stormwater services for the client councils.

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