Wellington Water

Draft He Rautaki Wai Āwhātanga | Stormwater Management Strategy

Our Journey to Wai Ora

Our water, our future.

Document Details

Date: 30 November 2022
Reference: 3-WW022.33
Status: Draft – for GWRC Review
Approved for release:

Julie Alexander, GM-NS&P _Date 30/11/202

Jeremy McKibbin, GM-NM _ _Date 29/11/2022____

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Document history and status

Revision	Date	Author	Reviewed by	Approved by	Status
DRAFT 1.0	24 Nov 22	Connect Water	Alistair Allan, James Reddish	Liam Foster	Draft to Approve
DRAFT 1.1	30 Nov 22	Wellington Water	Emily Greenberg	Liam Foster	For GWRC Review

Revision details

Date	Revision	Details
24 Nov 2022	1.0	Draft for final review and approval to release by Wellington Water.
30 Nov 2022	1.1	Draft for review by Greater Wellington Regional Council

Preferred citation

Wellington Water. November 2022. Draft He Rautaki Wai Āwhātanga |Stormwater Management Strategy – for Greater Wellington Regional Council Review. Prepared by Connect Water for Wellington Water.

Acknowledgements

The drafting of this strategy was possible only through the efforts of mahi tahi. Special acknowledgement is given to the original project team comprised of Wellington Water and panel members who identified the scope of work needed and who compiled the data to describe the catchment characteristics, led by Ben Fountain, Francis Leniston and Paul Gardiner and assisted by Abby Jensen, Nick Hewer-Hewitt, Sandro Lopez Fernandez, Justine Bennett, Jessica Grinter, Alistair Allan, David Arseneau, Sheryl Paine, and Rory McPherson.

Acknowledgements are also given to the many people who helped draft the approach and options, including Uki Dele, Matthew Lillis, Diana Issac, Fraser Clark, Nadia Nitsche, Ben Waters, Katrina Murison, Caroline Horrox, John Baines, Sean de Roo, Vivien Chen, Max Pocock, and James Reddish.

Additional acknowledgement is given to Janice Rodenburg, Jacob Marriner and Jo Wright for communications, graphic support, to Ezekiel Hudspith for legal review and to Steve Hutchison and Rob Blakemore for wise counsel.

Acknowledgement is also given to the Whaitua te Whanganui-a-Tara Implementation Programme, Te Mahere Wai, Te Awarua-o-Porirua Whaitua Implementation Programme, and the Ngāti Toa Rangatira Statement, that informed the thinking and philosophy of this Stormwater Management Strategy.

Abbreviations

Abbreviation	Full Name
BAU	Business as Usual
GWRC	Greater Wellington Regional Council
HCC	Hutt City Council
LGA	Local Government Act
NES-FW	National Environmental Standards for Freshwater
NPS-FM	National Policy Statement for Freshwater Management
NPS-UD	National Policy Statement on Urban Development
NRP	Natural Resources Plan for the Wellington Region
PCC	Porirua City Council
RMA	Resource Management Act
RSWS	Regional Standard for Water Services
SCaMP	Sub-Catchment Management Plan
SMS	Stormwater Management Strategy
SWDC	South Wairarapa District Council
UHCC	Upper Hutt City Council
WCC	Wellington City Council
WSD	Water Sensitive Design

A glossary of key terms is shared in ***Appendix A.***

Whakarāpopototanga whakarae | Executive Summary

This Stormwater Management Strategy (SMS) for minimising the adverse effects of discharges on water quality captures the need to shift how rainwater that falls on the urban area is managed, so that it can contribute to better aquatic ecosystem health, enhance Māori cultural values and the recreational value of water as well as enable growth across the Wellington region.

This SMS is specific for the discharges from the public stormwater network that services more than four hundred thousand people in the urban areas of Porirua, Wellington, Hutt City, and Upper Hutt. This SMS does not address the management of stormwater flooding for the purposes of protecting human health and property as this is covered with ongoing Wellington Water work programmes.

To discharge stormwater into waterbodies, Wellington Water, on behalf of our client councils, needs resource consent from Greater Wellington Regional Council (GWRC).

Condition 17 of Wellington Water's current (5-year) Stage 1 Global Stormwater Discharge Consent requires delivery of a Draft SMS to GWRC by 30 November 2022. A final strategy is due on 30th May 2023 as a component of the application and conditions of consent for a long-term (up to 35-year) Stage 2 Global Stormwater Discharge Consent. The Natural Resources Plan for the Wellington Region (NRP) includes requirements for a SMS, notably Schedule N.

Why manage stormwater for water quality and the need to transform our relationship?

Stormwater is generated when rainfall runs off the land. In our urban areas, rainfall runs off and into the waterways and harbours more quickly and in greater volumes than waterways are naturally adapted to. On its journey across the urban landscape, stormwater collects litter and contaminants including airborne contaminants and erodes sediment, affecting water quality and ecosystem health. The way we have 'managed' stormwater in the past has resulted in a deteriorated mauri of most of our urban waterways and harbours.

We can shift the way in which we 'treat' our urban waters and move to one of stewardship and kaitiaki for this precious taonga / resource. As guardians, we can promote integrated catchment management, support our community to thrive, provide safe and enjoyable recreational use of our waterways and restore the mauri (life force) of our waterways and harbours across the region to better support Māori customary uses.

We have learned many lessons over the seven years that Wellington Water has been managing the council stormwater assets which will inform our future role in stormwater management. One important lesson is that collaboration with others and working together enables us to achieve more. Wellington Water will provide leadership for a more sustainable water future, as we manage the council assets, through this transition to improved stormwater management for water quality and ecosystem health.

We need a transformational shift in how we plan, design, and construct our cities such that our urban waters can support and enhance environmental, social, and economic benefits. Water Sensitive Design (WSD) is one way to achieve this.

WSD seeks to protect and enhance natural freshwater systems, sustainably manage water resources, and mimic natural processes to achieve enhanced outcomes for ecosystems and our communities. Through applying WSD development-by-development, we can support our cities to move from that of being predominantly a "Drained" City towards a "Water Sensitive" city status[1], providing a more resilient and sustainable environment for our communities to live, work and play.

[1] *Based on the Water Sensitive Cities Transition Framework*

All of us have a part to play in how we manage stormwater from our partners and stakeholders through to our customers. Individuals can make a difference through valuing our water environments as well as through managing the rainwater that falls on their land, by preventing contaminants from being washed into the stormwater network and through installing sustainable uses of water on-site.

Our journey to wai ora

As described in Wellington Water's Statement of Intent, we are on a journey to transform water in the region from Hangarua (the wai is currently altered where mauri is not restored due to our alterations) to Te Ika Rō Wai (a pure form of water that you would expect to find in the head of Maui's fish, relating to where Te Whanganui-a-Tara is in Te Ika a Maui). This transformation necessitates effort by us all as those who live in and care for the Whaitua (translated in this case as '*catchment*').

Specifically for the SMS, this manifests itself as the ***Journey to Wai Ora***[2]**.** The Journey to Wai Ora signifies the long-term and adaptive management journey we are on, working at a sustainable level to reverse and minimise effects over the next 70 – 100 years as part of an overall community of people / organisations that influence the health of our waterways. This journey relies on a pathway of short-to-medium term steps. Steps beyond that have been left for the next generation to determine, so they can reflect on their own aspirations and contexts. Regarding stormwater discharges from the public stormwater network, these specific periods enable us to continuously adapt our approach to stormwater management to achieve progressive improvement.

In the past, management of different aspects of water were considered in isolation. On our ***Journey to Wai Ora***, this SMS integrates a strategic approach focussed on stormwater quality with our other work programmes focused on sustainable water use, flood, and wastewater management. This will support our community through protecting them and their assets as well as reversing the degradation of our waterways over time. In doing this we can help enable the principles of Te Mana o te Wai to benefit our whole community.

The vision developed specifically for this SMS is:

"Our region treasures its water. Our streams and harbours are healthy, our drinking water is safe and secure, our networks are resilient, our growing cities are water sensitive, and we are prepared for a changing climate. Water is at the core of how we plan and grow our cities"

Strategic Direction

This SMS describes the strategic direction and management approaches for managing the council-owned stormwater networks for Porirua, Wellington, Hutt, and Upper Hutt city councils[3].

To achieve the vision of this SMS we will work collaboratively with our mana whenua partners, Ngāti Toa Rangitira and Taranaki Whānui, and consider stormwater quality as part of integrated water management. The three objectives of this SMS respond to the objectives of the relevant Whaitua and the objectives and requirements of the NRP. These objectives focus on Aquatic Ecosystem Health, Māori Customary Uses including recreational contact, and Sustainable Growth.

[2] As described in the Te Whaitua te Whanganui-a-Tara Implementation Programme 2021
[3] Although Wellington Water also manages the stormwater networks owned by South Wairarapa District Council, the discharge consent for these networks do not currently require a SMS and therefore this SMS does not include this council area.

The three principles that support these objectives are:

- ***Mahi Tahi /working together –*** establishing and maintaining genuine partnerships with mana whenua and supporting community groups, working with other council departments and a wider community of stormwater network owners in all that we do, sharing knowledge and building capacity, and communicating outcomes.
- ***Ki utu ki tai / Integrated Catchment Management –*** references the need to work in an integrated water cycle management approach for multiple water resource outcomes, encouraging the wider community to embrace Water Sensitive Design.
- ***Data, Monitoring, and Investigations –*** the approach is underpinned by the continual process of gathering all forms of information about our catchments enabling the inclusion of western science, Māori customary use and cultural knowledge. This is a critical part of enabling adaptive management which is needed to respond to changes and delivery of our objectives.

The Strategic Actions[4] that will implement the objectives and principles are described in two-workstreams:

- ***Workstream 1: Universal Responses –*** New development and regeneration of our existing urban area provides opportunities to manage stormwater not only for flooding but also for water quality. Applications for new connections to the public stormwater network, will require all new development to deliver on a set of Universal Responses. The Universal Responses activity also includes the delivery of a targeted approach to understand and improve progressively over time, sites with a high risk of discharging contaminants of concern.
- ***Workstream 2: Stormwater Programmes for Water Quality Outcomes*** – Current stormwater programmes on behalf of our client councils are targeted at managing stormwater to protect people and property from the hazard of flooding. Delivery of this SMS requires the development of stormwater Sub-Catchment Management Plans (SCaMPs) and new programmes of work in strategy and planning, modelling and investigation, design and construction, operations and maintenance, education, training and outreach, and data and asset management.

Although flood management is not a primary focus of this SMS, it is essential that flood management, and water quality matters associated with managing wastewater and drinking water networks are looked at holistically. The approach to the development of stormwater SCaMPs supports the use of integrated catchment management which is a key tool for prioritising investments to progressively improve our waterways.

Over time these actions to implement this SMS, will reduce the negative impacts of stormwater network discharges in terms of heavy metals (particularly copper and zinc), nutrients, E. coli, sediment, and gross pollutants as well as minimising the localised scour erosion impacts of stormwater network discharges on our waterways.

This strategy addresses each of the components shown in Figure 0.1:

[4] *In accordance with Schedule N (f) – (h) of the NRP*

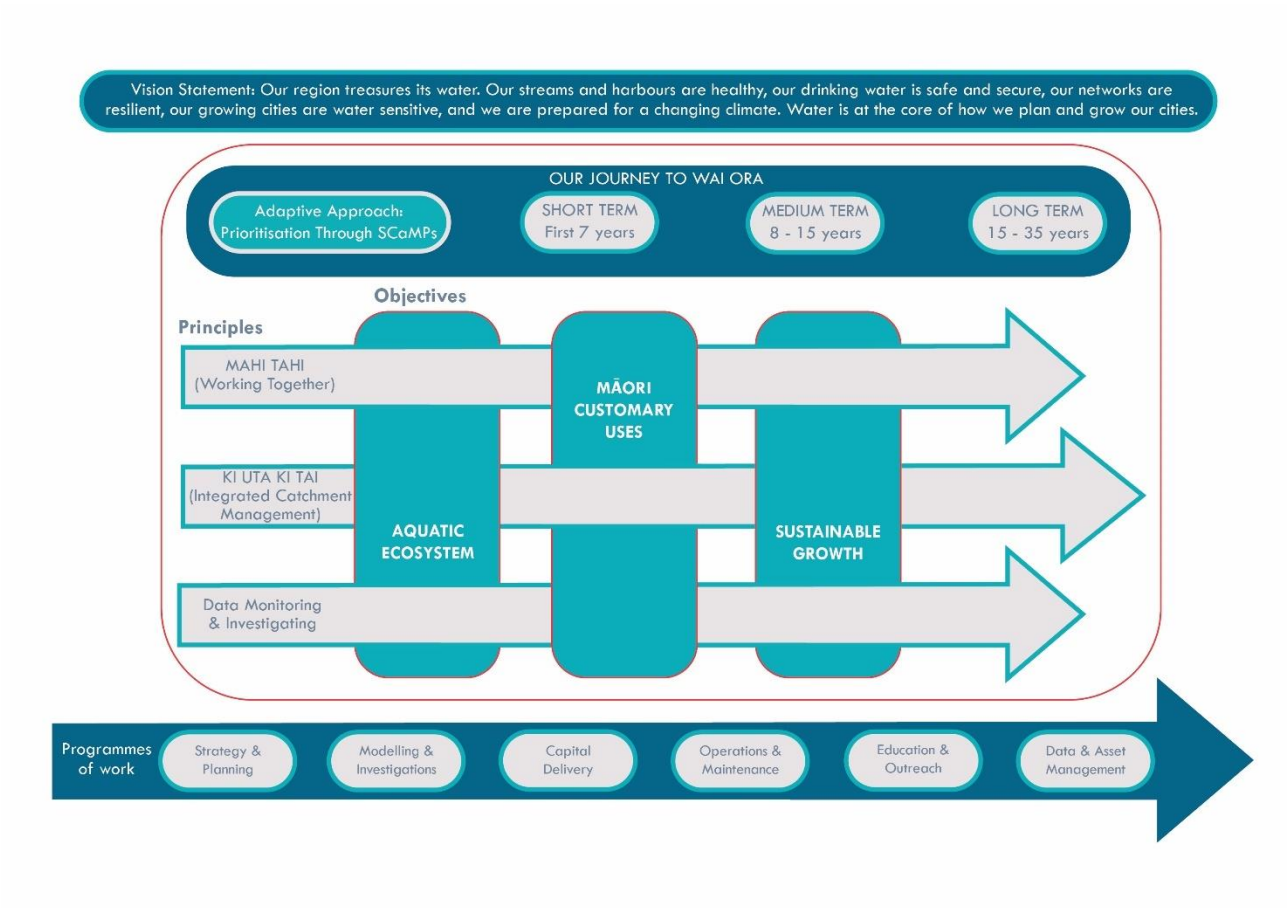

Figure 1.1 Strategic Approach for the SMS

Delivering the strategy

This SMS will guide the management of stormwater discharges from the network Wellington Water manage over the life of the Stage 2 Global Stormwater Discharge Consent. Wellington Water will measure progress towards the vision and objectives of this SMS through our implementation activities across the Programmes of Work. Components of this SMS will also be required to be reported on and complied with as conditions of consent associated with the resource consent for stormwater discharges.

Significant capital delivery and operational investment are required to implement this SMS. A governance group led approach, consisting of the appropriate representation of mana whenua, GWRC as the regulator, the investors and asset owners will monitor and manage the application of these implementation activities. This governance group will form their own set of key principles to guide the successful implementation of this SMS.

These principles could include collaborative funding models with other partners / members of the governance group, ways to secure central government funding to support freshwater outcomes, as well as ensuring a well-funded operational programme to renew, maintain and optimise water quality outcomes from all the council-owned stormwater networks.

An adaptive management approach is critical to managing stormwater effectively, and an ongoing process of monitoring / evaluation will help to update management approaches during a strategic review of this SMS. The review of this SMS will take place in six years. Our full journey to wai ora will take longer than the life of this SMS and is expected to take 70 to 100 years[5].

[5] *In alignment with the timeframes outlined in the Te Whanganui-a-Tara Whaitua Implementation Plan and Te Awarua-o-Porirua Whaitua Implementation Plan*

The actions in this strategy will help us towards our vision. Improvements in the health of waterways and harbours are unlikely to occur without the implementation of new activities that support the two parts of our approach, being to require new development to follow a set of Universal Responses and to progressively improve the discharges from existing urban areas, through targeted sub-catchment[6] scale (SCaMP) interventions where needed.

Throughout the document, we identify how this SMS is in accordance with Schedule N requirements of the NRP. Some of these requirements will only be fully met after the development of a regional stormwater contaminant model, to be led by GWRC, that can be used to support the delivery of SCaMPs, particularly in relation to specific strategic actions, management options and identification and management of localised effects.

Noting that there are significant changes to the Water Industry proposed through current Water Reform activities, it should be noted that each reference to "Wellington Water" in this document, within reason, includes any successor entity that may be established to stand in Wellington Water's shoes in the future.

[6] The distinction between a catchment and sub-catchment is a management decision. Every catchment can be geographically divided into numerous smaller and smaller sub-catchments. For this SMS, a sub-catchment is a geographically defined management unit.

How the Stormwater Management Strategy addresses Schedule N requirements:

Table 1.1: Schedule N requirements and how they are addressed by this Draft SMS with notes on detail that is yet to come.

The purpose of a stormwater management strategy for a local authority or state highway stormwater network is to:

- *provide a strategy for how sub-catchments within the stormwater network will be managed in accordance with any relevant objectives identified in this Plan, including any relevant Whaitua-specific objectives, and*
- *describe how the stormwater network will be managed in accordance with good management practice, that evolves through time, to minimise the adverse acute, chronic, and cumulative effects of stormwater discharges on fresh and coastal water.*

The detail of a stormwater management strategy shall correspond with the level of risk to receiving water quality arising from stormwater discharges in each catchment or sub-catchment. Detailed asset information and management strategies need not be included in the stormwater management strategy where this is set out in a related asset, or other, management plan that is provided to the Wellington Regional Council.

At a minimum, a stormwater management strategy shall:

Schedule	Requirement	Response
Management objectives		
N(a)	*identify the relevant water quality objectives in this Plan that the local authority or state highway stormwater network is to be managed in accordance with, and*	The relevant objectives in the NRP are addressed in Chapter 3 – Regulatory Context, specifically Figure 3.1 which shows the relevant objectives and policies as applicable to the SMS also Specifically, the SMS identifies two objectives in Chapter 7.2, Aquatic Ecosystem Health and Māori Customary Use including Contact Recreation.
N(b)	*identify any other relevant objectives for which the local authority or state highway stormwater network will be managed, and*	The three key objectives for the SMS are identified in Chapter 7.2. The third objective, Sustainable Growth, is relevant to the NPS-UD.
N(c)	*for discharges via another stormwater network, identify the requirements of any relevant discharge consents for the receiving network and integrate the strategies to the extent practicable, and*	Discharges via the Wellington International Airport stormwater network are identified in Appendix D, Catchment Characteristics.
Catchment characteristics		
N(d)	*include plans and descriptions of the local authority or state highway stormwater network within each catchment or sub-catchment, including identifying:*	Each of N(d)(i) to (iii) is addressed in Chapter 4.2 – Our Catchments, and Appendix D. The detail in Appendix D for this draft has been summarized and is incomplete. The SMS submitted in 2023 to support the consent application will provides further detail and will also provide this information via a link to online GIS maps.
N(d)(i)	*catchment areas, boundaries, major stormwater infrastructure and monitoring points, and*	

N(d)(ii)	*piped streams within the network that are of significance to mana whenua, as identified with mana whenua, and*	The detail in Appendix D for this draft has been summarized and is incomplete. The SMS submitted to support the consent application will provide further detail and will include a link to online GIS maps.
N(d)(iii)	*constructed overflows, pump stations and other wastewater infrastructure for local authority stormwater networks, and*	
N(d)(iv)	*existing and potential future land uses (including roads) and categorisation of these for their likely contribution of contaminants to stormwater, and*	The detail on existing and future land use in Appendix D for this draft has been summarized and is incomplete. The SMS submitted in 2023 to support the consent application will provides further detail and will also provide this information via a link to online GIS maps. Refining the understanding of the likely contribution of contaminants from land use will occur, in part through the development of site-specific SCaMPs under Workstream 1 and the prioritisation of larger sub-catchment SCaMPs under Workstream as detailed in Chapters 8.1.1 and 8.2.3 and will be supported by the future development of a regional-scale dynamic stormwater contaminant model being led by GWR, as discussed in Chapter 8.2.2C. This approach has been discussed with GWRC due to the size of the stormwater network managed by WWL on behalf of the four councils, and the need for progressive improvement.
N(d)(v)	*contaminated land and Hazardous Activities and Industries List (HAIL) activities at a high risk of contributing contaminants to stormwater, and*	Addressed in Appendix D – Catchment Characteristics. This includes a description of SLUR sites contained within each respective catchment.
N(e)	*using the above to identify the key risks associated with activities and land uses in the catchment or sub-catchment to receiving water quality from stormwater discharges, and*	Addressed in Chapter 2.2 How does stormwater affect water quality, Chapter 8 – Responses, and Appendix D (incomplete). The SCaMPS (Chapter 8.2.3) will provide more detailed sub-catchment information.
Strategic actions		
N(f)	*prioritise all catchments or sub-catchments covered by the consent for implementation actions or mitigation measures, based on monitoring carried out in accordance with Policy P85 and the assessment of effects, to maintain or improve the receiving water quality, and*	Addressed in Chapter 8.2.3.1 Prioritisation. In addition, an adaptive management approach will be underpinned by monitoring, investigations, and research. The monitoring undertaken will direct how catchments shall be prioritised in accordance with the prioritisation processes set out within this SMS (Chapter 8.2.3.1), and SCaMPs will be developed depending on the outcomes of this prioritisation. Monitoring will be undertaken in accordance with the requirements of P85.
N(g)	*where relevant, describe how water quality will be improved in any water body identified as a priority for improvement in Schedule H2 or in any fresh or coastal water body that fails to meet a national bottom line for a relevant value in the National Objectives Framework, and*	Addressed in Appendix D – Catchment characteristics. The catchment descriptions provided in Appendix D identify which waterways have been identified in Schedule H2. Further assessment and detail on how it is proposed to improve the water quality in specific catchments will then be provided in the respective SCaMP documents that will be prepared based on the prioritization programme.

		The philosophy employed by the SCaMPs is that catchment water quality will be improved though intervention leading to progressive change over time using the approach (as set out in Chapter 8) which will confirm how these measures will be applied to individual waterbodies in greater detail.
N(h)	*describe how discharges from the local authority or state highway stormwater network will be maintained or improved, through time, to meet the objectives described in (a), (b) and (c), including any relevant targets, timeframe, and methods, and*	Addressed through Chapters 8 -11 and range of Management Options shared in Appendix F. These include a comprehensive list of management options that could be used to improve the quality of stormwater discharges from a local authority network. The SCaMP approach will mean that interventions are detailed as well as the required water quality targets and timeframes for improvement.
Management options		
N(i)	*describe how stormwater discharges from new impervious surfaces from greenfields and brownfields development and/or new or redeveloped roads will be managed to minimise the adverse quality and quantity effects of post development stormwater discharges, including in accordance with Policies P83 and P84, and*	Addressed through Chapters 8 -11 and range of Management Options shared in Appendix F. It is proposed to manage the effects of stormwater through the application of a comprehensive suite of management options as part of our approach to the work, being: • Workstream 1 (Universal Responses: in Chapter 8.1). • Workstream 2 (expansion of work programmes in Chapter 8.2)
N(j)	*identify options for minimising contaminant inputs into the local authority or state highway stormwater network from land use activities at high risk of generating stormwater contaminants, such as contaminated land, road intersections, interchanges and overpasses with high traffic volumes, areas with significant galvanised steel roofing and HAIL activities, and*	
N(k)	*describe how for local authority stormwater networks, the adverse effects of wastewater interaction with stormwater will be minimised in accordance with Policies P87 and P88, and*	
Localised effects		
N(l)	*using a risk-based approach, identify stormwater discharge points where there are more likely to be significant adverse effects as a result of a specific discharge, with consideration of attributes that are targeted to the relevant receiving environment and implement an appropriate monitoring programme.*	Addressed in Chapter 8.2.3.1 – Prioritisation of Wellington Water-led SCaMPs, Chapter 7.3.3 – Adaptive management informed through monitoring, investigations, and research, and Section 3 – Responses.
N(m)	*when the monitoring in (l) above provides evidence of significant adverse effects resulting from a specific stormwater discharge, describe how the localised adverse effects of discharges from the*	

	local authority or state highway stormwater networks will be prioritised for reduction.	

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Part One: Stormwater Management Strategy

Section 1: Background

1 Two worlds coming together[7]

Te Mana o te Wai recognises the importance of the relationship Māori have with wai/water to water management across Aotearoa New Zealand. It fundamentally and explicitly states that the health and wellbeing of wai is to be prioritised first.

Past stormwater management has not been so deliberately relationship focussed and, therefore, has not considered the wellbeing of the water. Te Mana o te Wai enables us to renew our relationships with wai/water.

Table 1.1 sets out the Te Mana o te Wai principles that support decision-making for this Stormwater Management Strategy (SMS). Interpretation of these principles will be taken locally, guiding the implementation for future water management. The principles unite Māori and non-Māori in their roles to care for our waterways in a partnered approach. It is for us all to have the space to prioritise the health and well-being of water and as water is the life of all things, the benefits will be experienced by all – now, and future generations.

Table 1.1 - Water management roles of mana whenua and non-Māori (from NPS-FM,2020)

Principle	Explanation	Principle	Explanation
Mana whakahaere	power, authority, and obligations of tangata whenua to make decisions that maintain, protect, and sustain the health and well-being of, and their relationship with, freshwater.	**Governance**	responsibility of those with authority for making decisions about freshwater to do so in a way that prioritises the health and well-being of freshwater now and into the future.
Kaitiakitanga	obligation of tangata whenua to preserve, restore, enhance, and sustainably use freshwater for the benefit of present and future generations.	**Stewardship**	obligation of all New Zealanders to manage freshwater in a way that sustains present and future generations.
Manaakitanga	process by which tangata whenua show respect, generosity, and care for freshwater and for others.	**Care and respect**	responsibility of all New Zealanders to care for freshwater in providing for the health of the nation.

Mana whenua are central to the achievement of Te Mana o te Wai and therefore central to the implementation of this strategy. Wellington Water's mana whenua partners for this SMS, are:

- Ngāti Toa represented by Te Rūnanga o Toa Rangitira (primary location: Porirua, Wellington, Te Awa Kairangi)
- Taranaki Whānui ki te Ūpoko o te Ika a Maui represented by Port Nicholson Block Settlement Trust (primary location: Wellington, Te Awa Kairangi and Wainuiomata).

As reported in our Statement of Intent (2021 – 2024), Wellington Water is on a journey to transform water in the region from Hangarua (its current altered state) to Te Ika Rō Wai (a pure form of water that you would expect to find in the head of Maui's fish). This transformation requires a healthy environment and work by those who live in and care for it. It will be a joint effort by community, district councils, Greater Wellington Regional Council and Wellington Water.

[7] *This Strategy was not written by mana whenua. This section was written with the learnings from current publicly available Information and to support the capability to engage with mana whenua partners of Ngāti Toa and Taranaki Whānui ki te Ūpoko o te Ika.*

Noting that there are significant changes to the Water Industry proposed through current Water Reform activities, it should be noted that each reference to "Wellington Water" in this document include any successor entity that may be established to stand in Wellington Water's shoes in the future.

1.1 Strategy Structure

This SMS articulates a long-term plan that is illustrated in Figure 1.1 and reflected in the strategy structure.

Figure 1.1 The structure of this Stormwater Management Strategy

2 Tēnei Rautaki | About this Strategy

2.1 He aha te wai āwhātanga? | What is stormwater?

Stormwater is rainwater that runs off the land, including modified land that is covered by impervious surfaces such as roofs, roads, driveways, and footpaths. Stormwater then runs over land either directly, or through pipes and drains, mixing with the streams, rivers and groundwater to our natural waterways and harbours[8].

As a result of increased hard surfaces associated with urbanisation, stormwater runs off the land more quickly and in greater volumes than before urbanisation occurred. This change in the 'natural water cycle' can adversely affect the mauri, and our enjoyment of water bodies.

Degradation of water quality, and the health of aquatic ecosystems from stormwater discharges has had a significant impact on our waterways, such as increasing flows resulting in increased stream erosion and the increased contribution of contaminants washing off our urban and rural surfaces. This impacts on all our relationships with water and impacts mana whenua from exercising Mana whakahaere, kaitiakitanga, rangatiratanga (sovereignty) and manaakitanga (respect for water).

2.2 How does stormwater affect water quality?

The flow of rainwater over impervious surfaces provides an effective pathway for contaminants to discharge to watercourses, aquifers, or the marine environment. Table 2.1, below, describes the most common sources of contaminants[9].

Table 2.1 - Common contaminant sources

Common Contaminant Source	Description
Roads, especially those with heavy traffic	An accumulation of fine particles of zinc, copper, and rubber from motor vehicle wear, as well as hydrocarbons from oil drips, exhaust pipes, and grit from wear and tear of roading materials.
Brownfield and greenfield development, including road building	Large earthworks[10] can result in erosion and sedimentation in streams, rivers, and coastal areas. Contaminants from previous activities on the development site.
Industrial areas	Industrial areas can be hot spots for stormwater contamination. Storage yards, building materials and routine activities that pose a risk of spills can all be sources of contamination to the stormwater system.
Land contaminated by historical land uses, including old landfills.	Surface runoff from contaminated sites can pick up a wide range of contaminants, depending on the historical land use. These typically include hydrocarbons, heavy metals, pesticides, herbicides, and fertilisers. Litter and objects may also be mobilised as a result of erosion.
Domestic and commercial building materials	Copper and zinc building materials can be a contamination source to stormwater. Unpainted, galvanised steel roofs and walls commonly used in commercial and industrial areas and older parts of our cities release zinc to the stormwater system.

[8] *The NRP defines "Stormwater" as - Runoff that has been intercepted, channelled, diverted, intensified, or accelerated by human modification of a land surface, or runoff from the external surface of any structure, because of precipitation and including any contaminants contained therein. For the avoidance of doubt, stormwater excludes discharges associated with earthworks, vegetation clearance, break-feeding and cultivation that are managed under rules in section 5.4 of the Plan.*

[9] *Addresses Schedule N(e).*

[10] *From the Regional Plan - "For the avoidance of doubt, stormwater excludes discharges associated with earthworks, vegetation clearance, break-feeding and cultivation that are managed under rules in section 5.4 of the Plan."*

	Copper is released from copper-cladding and copper drainpipes. This SMS targets cooper and zinc, however there are other contaminants that also originate because of this, such as, asbestos, microplastics, arsenic etc.
Domestic activities	A lack of understanding about the connectivity of the stormwater network to freshwater and coastal receiving environments can contribute to people discharging contaminants directly to the stormwater network through activities such as car washing, spills, paint brush washing, exotic plants or use of domestic fertiliser or pesticides.
Litter	Litter is dropped or blown around the city. This may be swept by runoff into the stormwater system, into streams, rivers, beaches, and coastal waters.
Private cross connections	Mistakenly connecting private wastewater laterals from a building's toilet to the stormwater system is a potential source of stormwater contamination. Connections of roof downpipes directly to the wastewater lateral or mistakenly connecting stormwater laterals to the wastewater system can also cause rainwater to overwhelm the sewer pipes resulting in overflows of untreated wastewater from gully traps and manholes. .
Wastewater overflows.	Where wastewater networks have insufficient capacity due to excessive infiltration of rainwater or groundwater, overflows of untreated wastewater can occur into stormwater network during high rainfall events or through leaks in the wastewater system contributing to the stormwater networks. Constructed overflows provide a pressure release mechanism which allows for wastewater (which is untreated but may be diluted through an increase in rainwater) to enter the stormwater network, rather than have untreated wastewater spill onto land creating an immediate public health risk.
Leaking Private Public Wastewater Networks	Aging and poor condition public and private wastewater networks that are leaking into the ground through pipe failures or leaking joints in the infrastructure. This wastewater is leaching into the ground and is connecting with high ground water tables or seeping into public stormwater networks or waterways.
Public Manhole and Pump Station overflows, including Gully trap overflows	This is public and private networks that have blocked or network condition issues resulting in network backing up and surcharging through manholes etc. These overflows typically overflow on land, but through natural flow paths can make their way to stormwater networks or water ways. This can also occur when networks are in poor condition and allow infiltration into network through rain events that can result in mixing of stormwater and result in overflows in public and private networks, through manhole lids, chamber lids or private gully traps.

The urban stormwater network was designed to support public health and economic outcomes through collecting and carrying rainwater away from buildings and roads. Urban stormwater management is a necessity for any community has significant potential to enhance the health and well-being of the urban environment and the community.

All modern land use changes contribute to a reduction in water quality and therefore the diminishing mauri of our waterbodies. Given urban areas are intensifying and expanding, mana whenua has raised concerns that this will result in contamination of land and waters leading to further degradation of our natural environments / taiao. This is reflected in impacts across the region on recreational water quality and on Māori customary uses, such as the kaitiaki role with water practised through mahinga kai, including:

- Contaminated waters compromising the habitats and ecosystems that sustain life for taonga species (treasured species), such as kōura, kōkupu, and tuna.
- Contamination of, and increased risk to, wāhi tapu / sacred places near the waterbodies – from increased stormwater flows from development, accelerating erosion and the carrying of increasing levels of contaminants.
- Contamination of the waterbodies weakens the ability to practice cultural practices and sharing knowledge across the generations. This has lasting impacts on overall cultural and social wellbeing of people.

2.3 Our role in managing stormwater

Wellington Water manages the public urban network[11] that collects, conveys, and disposes of stormwater on behalf of our client councils. This management includes the following roles:

- Obtaining and complying with regional discharge consents (the subject of this SMS)
- Carrying out works in the beds of some urban waterways.
- Processing applications to each council for new or modified connections to the network and engineering approval of extensions to the public networks (to support subdivision and new roads).
- Investigations, modelling, design and installation of network replacements, upgrades, and improvements
- Operations and maintenance of the existing public networks
- Data management
- Asset management, including providing recommendations to councils for future funding to achieve the above.

Regarding connections and engineering approval of extensions, one of Wellington Water's role is to provide the engineering assessment and recommendation for approval of new or modified connections to the stormwater network. This role requires consideration of requirements under the Local Government Act, Building Act and Resource Management Act, depending on the proposal and where appropriate[12].

Historically these assessments have been based on councils' provision of primary level of service comprised of pipes, formed drainage channels and soakage systems that were designed and managed to carry rainwater away from buildings and properties. More recently, Wellington Water has sought to provide a secondary level of service comprised of overland flow paths and along road surfaces to protect people and properties from the flood hazards from larger rain events.

Wellington Water also has the role of obtaining and complying with regional consents for the discharge of stormwater from the council-owned reticulated networks. To obtain a long-term consent, a SMS is needed for the discharges from Porirua, Wellington, Hutt, and Upper Hutt City Councils (**Error! Reference source not found.**)[13]. To support this role, this SMS addresses a new level of service - improved water quality of stormwater discharges to the receiving environment (streams, rivers, and coastal areas). Therefore, this level of service is a new requirement under the Resource Management Act when assessing new or modified connections to the network.

To achieve the outcomes of this new level of service, Wellington Water's role is also to work closely with our mana whenua partners, Regional Council, Territorial Authorities, and other network providers to address stormwater management in new and existing urban areas. Our goal is that our role will be stewards of the environment that support mana whenua as kaitiaki.

This new level of service also requires changes to the management programmes associated with investigations, operations and maintenance, and data and asset management, which are discussed in more detail in the Chapters that follow.

As mentioned previously, it is anticipated that all these roles associated with the management of the public network will be transferred to the new water utility entity set up under the Three Waters Reform legislation on the 1st of July 2024.

[11] The NRP defines "stormwater network" as - The network of devices designed to capture, detain, treat, transport and discharge stormwater, including but not limited to kerbs, intake structures, pipes, soak pits, sumps, swales and constructed ponds and wetlands, and that serves a road or more than one property.

[12] Not all connections can be assessed under the RMA, depending on the rules in the Regional and District Plans.

[13] Although Wellington Water also manages the stormwater networks owned by South Wairarapa District Council, the discharge consent for these networks do not currently require a SMS and therefore this SMS does not include this council area.

Figure 2.1 Map showing the four council areas of Porirua, Wellington, Hutt, and Upper Hutt City Councils covered by this Stormwater Management Strategy.

3 Regulatory Context

Wellington Water needs a resource consent under the Resource Management Act (RMA) to discharge stormwater from the council-owned stormwater network into water, or onto or into land where it may enter water[14]. As required under the RMA, the management of water must give effect to Te Mana o te Wai as required by the National Policy Statement for Freshwater Management (NPS-FM). Also under the RMA, urban development must enable growth, as required by the National Policy Statement on Urban Development (NPS-UD).

The requirements for this discharge consent are specified in the Natural Resources Plan for the Wellington Region (NRP) which is the responsibility of Greater Wellington Regional Council (GWRC). The NRP requires an application for resource consent for the discharge of stormwater from a local authority network to be supported by a SMS that is in accordance with Schedule N of the NRP (see Appendix B). The conditions of consent, once granted, will refer to specific aspects of this SMS. In this way, this SMS provides a way in which compliance with the consent will be achieved.

More detail on the provisions in the NRP that are of most relevance to this SMS and the resource consent is provided in Figure 3.1[15].

[14] *Rule R53 of the NRP*
[15] *Addresses Schedule N(a) & N(b).*

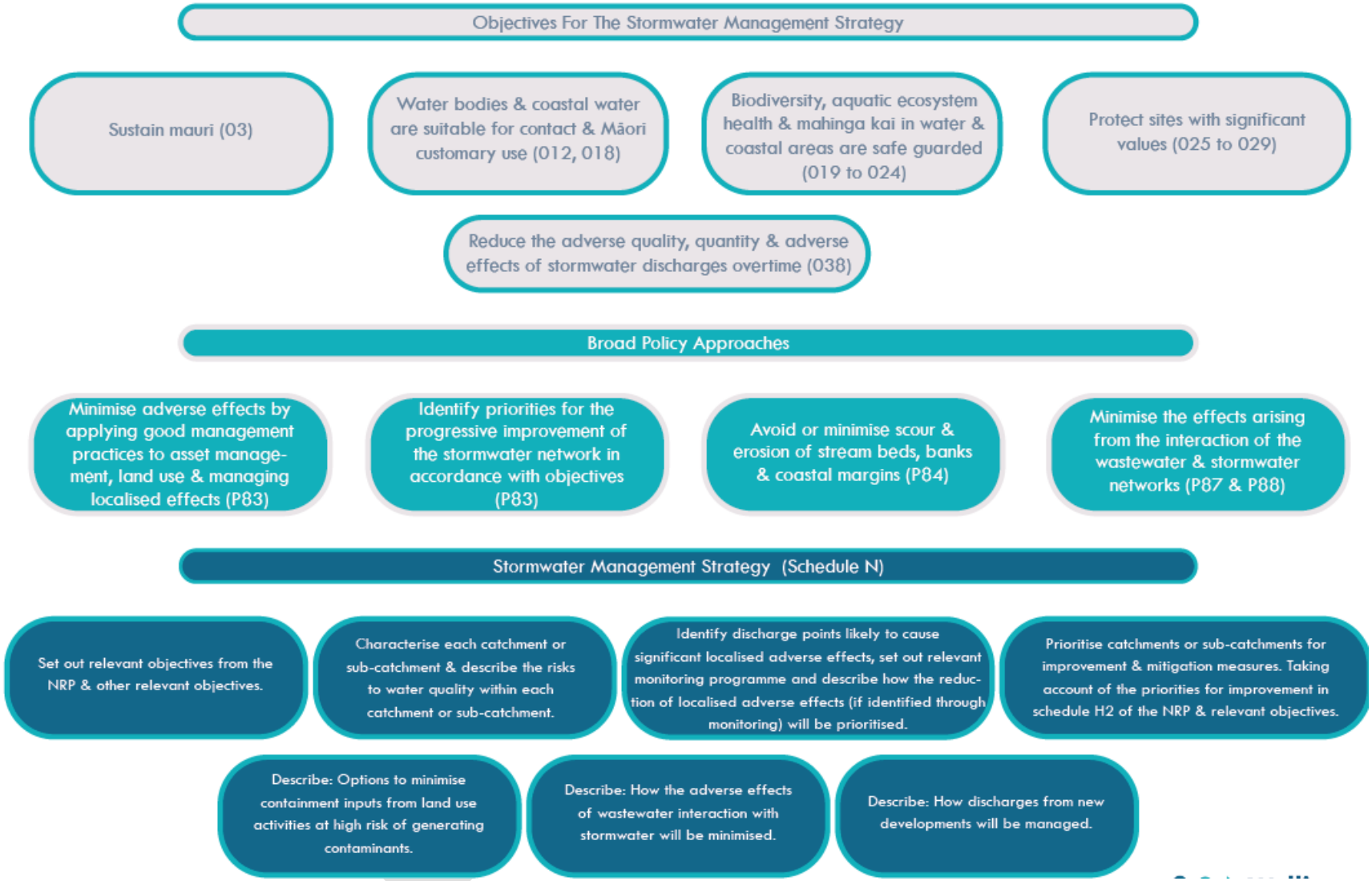

Figure 3.1 - Natural Resources Plan Regulatory Framework for this SMS. Objectives in the NRP are numbered starting with an "O" and Policies start with a "P".

3.1 Compliance with the SMS

This SMS will be referred to in the conditions of consent of the granted global consent.

This SMS will result in Wellington Water needing to expand or develop new programmes of work associated with stormwater management for water quality, which will require funding and investment by the asset owner to be obtained and invested. This SMS itself cannot guarantee this funding. However, this SMS includes a governance structure to support securing appropriate funding (see Chapter 9) to be enforced through the stormwater consent.

The NRP anticipates that this SMS will be implemented both by the operator of the stormwater network [16] and by developers of future growth (through Workstream 1 and Workstream 2)[17]. It is acknowledged that a plan change to the rules in the NRP would assist in clarifying how existing and new connections to the network must comply with this SMS.

This SMS will set out a framework that private urban developers and existing land users will need to comply with, to avoid the generation of contaminants from entering stormwater. It will also manage the stormwater that is generated on, and runs off their development, with respect to quantity or quality before it enters the council-owned network.

In most cases, but not all, the SMS framework for private urban development and existing land uses are given effect to by provisions under the RMA (through rules in the NRP) or by provisions under the Local Government Act (LGA), including through bylaws and codes of practice. This is illustrated in Figure 3.2.

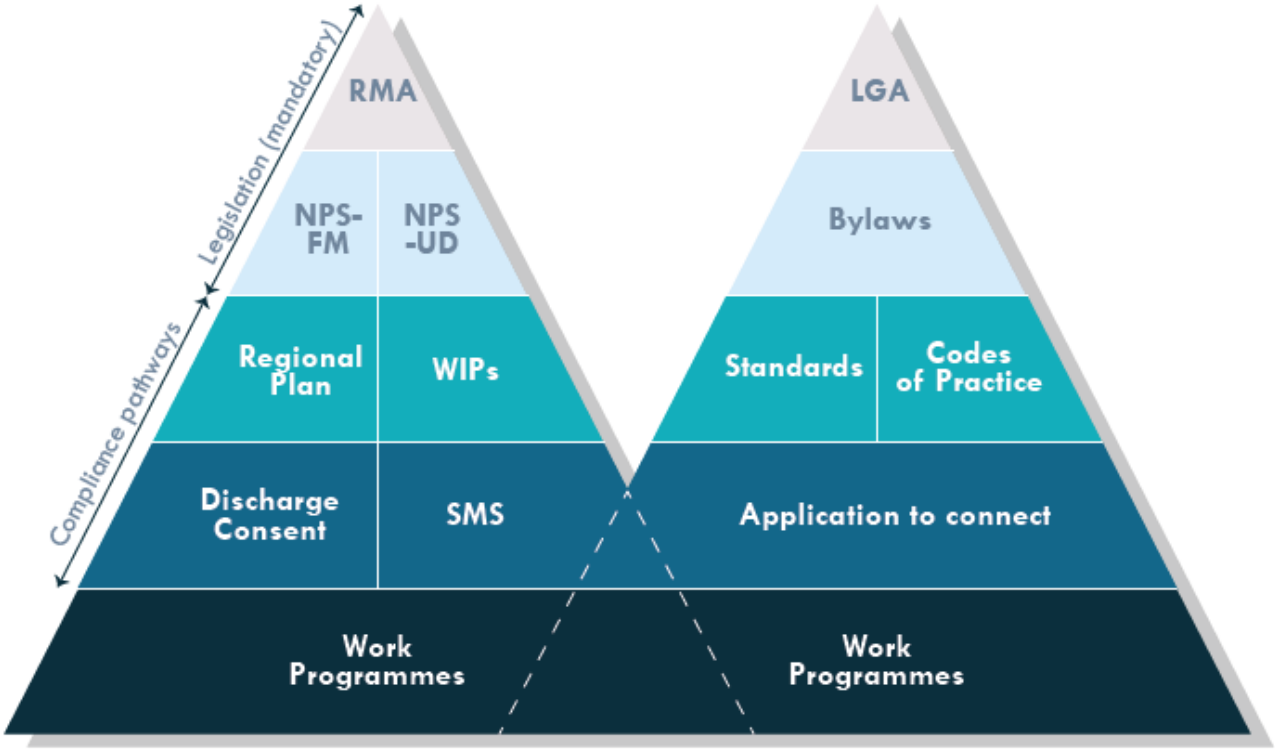

Figure 3.2 - Giving effect to this SMS under the RMA and LGA

As noted above, provisions under the RMA and LGA do not give effect to this SMS in all cases of private urban development and existing land uses. This is due to gaps in existing regulations in both the NRP (Regional Plan) and District Plans that permit stormwater discharges without any conditions or need for consent.

[16] *In accordance with Rule R53 in NRP*
[17] *In accordance with Rule R49 in NRP*

There are also gaps in stormwater bylaws that, if revised, could be used to give effect to the management framework in this SMS. At the time of publication of this SMS, it is understood that legislation under the Three Waters Reform is intended to be in effect on 1 July 2024 and that this legislation will repeal and replace certain portions of the LGA, including bylaws and codes of practice. It is unknown how or if this new legislation will support the need for compliance with this SMS.

3.2 What's in and What's out

This SMS contains specific stormwater management actions to improve the wellbeing of our streams, rivers, and harbours, through focusing specifically on the reduction of:

- E. coli (in freshwater) or Enterococci (in coastal water) (as a bacterial indicator of wastewater- this is largely intended to be addressed through actions in the Wastewater Network Overflow consent) – see Figure C 1 In Appendix C.
- Nutrients (which promote algal growth)
- Heavy metals (copper and zinc) (which are toxic to aquatic life)
- Sediment from surface wash-off (and which are bound to heavy metals and other urban contaminants)
- Stream scour (erosion and stream downcutting)
- Gross pollutants (litter and particles larger than 5 mm).

This SMS focuses on managing the networks to minimise the discharge of the contaminants above and scour events, and in keeping with integrated catchment management approaches it supports activities to improve the state of our waterways. The contaminants of focus serve as a proxy measure that accounts for the contaminants excluded from this SMS.

The following will be excluded from the resource consent and from this SMS, as they are subject to their own regulatory processes, controls, and measures:

- Leachates from old landfills
- Sediment generated through bulk earthworks and construction
- Flood management, other than specific requirements related to managing increased flooding from urban surfaces and its impact on scour and erosion within waterways, associated with network discharges
- Wastewater overflows from the public wastewater network (see Figure C 1In Appendix C), other than integrated investigations associated with stormwater discharges.

Although most surface water and river flood management are not in the scope of this SMS, an integrated approach is intended to be applied when the management options are assessed to ensure that flood management and water quality matters are looked at holistically.

The management of untreated wastewater overflows from the public wastewater network into the stormwater network will primarily be consented through the Wastewater Network Overflow Consent, although this SMS has several work programmes that are integrated with this important work.

4 Our Journey to Wai Ora

This whakataukī ('proverb') is clear that the journey to wai ora (healthy water) requires us to understand how our stormwater has been managed in the past, and present to help guide us as we look forward.

Kia whakatōmuri te haere whakamua.
I walk backwards into the future with my eyes fixed on my past.

4.1 Ka mua | Looking Back

Over generations, water and stormwater management has changed significantly. Water helped shape and create our landforms and once enabled us to gather food, seek shelter and settle. The region was cloaked in abundant forests, supporting natural freshwater environments such as streams, rivers, and wetlands out through into the harbours and coastal margins. The state of wai ora enabled people to thrive across the region.

Unfortunately, in the past 100 years there has been a pattern of water quality degradation. As the influx of non-Māori settlers challenged and changed land ownership and traditional waterway approaches to enable economic wellbeing, in the form of urban development to begin across the region. Our region's water quality was impacted by the activities that led to point discharges, the leaching and runoff of stormwater from urban development as well as our relationship with stormwater that soured through decades of treating it as a nuisance. Forests were cleared, streams (such as the Pipitea Stream, Waimapihi (Te Aro) Stream, Porirua Stream and Waiwhetu Stream) were piped, rivers channelised and the coastal estuary reclaimed to provide land for development.

This water quality degradation needs to be repaired but it will take time. It could be another 100 years before our waterways are restored to clean and healthy quality levels. Mana whenua provide a guide for this journey setting the framework for wai ora[18], and supporting the creation of a pathway of short-to-medium term steps. Steps beyond this timeframe have been left for the next generation to determine, so they can reflect on their own aspirations and contexts.

Brown R. K. (2009) identified an approach to share how urban environments have transitioned over time and presents an aspirational view for supporting the journey to wai ora. The potential for producing water sensitive cities and resilient communities through Water Sensitive Urban Design, has been shown to be closely aligned to the aspirations of Māori for water environments across Aotearoa New Zealand (Afoa, 2019). The following descriptions relate to Figure 4.1:

- ***Water Supply and Sewered City*** era: In the early parts of this century the focus was driven by the need to deliver safe drinking water, remove sewage, and drain land to enable development to take place.
- ***Drained City*** era: Stormwater was something to be disposed of to reduce the risk of flooding, resulting in the construction of drains and channels. Areas were often piped to take stormwater from agricultural and urban areas and transport it to waterways or directly to the bays.

[18] *As identified in the Te Whaitua te Whanganui-a-Tara Implementation Programme 2021*

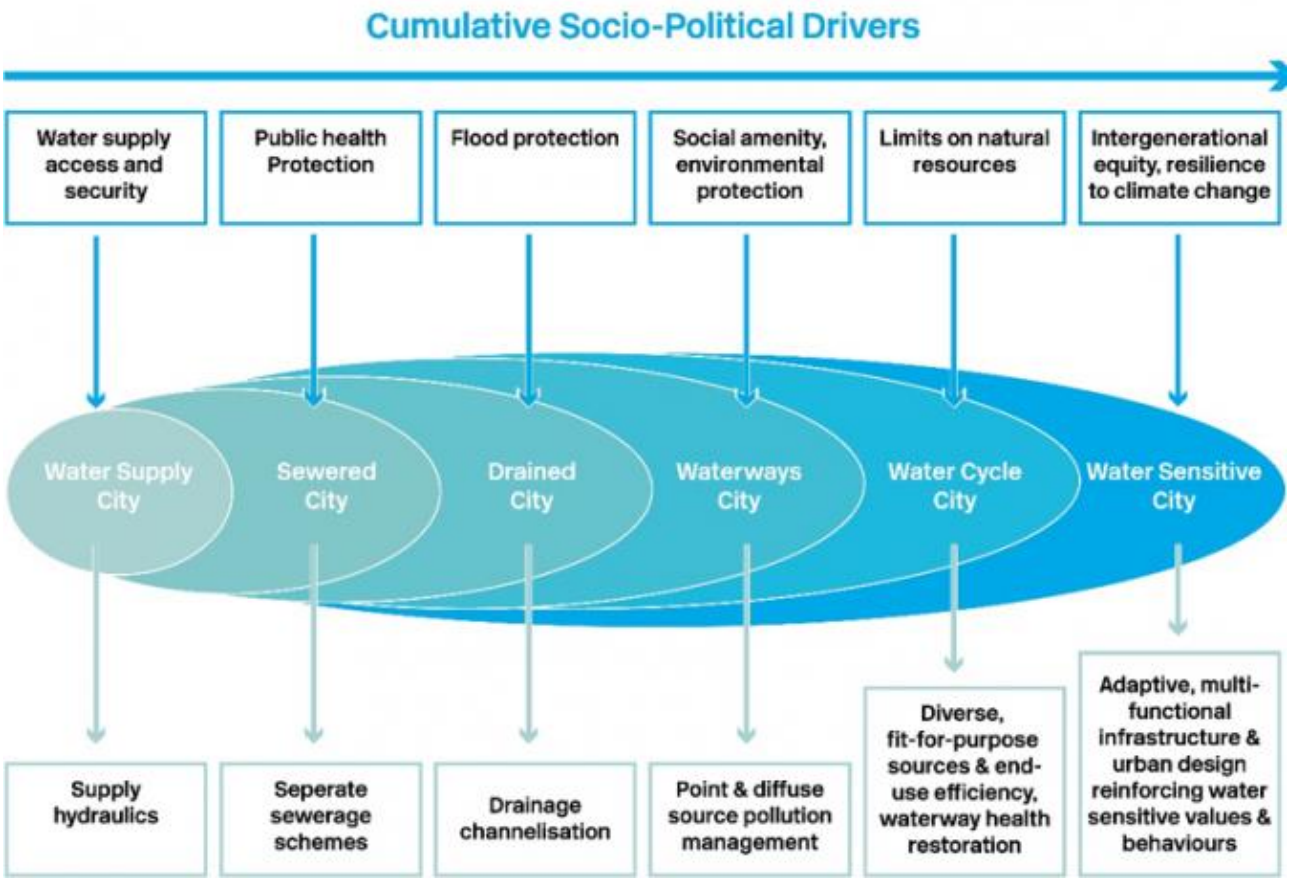

Figure 4.1 - Water Sensitive Cities framework: the urban water transition phases (Brown R.K., 2009)

Throughout the mid-20th century, the awareness of environmental impacts on our waterbodies and the approaches to manage this was regularly questioned[19]. During this time, Wellington's urban settlements were still served through efficient methods to dispose of stormwater rapidly. Discharging contaminants to water environments was a matter of significance in early Waitangi Tribunal claims during the 1970s and 1980s, leading to changes in national legislation, through the Resource Management Act in 1991.

The era of the **Waterways City**: Over the latter part of the twentieth century, scrutiny on the impacts of urbanisation on our water environments increased and the need for central government policy on freshwater quality became apparent. This gap was filled finally in 2011[20]. This enabled a new focus where community awareness and pressure pushed thinking towards integrating urban planning and stormwater management.

The beginning of the past decade saw an increasing awareness and slow adoption of water sensitive design approaches across the region, and an increasing awareness of the impacts of stormwater flows on environmental values, highlighting the journey that we are currently on, with the emergence of the **Water Cycle City** era, where we collaboratively focus on targeting our efforts towards understanding and remedying existing point source and diffuse source pollution.

[19] *Resulting in the creation of Regional Water Boards through the 1967 Water and Soil Conservation Act.*
[20] *The National Policy Statement for Freshwater (NPS-FM) introduced in 2011. Updated and replaced in 2014 and amended in 2017. The NPS-FM was further updated in 2020 – replacing these previous versions.*

4.2 Nāianei | At present

Regular monitoring by GWRC and monitoring for the Stage 1 Global Stormwater Consent indicates that some coastal areas, rivers, and streams are adversely affected by discharges from urban land use, stormwater, and wastewater overflows.

4.2.1 Stage 1 Consent

The development of this SMS is a requirement (condition 17) of the Stage 1 Global Stormwater Consent.

Monitoring undertaken as part of the purpose of the short-term Stage 1 consent has improved our understanding of the water quality across the region and the impact of stormwater discharges. In general, monitoring [21] indicates most of our urban streams have poor water quality with regards to E. coli, copper, zinc, and nutrients.

4.2.2 Our Catchments

This SMS supports stormwater management for water quality in three major catchments[22] in the Wellington Region - Te Whanganui-a-Tara | Wellington Harbour[23], Te Awarua-o-Porirua Harbour and Te Moana-o-Raukawa | Cook Strait. Although these catchments include rural areas outside of the main urban centres of the Hutt Valley, Porirua, and Wellington, this SMS focuses only on the urban zones.

For the Stage 1 Global Stormwater Discharge Consent, approximately 30 stormwater catchments were identified based on receiving environments and the stormwater reticulation network, as shown in Appendix D.

Detail of the existing condition likely future pressures in with regards to urban land use that can affect the water quality of stormwater discharges[24] in each of the sub-catchments[25] is provided in Appendix D. These characteristics include, catchment area, urbanised areas, location of stormwater and wastewater infrastructure, contaminated land and Hazardous Activities and Industries List (HAIL) sites, locations of stormwater and receiving water monitoring locations, sites of significance to mana whenua and other characteristics required in Schedule N of the NRP as listed in Appendix B.

Please note that the initial maps and information provided in Appendix D are draft at this time and the final SMS will provide further detail including providing information as online maps available to the public as well to provide a base level of information to build on during the development of SCaMPs.

In addition, it is important to note that some specific information on catchment characteristics, localised effects and stormwater quality management options will be produced as stormwater SCaMPs following prioritisation, investigation, modelling, and consultation. Further details of SCaMPs are included in Section 3: Our Response.

[21] Stormwater Monitoring Plan Annual Report 2020-2021

[22] A catchment is a basin shaped area of land often bounded by hills or mountains. Rainwater that falls on a catchment is collected naturally in streams and channels where it flows to a common outlet, such as a river or ocean. Reticulated networks that collect rainwater don't always follow surface features and therefore reticulated urban stormwater networks and their outlet can also be used to define catchment boundaries

[23] Te Whanganui a Tara means "is the great harbour of Tara" in te reo Māori. This is one of the names of this area and was named after the tupuna (ancestor) Tara. Other names this area is referred to are 'Te Ūpoko o te Ika a Māui' 'the head of Māui's fish' and 'Pōneke' referring to Port Nicholson. In te reo Pākehā (the English language) it is referred to as Wellington after the first Duke of Wellington settled in 1840.

[24] Addresses Schedule N(e).

[25] The distinction between a catchment and sub-catchment is a management decision. Every catchment can be geographically divided into numerous smaller and smaller sub-catchments. To this SMS, a sub-catchment is a geographically defined management unit.

4.3 Ka muri | Looking Forward

Ehara taku toa i te toa takitahi, engari he toa takitini
Success is not the work of an individual, but that of many.

As described in Wellington Water's Statement of Intent, Te Ika Rō Wai[26] is the vision and goal of Wellington Water to carry out activities that will restore the balance and mauri of our waterways over the next 100 years. Where we are heading is informed by drawing from the visions and perspectives of those who care and live within the Whaitua. Moving our organisation towards Te Ika Rō Wai, requires us to deliver on an integrated water management approach.

Wellington Water acknowledges the extensive mahi already completed by the Whanganui-a-Tara and Te Awarua-o-Porirua Whaitua committees. These committees led years of consultation, analysis, and information sourcing to gain perspectives from others who live and care for the Whaitua to issue implementation plans that outline the 'where are we heading?' and 'how?' questions to stormwater management in this region. The following is an overview of the Whaitua Implementation Plans that answers the question of 'where are we heading?'.

Te Mahere Wai-o-Kahui Taiao that includes a vision for Te Whaitua te Whanganui-a-Tara Implementation Programme from both Taranaki Whānui and Ngāti Toa states that the *'long term vision is for all waterways in Wellington, Lower Hutt and Upper Hutt to be restored to a state of wai ora within 100 years.'*[27]

Ngāti Toa's vision for Te Awarua-o-Porirua Whaitua is captured in the Ngāti Toa Rangitira Whaitua Statement[28], '*That the mauri of Te Awarua-o-Porirua is restored, and its waters are healthy so that all those that live in the region, including Ngāti Toa and our manuhiri, can enjoy, live and play in our environment and future generations are sustained, physically and culturally.'*

Both Whaitua committees describe the vision for stormwater management to be one that achieves a state of wai ora (healthy water) and restoring the mauri of our waterways. This stormwater management strategy aims to honour these visions by defining that this is where we are heading – A Journey to Wai Ora.

We will know we have achieved a state of wai ora because the wai will tell us. We will know because we will be able to witness ecosystem restoration, have access to mahinga kai sites to provide capacity for manaakitanga for Mana Whenua and manuhiri as well as have a strengthened connection to water.

The collaborative journey to wai ora will help us achieve the regional transition of our urban centres to becoming a **Water Sensitive City**, as shown in Figure 4.1. Wellington Water will continue to play a myriad of roles in the region's transition to a more sustainable water future and vision of wai ora ranging from leader to regulator to infrastructure developer to modeller and many more.

It has taken us over 100 years to gradually degrade our waterways to leave them at their current state. There is no magic bullet to resolve our past indiscretions, and it will take many years of collaboration before we see an obvious improvement in our waterways. Wellington Water will work with our partners, stakeholders, and wider communities as we embark on our journey towards healthy waterways and harbours over the next 70 to 100 years.

[26] *Our Water, Our Future: Wellington Water Statement of Intent 2021-2024*
[27] *Te Whaitua te Whanganui-a-Tara Implementation Programme 2021*
[28] *http://www.gw.govt.nz/assets/Whaitua/Ngati Toa TAoP Whaitua statement.pdf*

Section 2: Purpose, Vision & Objectives

5 Te Kaupapa Matua | Purpose

This SMS sets out how we will minimise the adverse effects of stormwater discharges to improve water quality[29]. This will be achieved, in part, by identifying priorities for progressive improvement, and timeframes to achieve this improvement[30]

Therefore, the purpose of this document is to describe how Wellington Water will manage stormwater discharges across the urban areas to restore and maintain the mauri of waterbodies and to help achieve our long-term vision.

6 Te Whakakitenga | Vision

The vision developed specifically for this Stormwater Management Strategy is:

"Our region treasures its water. Our streams and harbours are healthy, our drinking water is safe and secure, our networks are resilient, our growing cities are water sensitive, and we are prepared for a changing climate. Water is at the core of how we plan and grow our cities."

6.1 The importance of our vision

Our vision for stormwater management will guide us on our Journey to Wai Ora. It signifies the long term, integrated and adaptive management journey we are on, by sustainably reversing and minimising the effects of stormwater discharges on the mauri of our waterways and harbours overtime, and integrated with the management of sustainable water use, flood, and wastewater management as part as a community of people and organisations that influence water quality.

The SMS will be reviewed on a regular basis across the life of the Stage 2 Global Stormwater Discharge Consent. It is based on a framework that addresses challenges but connects our stormwater work to Te Mana o Te Wai, through the implementation of the Whaitua[31] recommendations, community outcomes, and national best practice. This framework prioritises where specific programmes of work will support Wellington Water to play our part on the Journey to Wai Ora.

Breaking the journey into short-, medium- and long-term timeframes enables us to continuously adapt our approach to stormwater management to achieve progressive improvement.

[29] *In accordance with Policy P83.*
[30] *In accordance with Policy P86.*

7 Objectives and Principles

This SMS identifies three objectives and three principles which will guide the management of stormwater discharges for water quality over the life of the Stage 2 Global Stormwater Discharge Consent and its conditions to help us measure our progress towards achieving our vision. Woven together, the objectives and principles form a Kete that contains the six work programmes needed to implement this SMS, as shown within Figure 7.1.

7.1 Our Kete – how this SMS will influence our delivery

Our approach is to weave together our principles and objectives that are aligned with the principles of Te Mana o te Wai into a Kete that contains all the work programmes needed to implement this SMS. This approach illustrates the way we will:

1. Work in partnership with mana whenua to prioritise the mauri of our waterbodies. It is necessary to prioritise works to get the 'best outcome for effort'. By working closely with our mana whenua partners, opportunities will be identified to invest in on-ground works that deliver outcomes that enhance our environment, our wellbeing, and the enjoyment provided by our water environments.
2. Take an integrated management approach that considers how multiple benefits and efficiencies can be gained by aligning the goals and activities of this SMS with other strategies for the three waters networks we manage.
3. Support sustainable growth through best practice stormwater planning activities. We will continue to work on preventing degradation to waterways occurring from land use changes and new development as well as strategically investing to decrease the negative impacts from stormwater in priority areas. This includes the prioritised approach to developing stormwater Sub-Catchment Management Plans (SCaMPs). These activities will provide the tools, knowledge for new developments to minimise the adverse effects of stormwater, while ensuring that the social, cultural, economic, and environmental well-being of the community is maintained and enhanced.
4. Be adaptive – being flexible and open to new management approaches as knowledge, information, and technology becomes available. Using an adaptive management approach ensures that management decisions are based on what we have learned.

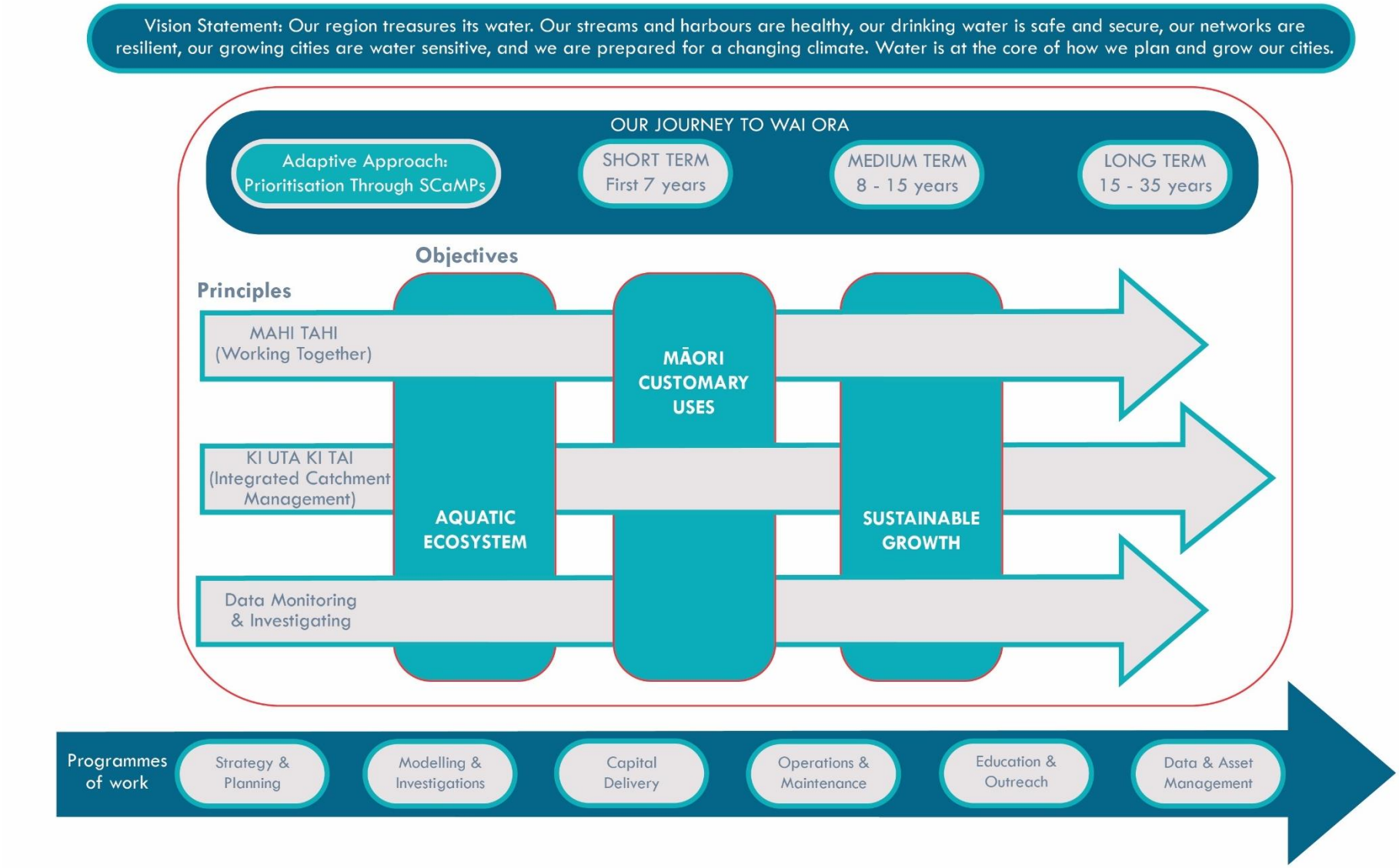

Figure 7.1 - Objectives and Principles of this SMS to guide us on our journey to wai ora and achieving our vision.

7.2 Objectives

Through an internal process working across Wellington Water, we have identified three objectives[32] that will guide our decision making and direct us towards supporting them.

7.2.1 Aquatic ecosystem health, biodiversity and mahinga kai

Aquatic Ecosystem Health encapsulates that this objective is to ***"safeguard biodiversity, aquatic health and mahinga kai"***[33]. We will protect and enhance the ecosystem of stormwater receiving environments by designing our infrastructure in unity with nature through an integrated approach to new and existing urban development. To support this objective the following will be incorporated into the implementation of this SMS:

- Understand the condition of waterways and the values they support, and the action required to improve them,
- Improve the water quality of stormwater discharging into the waterways, harbours, and coastal environments,
- Maintain and restore fish passage at man-made instream structures,
- Support the implementation of WSD as the guiding principle for all new development, and
- Minimise stream modification and loss of natural streams.

7.2.2 Māori Customary Uses & Contact Recreation

Healthy waterways are important sources to the well-being of communities, where we want people to be able to enjoy our beaches, rivers, streams, and the natural environment with the confidence that the waterways are healthy. Implementing this SMS will ensure that the waterbodies and harbours are ***"suitable for contact recreation and Māori customary uses"***[34].

Our mana whenua partners' te Ao Māori (world view) approach embodies this holistic perception, and by partnering with mana whenua we, as a steward, will support them in their role as kaitiaki (guardians) of the water bodies in the region. The concept of te mana o te mauri o te wai (the spiritual values of the water) recognises the life-supporting capacity and capability of water.

We aim to uphold these values and align our work to achieve te hauora o te wai (the health and wellbeing of water), te hauora o te tāngata (the health and wellbeing of people), and te hauora o te taiao (the health and wellbeing of the environment). This objective helps us deliver these aspirations through the following:

- Prioritise the principles of Te Mana o te Wai, and
- Work in genuine partnership and building capacity with mana whenua and the community.

7.2.3 Sustainable Growth

This SMS supports **well-functioning urban environments**[35] while enhancing and protecting the mauri of our waterways and harbours. Implementing this SMS will support sustainable growth through the following:

- Use a risk-based approach plan, cost and timeously deliver infrastructure assets to meet future stormwater requirements for the growing region, supporting the aspirations to deliver 'better growth' through the NPS-UD.
- Provide clear guidance on catchment specific stormwater requirements in new growth areas (SCaMPs).
- Establish good working relationships with the development community to support the development of rules, requirements and supporting the understanding and implementation of best practice stormwater management.
- Minimise contaminant loads through education, integrated planning, and provision of infrastructure.
- Align with flood risk management approaches during implementation of water sensitive design solutions.

[32] *As required by Schedule N*
[33] *In alignment with Objective O19 of the NRP*
[34] *In alignment with Objective O18 of the NRP.*
[35] *In alignment with the NPS-UD*

7.3 Principles

We have identified three key principles that will bind our work programme moving forward.

7.3.1 Mahi Tahi / working together

The first key principle is Mahi Tahi or working together. This involves improving the connectivity between our communities and stormwater. Examples where Mahi Tahi will guide us is through working with:

- Council Roading, Parks, Waste Minimisation and Planning departments, on the installation, operation and maintenance of water quality devices and green infrastructure,
- Council building officers to manage building site sediment,
- Greater Wellington Regional Council to support the development of a regional stormwater contaminant model to report on urban and rural water quality, track changes from installing water quality devices and rule-based and voluntary actions, and test the benefits and costs of proposed solutions,
- The industry to promote best management practices, and
- Mana whenua and communities to support and implement monitoring and restoration programmes.

Mahi Tahi and establishing and maintaining genuine partnerships with others in all that we do, sharing knowledge and building capacity, and communicating outcomes will be critical for successful implementation of this SMS and our approach is captured in the governance chapter (Chapter 9).

7.3.2 Ki uta ki tai (Integrated Catchment Management)

Ki uta ki tai (translated as mountains to sea) acknowledges that everything is connected. It acknowledges the connections between people and communities, people and the land, and people and water. In terms of stormwater management, this links the atmosphere, surface water, groundwater, land use, water quality, water quantity, and the coast.

This highlights the need to manage stormwater quality through an Integrated Catchment Management approach and to enable WSD to be implemented into new and existing development. This will be particularly important as council networks become further pressured through ageing assets, growth, sea level rise and a changing climate.

7.3.3 Adaptive management informed through monitoring, investigations, and research

As we live in a time of change and uncertainty, an adaptive management approach to implementation is needed. Retraining the sector to value urban water management, around aquatic ecosystem health and Māori customary values, will require curiosity, innovation, and the courage to embrace lessons from both successes and failures.

Learning together and sharing lessons learned through demonstration projects and partnerships with mana whenua, all levels of government, business, industry, academia, the voluntary sector, and others will

- build collective capacity,
- allow us to understand barriers and opportunities, and
- learn and adjust programs as they are implemented.

This SMS is underpinned by monitoring, including Mātauranga Māori, investigations, and research. Monitoring will be undertaken in accordance with policy requirements set out in the NRP[36]. Monitoring performs two roles (1) compliance monitoring to satisfy specific consent compliance conditions, and (2) performance monitoring of the system, to:

[36] *In alignment with Policy P85(b): Undertaking monitoring to identify the adverse quality and quantity effects of discharges from the stormwater network.*

- inform us on the success of our interventions and support identification of possible issues requiring future projects or management actions,
- further development of conceptual models,
- address knowledge gaps and assists strategic and policy development and direction.

However, it is difficult for monitoring to identify direct correlations between stormwater discharges and the health of the receiving environment. This is due to several reasons, such as concentrations of contaminants in stormwater vary depending on when the sample is taken, there are too many discharge points to monitor, water quality is also affected by rural runoff, and ecological interactions include more than just water quality (such as sunlight, recruitment, and habitat quality). Therefore, successful monitoring must be coupled with dynamic contaminant modelling[37]. For the Wellington Region, this effort is being led by GWRC with support from Wellington Water and others.

To support progressive improvement over time, we will use an adaptive management approach to re-prioritise catchments for investigations and SCaMP development dependent on the monitoring and modelling information, following our prioritisation process, shown in Chapter 8.**Error! Reference source not found.**Figure 7.2 and illustrated in Figure 7.2.

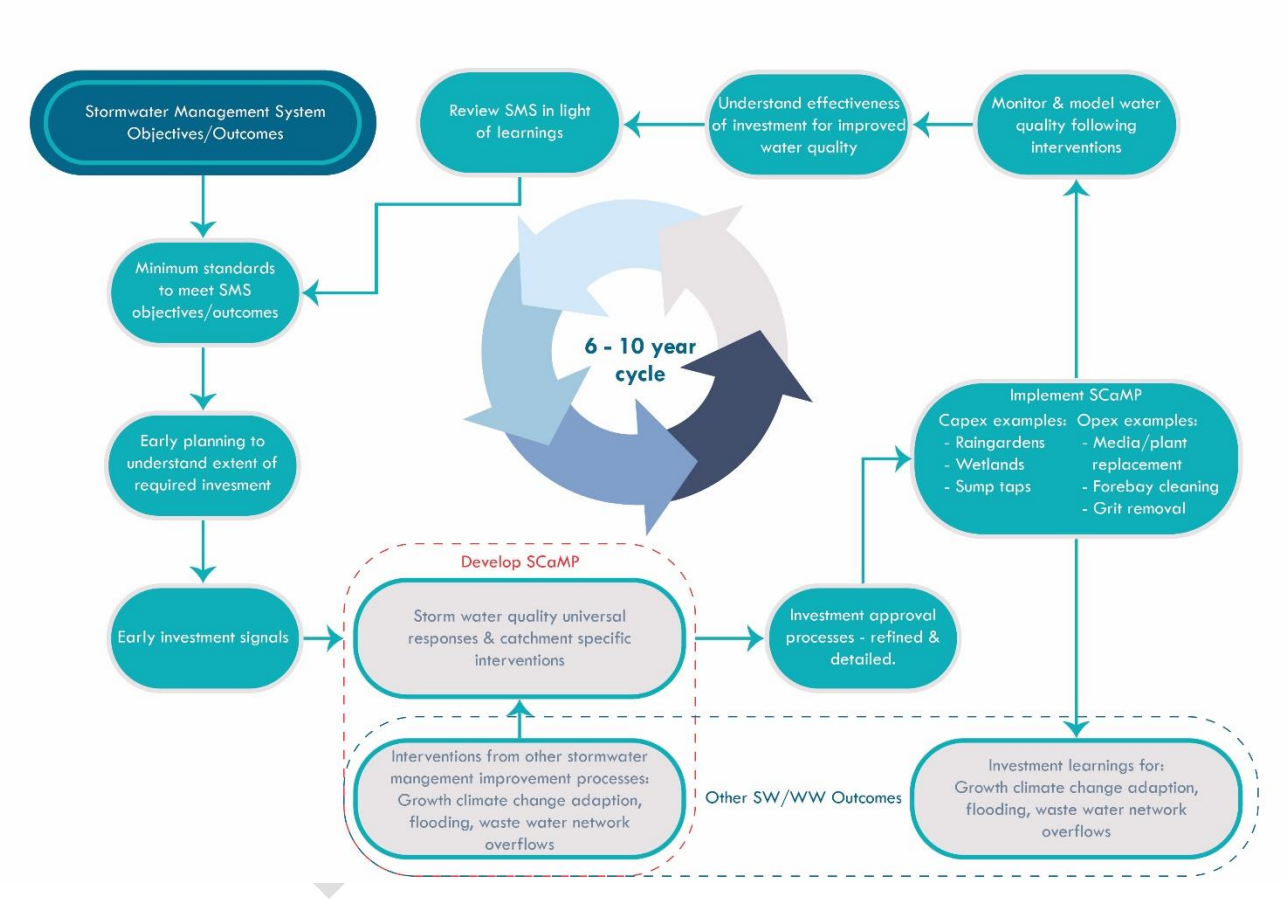

Figure 7.2 - Adaptive management is an important part of the investment, implementation, and review cycle.

[37] *An example of this is Auckland Council's Freshwater Management Tool.*

Section 3: Responses

8 Responses – Two Workstreams

The Objectives and Principles discussed in the section above will be achieved through two workstreams that will be implemented concurrently, as shown in Table 8.1.

Table 8.1 - Two workstreams of this SMS.

Workstream 1: Universal responses						
Requirement	*Site-specific SCaMPs for sites >3,000m²*	*No new exposed copper or zinc cladding*	*Gross pollutant traps*	*Hydraulic neutrality*	*Industrial health checks*	
Workstream 2: Short, medium, and long-term work programmes						
Work Programme	*Strategy and planning*	*Modelling & investigations* (incl, acute human health risk investigations)	*Capital delivery (incl. prioritised SCaMPs*	*Operations and maintenance*	*Education and outreach*	*Data and asset management*

8.1 Workstream 1: Universal Responses

Workstream 1 focuses on minimising sources of contamination to the public stormwater network from new development and from existing potential hot spots such as carparks and industrial sites prior to the development of Wellington Water-led SCaMPs (under Workstream 2 below).

In our supporting role of approving new connections to the public stormwater network (see Chapter 2.3), Workstream 1 will require all new development not covered by a SCaMP to deliver on a set of stormwater mitigations referred to as Universal Responses. Universal Responses for new development and subdivisions will be enforced as a requirement of the approval to connect to the public stormwater network under the RMA or the LGA and stormwater bylaws. It is anticipated that legislation under Three Waters Reform will replace current LGA and bylaw requirements for connections to the public network.

The greatest opportunities available to achieve our journey to wai ora are those associated with development and regeneration. It is more cost-effective to design new developments with appropriate stormwater management than to retrofit existing urban areas. To address this, Workstream 1 requires all new developments and redevelopments on sites greater than 3,000 m[38] to have a site-specific SCaMP (if they are not already covered by an approved sub-catchment scale SCaMP), focused on using the principles of water sensitive urban design, as shown in Figure 8.1 below.

Figure 8.1 also illustrates how Workstream 1 includes a set of stormwater mitigations specific to smaller developments in areas not covered by the requirements of an approved SCaMP[39].

[38] *Consistant with the lower limits of Rule R49 of the NRP*
[39] *Addresses Schedule N(i) in the NRP.*

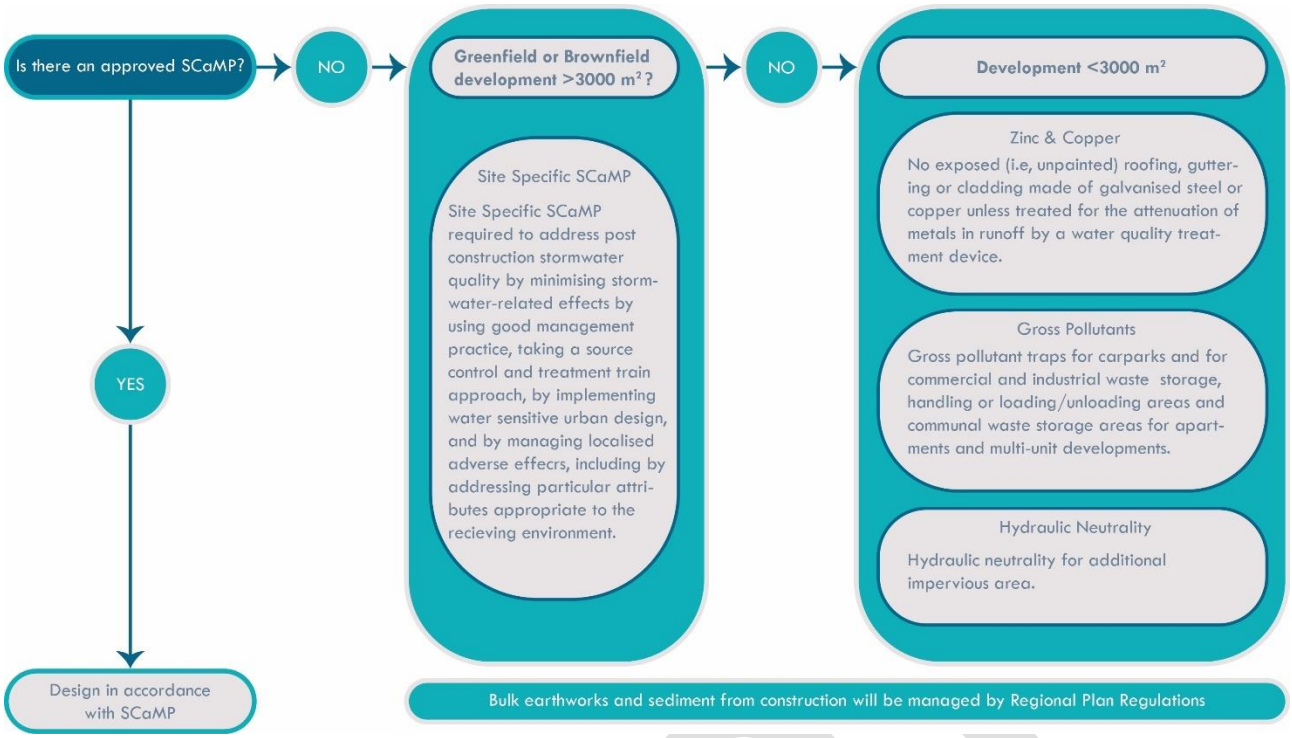

Figure 8.1 - Universal Responses required for new developments in areas not covered by an approved SCaMP

In addition, Workstream 1 includes a new work programme of high-risk health checks for existing urban sites with a high risk of discharging contaminants to the stormwater network. These are site audits to understand the activities and potential sources of contaminants discharging into the stormwater networks and to identify remedial activities, as discussed in more detail in subsection 8.1.2 below.

8.1.1 Universal Response: Site-specific SCaMPs

The Universal Response in Workstream 1 for greenfield and brownfield developments of 3000 m^2 or greater requires the development of a site-specific SCaMP that minimises the stormwater-related effects of development by using good management practice, taking a source control and treatment train approach, and by implementing water sensitive urban design[40]. Implementation of the SCaMP must be in place prior to discharging to the public stormwater network.

Developments of this size that are proposed in areas subject to an approved SCaMP developed under Workstream 2, would be subject to that larger SCaMP and would not have to develop a site-specific SCaMP.

8.1.2 Universal Response: Mitigations for smaller developments

Under Workstream 1, Universal Responses for new development and smaller subdivisions focus on avoiding or minimising the generation of zinc and copper in the stormwater runoff, litter such as plastics and construction debris and stormwater flows that would increase risk to human health or safety, or increase the risk of inundation, erosion, or damage downstream[41].

Hydraulic neutrality to mitigate for peak flows is an existing Wellington Water requirement[42] for new developments and subdivisions, and this existing requirement is included in the suite of Universal Responses. Hydraulic neutrality, as

[40] *As referenced in Policy P83 of the NRP*
[41] *As referenced in Policy P84 of the NRP*
[42] *As identified in the Regional Standard for Water Services*

defined in the RSWS, focuses on capturing the additional peak stormwater that is generated during rain events and then slowly releasing it to reduce increasing peak flooding in downstream areas.

In addition, this SMS needs to reduce scour and streambank erosion resulting from the increased frequency of lower intensity flood events (e.g., the 2-year rainfall event[43]) that can result from increased imperviousness associated with urban development. This will be addressed through greenfield and brownfield SCaMPs as part of the Universal Response and through sub-catchment specific SCaMPs developed over the short- medium and long-term (see DC1 in Appendix G Programmes of Work).

It is anticipated that this set of mitigations will incorporate additional or refined aspects of Water Sensitive Design as new and expanded work programmes developed over the short, medium, and long-term under Workstream 2 are completed.

8.1.3 Universal Response: High-risk sites - health checks

The new programme of health checks, as part of Workstream 1, will be implemented for large carparks and industrial and commercial sites[44]. This programme of works (OM7 in Appendix G) will be developed in collaboration with existing stormwater pollution prevention programmes carried out by GWRC and some of the local city councils, to identify and agree with the Regional Council. The audits would focus on:

- celebrating good practices through recognition and awards,
- behaviour change through targeted education programmes,
- remedial fixes, from better site management practices through to specific investment.

Should a site continue to discharge contaminants into the stormwater network without applying the requirements of Wellington Water, it would not be in accordance with this SMS and the discharger would need to seek a resource consent separately from GWRC [like the Christchurch City Council's Comprehensive Stormwater Network Discharge Consent (CRC190445)[45].

The case study of Auckland's Schedule 4 Connection Requirements for their regionwide stormwater network discharge consent below supports the use of these types of universal responses.

Case Study 1: Auckland Regionwide Stormwater Network Discharge Consent

Auckland's regionwide stormwater network discharge consent uses best practice to manage all public stormwater discharges across the Auckland region to protect the environment, people, and property and to improve water quality.

The regionwide Network Discharge Consent (NDC) replaces 116 different consents and multiple authorisations with a single consent containing a comprehensive set of requirements for use across all of Auckland. This means that instead of getting a private discharge and diversion consent, developers can come under the council's consent provided they meet the NDC requirements.

This NDC is a landmark for local authorities across New Zealand, where the single consent defines clear targets to lift water quality, reduce flooding and protect streams and other water assets. It is a key tool for integrated development and stormwater management.

[43] *TR2013/035 Auckland Unitary Plan stormwater management provisions: The natural stream channel 'bank full' is approximately up to the 2 year ARI rainfall event, so events up to and including these events have the most impact on stream erosion and in-stream habitat, in part due to the frequency of occurrance -*
[44] *Addresses Schedule N(l) in the NRP.*
[45] *Addresses Schedule N(m) in the NRP.*

8.2 **Workstream 2:** Stormwater Programmes for Water Quality Outcomes

Workstream 2 is an expanded programme of works that happens concurrently with Workstream 1. The six major programmes are shown below in Figure 8.2 and are detailed in Appendix G: Programme of Works:

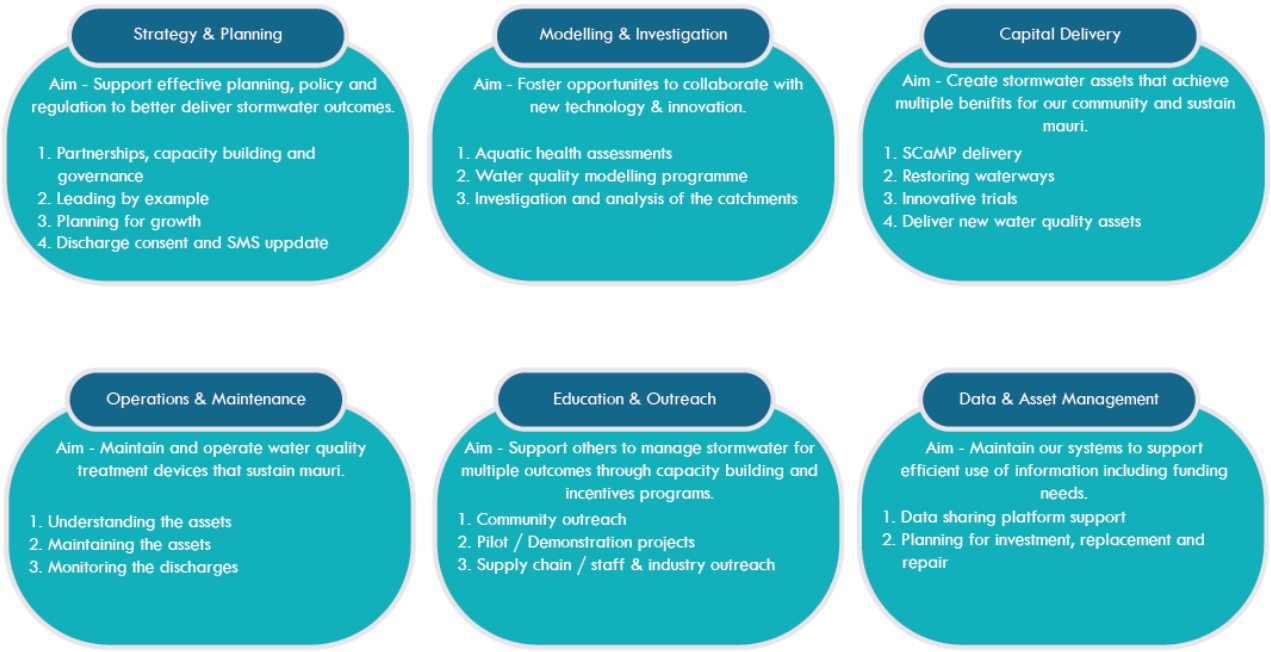

Figure 8.2 The six programmes of work in Workstream 2 to help achieve stormwater quality outcomes.

These programmes are scheduled to occur within short, medium, and long-term timeframes, as described in Section 8.3 below.

In some instances, programmes developed under Workstream 2 will supersede Workstream 1 requirements. Capital Delivery under Workstream 2 includes the development of stormwater SCaMPs which will require specific stormwater quality mitigations that will replace the Universal Responses in Workstream 1.

8.2.1 Strategy and Planning

A key requirement of the Strategy and Planning work programme is to support the collaborative governance group needed to implement this SMS (see Chapter 9). This work programme is also critical to setting up and managing many of the activities that involve working with others (the principle of mahi tahi) to achieve the objectives of this SMS.

Examples include setting up Service Level Agreements for the design, approval, and operation of public stormwater treatment devices in the road corridor or in parks reserves, working closely with councils and the development community, “Leading by example” by revising requirements for stormwater quality associated with fleet vehicles and depot yards, and ensuring this SMS is integrated into other company strategies.

8.2.2 Modelling and Investigations

This work programme includes projects related to understanding the current and future sources of contaminants to the stormwater discharges. For example, the development of a dynamic regional stormwater contaminant model, led by GWRC, is supported through this work programme. This model will be like Auckland’s Freshwater Monitoring Tool,

which is used to understand the impact of stormwater on water quality in streams, rivers and harbours and helps test potential management options and solutions.

8.2.3 Capital Delivery including Wellington Water-led SCaMPs

The Capital Delivery programme includes the design and construction of stormwater water quality treatment devices.

This programme of work also includes the development of prioritised SCaMPs, which are sub-catchment scale management plans to minimise the stormwater-related effects of development by using good management practice, taking a source control and treatment train approach, by implementing water sensitive urban design, and managing localised adverse effects, including by addressing attributes appropriate to the receiving environment[46].

SCaMPs will focus on identifying optimised catchment-scale solutions (such as wetlands and rain gardens) based on monitoring, investigations, and contaminant modelling. Site-specific SCaMPs developed previously as a Universal Response under Workstream 1 will be incorporated into the larger sub-catchment SCaMP.

This SMS, therefore, requires two types of SCaMPs to be developed:

1. Developer-led site-specific SCaMPs for large developments and greenfield sites to manage post construction stormwater as part of the Universal Responses under Workstream 1.
2. Wellington Water-led sub-catchment scale SCaMPs under Workstream 2.

   SCaMPs at the catchment or sub-catchment scale to identify specific stormwater solutions that are needed in addition to any site-specific SCaMPs and the existing Universal Responses.

   These solutions will likely include treatment train solutions that incorporate requirements for private devices or mitigations, as well as programmes of work and catchment-scale interventions such as treatment wetlands to remove contaminants, and large-scale detention areas to minimise scour events.

The second Bill of the proposed Three Waters Reform is due to be released in Q4 2022. It is likely to include minimum requirements for stormwater management plans, that are likely to be like a SCaMP. Although this legislation cannot derogate from the requirements under the RMA (and therefore the NRP's requirement for a SMS), at this time it is unknown how this legislation will affect requirements for stormwater management for water quality (note the Bill Phase2 identifies the requirements for the delivery of a Stormwater Management Plan for network operators – this will be captured and refined as this information is released and incorporated into our final submission). This section of text will be updated between now and May 2023 as Three Waters Reform progresses through the House.

The SCaMPs will identify catchment-scale solutions for existing and future problems that will require significant investment. As such we anticipate that the capital funding requirements will increase over the mid and long-term periods and then be sustained over future consent periods to support the Journey to Wai Ora. Sharing costs through co-investment with development opportunities such as the regional 'Let's Get Wellington Moving' programme are instrumental to successful stormwater management.

An example of a SCaMP being developed for a large-scale brownfield redevelopment is the case study of Eastern Porirua Regeneration below.

[46] *As referenced in Policy P83 of the NRP*

Case Study 2: Eastern Porirua Regeneration

This large-scale brownfield redevelopment involves the construction of a wetland in Cannons Creek Park to mitigate current and future flood risks and treat stormwater prior to discharge to Kenepuru Stream. This redevelopment is likely to improve environmental outcomes for freshwater quality in the long term as it will reduce wastewater overflows and improve stormwater quality. It is proposed to keep the sports field on the southern end of the park and convert the northern field into a wetland with different recreational opportunities such as walking and cycling.

Case Study 2:
Draft design of the proposed wetland at Cannons Creek Park (Photo sourced from Porirua Development).

8.2.3.1 Prioritisation of Wellington Water-led SCaMPs

Prioritisation[47] of sub-catchments[48] is a useful tool to guide the development of SCaMPs, given that their development requires detailed information and evaluation of current conditions and pressures, including future pressures from projected growth or land development, as well as risks of contamination and resulting effects on the freshwater and coastal receiving environments.

An initial prioritisation was completed as a starting place for consultation with mana whenua, the community, and other stakeholders, as shown in Figure 8.3. The priorities will be finalised by the collaborative group using the principles of Te Mana o te Wai.

This initial prioritisation used a Multi-Criteria Analysis (MCA)-style assessment and, in accordance with Schedule N of the NRP considered the available monitoring data gathered under the Stage 1 Consent Stormwater Monitoring Plan Appendix E. Thirteen (13) criteria were used to reflect what is known about each sub-catchment's asset management, natural environment, land use, social values, and cultural values

[47] *Schedule N (f) in the NRP requires "all catchments or sub-catchments covered by the consent [to be prioritised] for implementation actions or mitigation measures, based on monitoring carried out in accordance with Policy P74 and the assessment of effects, in order to maintain or improve the receiving water quality".*

[48] *A catchment is a basin shaped area of land often bounded by hills or mountains. Rainwater that falls on a catchment is collected naturally in streams and channels where it flows to a common outlet, such as a river or ocean. Reticulated networks that collect rainwater don't always follow surface features and therefore reticulated urban stormwater networks and their outlet can also be used to define catchment boundaries. The distinction between a 'catchment' and a 'sub-catchment' is a management decision. Every catchment can be geographically divided into numerous smaller sub-catchments. For the purpose of this SMS, a sub-catchment is a geographically defined management unit.*

Wellington Water's scheduling within the short, medium, and long-term to develop and implement SCaMPs[49] will be based on the priority ranking of each sub-catchment following consultation with mana whenua and others. It is likely that some SCaMPs will be for areas smaller than the sub-catchments shown in the figures below.

In addition, the principle of ki uta ki tai and integrated catchment management can result in works being reprioritised to get the 'best outcome for effort' by considering where the best results will be delivered from one set of works over another. This could result in targeting specific parts of a wider sub-catchment or amending the overall catchment prioritisation based on new information.

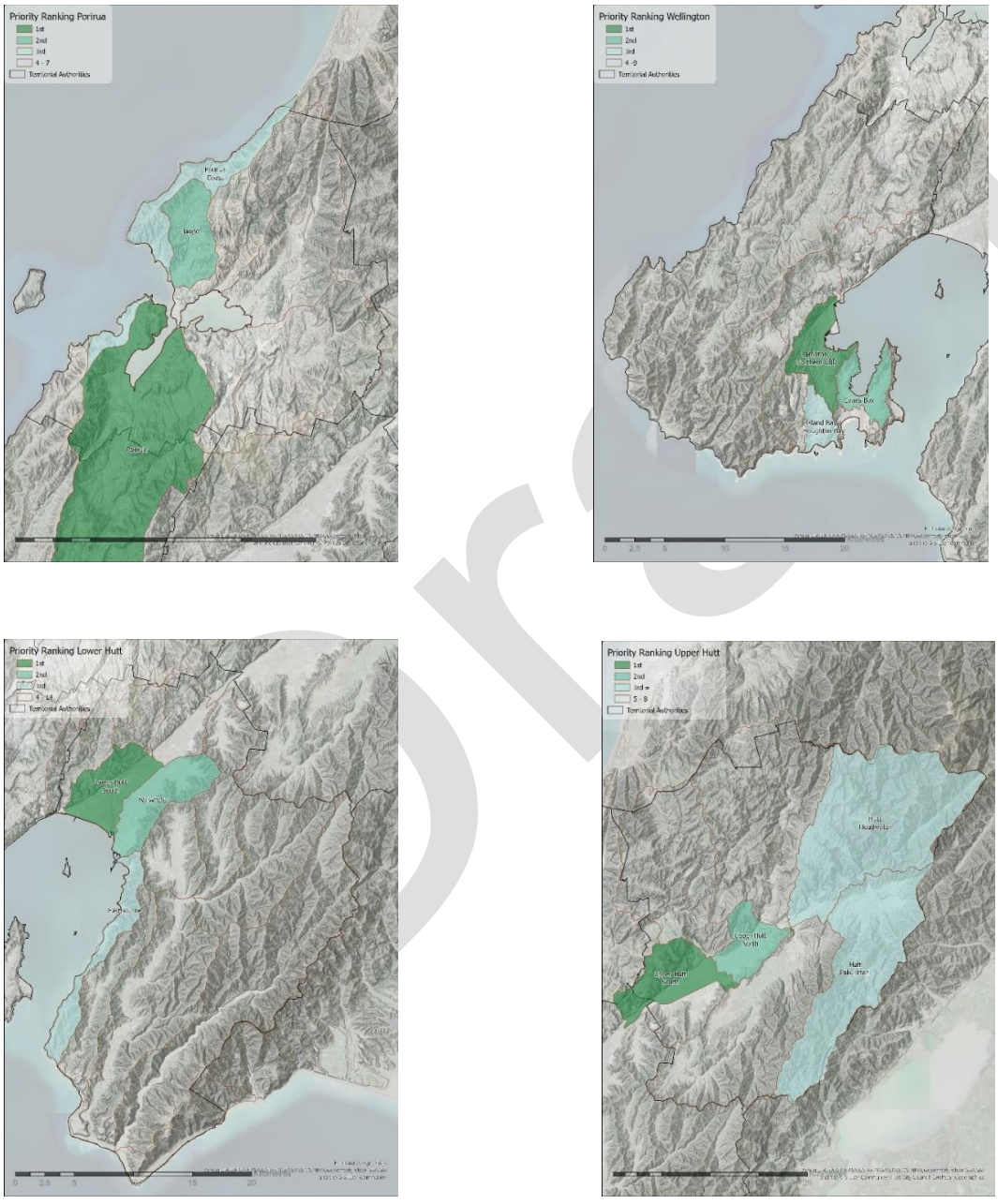

Figure 8.3 – Initial prioritisation of sub-catchments for the development of SCaMPs.

[49] *Areas without a SCaMP will be subject to Universal Responses.*

8.2.4 Operations and Maintenance

Aspects of Workstream 2 that are included in the Operations and Maintenance work programme include monitoring of stormwater discharges as well as the maintenance activities needed to keep water quality devices in working order. This work programme is tightly integrated with routine works in the beds of streams, new and expanded opportunities to work with mana whenua on Mātauranga Māori and riparian rehabilitation, community group restoration and citizen science projects.

It is also integrated with works to identify and respond to sites with acute human health risks from wastewater in stormwater (discussed in the subsection below), industrial site health checks and trade waste programmes and council waste minimisation programmes associated with reducing litter. This expanded work programme is also needed to collect as-builts and ensure private stormwater quality devices are inspected and maintained.

8.2.4.1 Sites with Acute Human Health Risk

The Stage 1 Global Stormwater Discharge Consent has a strong focus on identifying and responding to sites where E. coli (in freshwater) or Enterococci (in coastal water) concentrations indicate wastewater presents an acute risk to human health[50]. This SMS and the Stage 2 consent will continue to support the existing two work programmes ('Knowing Your Pipes' - cross-connections and 'Human Health Mitigation Projects' (HHMP) that respond to these locations.

Many of these problems are the result of faults in the wastewater network (see Figure C-2 In Appendix C) as opposed to the stormwater network. Therefore, integration between stormwater and wastewater management is critical to the successful resolution of these faults.

Workstream 2 in this SMS addresses sites with acute human health risks[51] through:

- Water quality sampling of outfalls and receiving water to identify sites that present acute risks to human health.
- Identifying the source of wastewater that enters the stormwater and rectifying this, such as:
    - Overflows of untreated wastewater from the wastewater network during heavy rain events and resolving through the Wastewater Network Overflow Programme.
    - Faults or historical overflow connections in the wastewater network to the stormwater network resolved through capital projects.
    - Cross-connections or faults in private stormwater/wastewater laterals, and then working with property owners to fix the lateral pipes.

8.2.5 Education and Outreach

The Education and Outreach work programme is a new programme of effort that Wellington Water will deliver to support the delivery of the SMS outcomes. This recognises the significant challenge we face across Aotearoa (and globally), being the current and future levels of industry capability and capacity to deliver on the significant changes to the outcomes that the stormwater professions are being challenged to achieve.

This is further challenged as we enter significant regulatory and legislative changes associated with RMA and Three Waters Reform activities. The programme will look to deliver:

- internal staff training through a competency framework with career progression targeting capability and capacity building aligned with the needs to this SMS.
- Industry wide education of key supply chains that can influence and deliver good outcomes in line with the SMS objectives.
- Appropriate community outreach activities.

[50] *As identified in Policy P85(c) of the NRP*
[51] *As referred to in Schedule N (k) in the NRP*

Where possible this programme builds on existing council education and outreach programmes associated with achieving environmental health outcome such as targeted industrial pollution prevention programmes and supporting wider community involvement in delivering compliance and environmental monitoring programmes.

8.2.6 Data and Asset Management

It is important to accurately record the location and details of private and public stormwater devices using device registers and as-built data management. It is also important to integrate data management that provides monitoring results that are publicly available with the Education and Outreach programmes.

To deliver enhanced stormwater quality over the next 30 years[52] Workstream 2 identifies a significant new and expanded programme of works resulting in new public assets which need to be funded and maintained.

Asset management is needed to successfully plan for investment, replacement and repair of stormwater infrastructure associated with achieving the objectives of this SMS. The general asset management framework and how the SMS will be incorporated is shown in Figure 8.4.

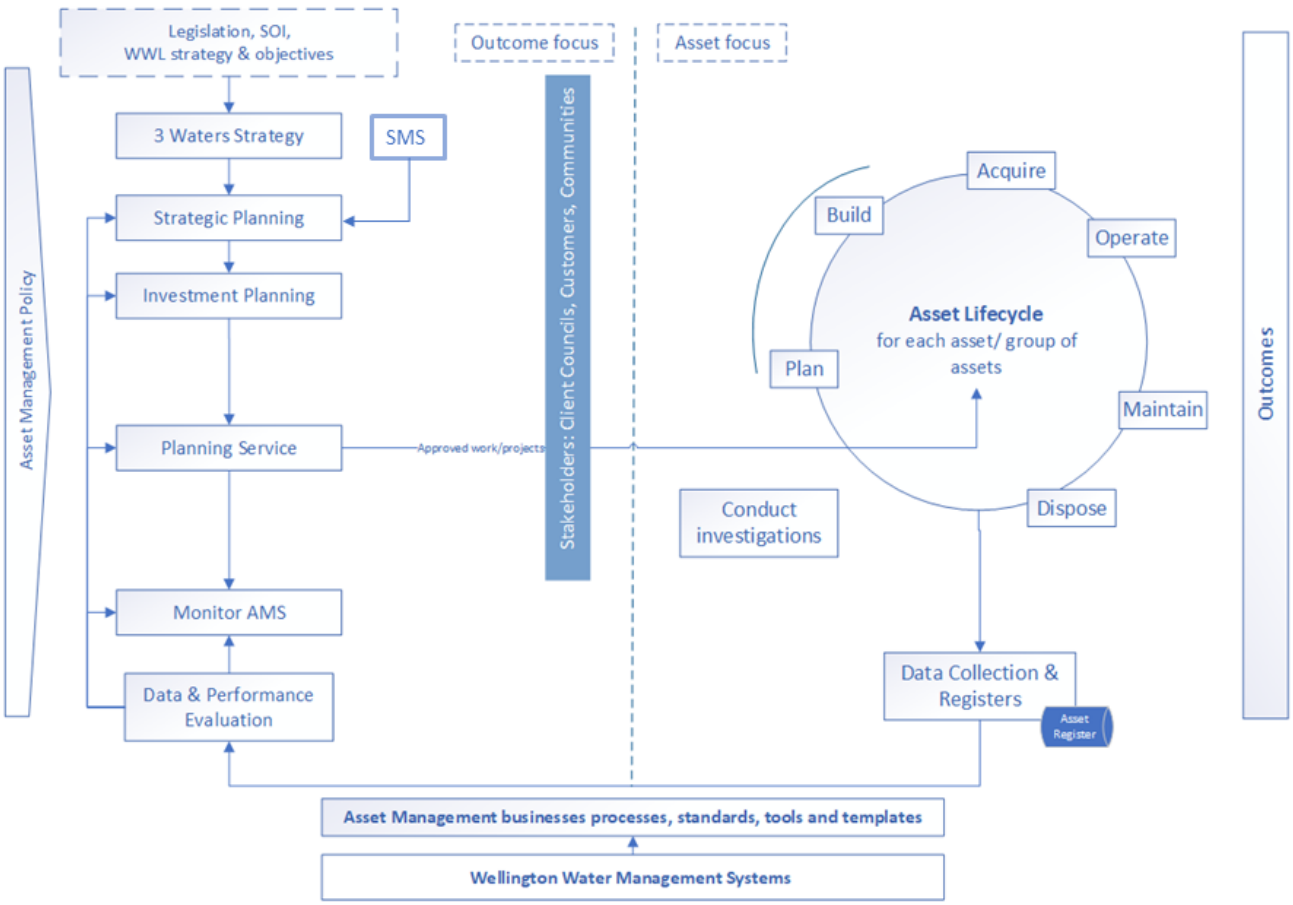

Figure 8.4 - Wellington Water's asset management planning framework showing the SMS feeding into strategic planning.

As a starting point for discussion, the programmes represent between $1 to $2 billion investment over the next 30 years and across the four cities of Porirua, Wellington, Hutt, and Upper Hutt. Figure 8.5 identifies the potential distribution of the investment that is being sought to enable the implementation of this activity to enable Wellington Water to support the requirements and objectives identified as part of the Consent application process, on our overall

[52] *30 years is the current long term investment cycle under the LTP*

Journey to wai ora. This SMS itself cannot guarantee funding and this is discussed in Chapter 9.2 Influence on Funding and Chapter 10.2 Challenges and Opportunities.

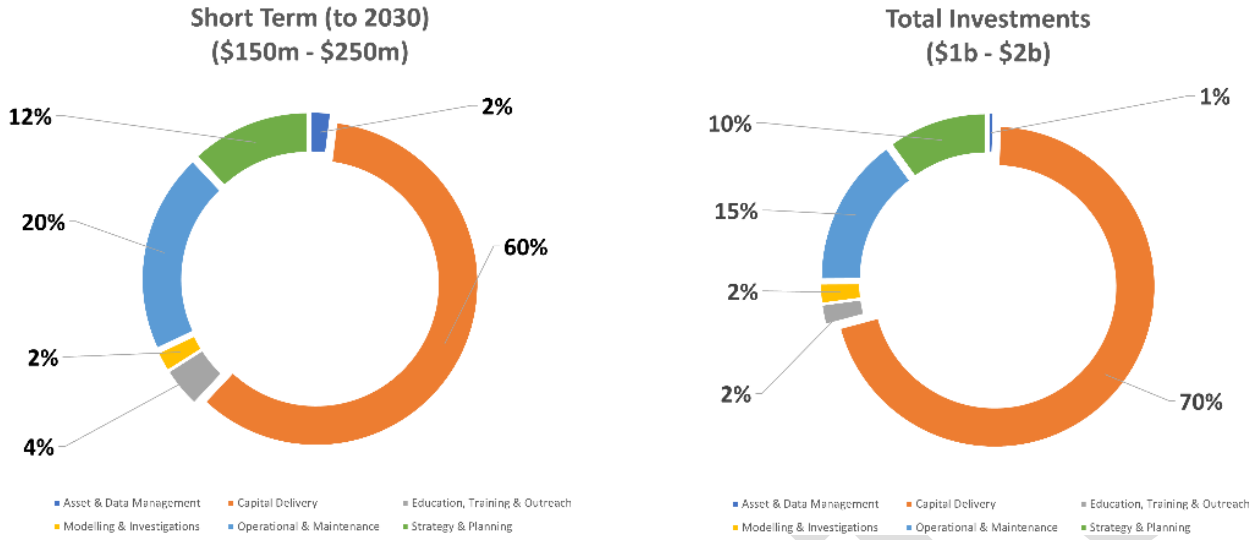

Figure 8.5 - Investment across the six work programmes for the short-term to 2030 (left) and overall, to 2054 (right).

8.3 Prioritising our implementation into short-, medium- and long-term periods

The structure of this SMS is designed to support the delivery of progressive improvement over the length of the Stage 2 Global Stormwater Discharge Consent [53] as part of our journey to wai ora. It is important to ensure that the work programmes and funding arrangements are affordable, and the costs are spread overtime. To do this the work programmes will be staged over three timeframes described below:

- **Short-term** –Includes ongoing activities and short-term. Ongoing activities include 'opportunistic' system / network changes resulting from Wellington Water routine maintenance, renewal, or upgrade works[54], as well as supporting the implementation of the Universal Responses and delivery of site audits of high-risk sites for stormwater contamination. Over the short-term there will be the implementation of a range of work programmes, predominantly investigation focussed, including the development of a set of prioritised SCaMPS.
- **Medium term** – Continual review of implementation programmes to adapt delivery to support achieving SMS Objectives alongside our Partners and Other Network owners, including development of the next set of SCaMPs.
- **Long-term** – Working with mana whenua to reframe these identified work programmes with the next generation at an appropriate time, to enable ongoing improvement of our waterways and ability for mana whenua to practice mana whakahaere and tino rangatiratanga.

The timing to achieve the various activities will depend on agreement on priorities and the availability of resources, both financial and human. Resourcing is fundamental to implementation. Some of the activities will be completed from existing resources or a realignment of resources while other actions will be subject to future budget decisions. Our rationale for proposing the Governance Structure and Process (Chapter 9) is to identify the responsibility to identify and deliver on the investment required to support the delivery of progressive improvement over the length of the Stage 2 Global Stormwater Discharge Consent.

[53] *See Policy P86 in the NRP*
[54] *See Policy P83 in the NRP*

The implementation of this SMS will occur over three timeframe periods, as shown in Table 8.2 below. This will allow the wider community to prioritise actions related to stormwater management. Effective stormwater planning and management universally will provide significant long-term cost savings while supporting resilience and protecting and enhancing the ecosystem health.

Table 8.2 - Key activities planned for the SMS time periods (indicative list with confirmation following through the appropriately formed governance group).

Period	Years	Predominant Activities
Short	To 2030	Governance – Set up and start the process for co-governance of this SMS and Water Quality enhancement programme – to build strong resilient relationships. First update to SMS after 6 years. Continual enhancement of minimum standards.
		Prioritised SCaMPS – Targeting an initial highest priority sub catchments s time).
		Staff & Supply Chain capability development
		Collaborate with others to develop clear communication and education on sustainable stormwater management
		Capital Delivery - Prioritised improvements to enhance water quality and incorporation of Universal Responses across all Wellington Water programmes
		New Development – Advising & supporting Sustainable Development.
		O&M – Enhanced Operational Programme refinement. Further investigations, monitoring, and outreach – catchment by catchment, High Risk Sites – Site Audits.
		Modelling & Monitoring – activities to support programme delivery, refining investment programme and tracking outcomes and incorporation of mātauranga Māori monitoring programme.
		Implementation of Universal Responses by all
Medium	2030-2040	Prioritised SCaMPS – Targeting the next set of highest priority sub catchments
		Capital Delivery - Prioritised improvements to enhance water quality.
		New Development – Advising & supporting Sustainable Development.
		O&M – Enhanced Operational Programme refinement. Further investigations, monitoring, and outreach – catchment by catchment, High Risk Sites – Site Audits.
		Implementation of Universal Responses by all
Long	To 2058	Prioritised SCaMPS – Targeting the next set of highest priority sub catchments
		Capital Delivery - Prioritised improvements to enhance water quality.
		New Development – Advising & supporting Sustainable Development.
		O&M – Enhanced Operational Programme refinement. Further investigations, monitoring, and outreach – catchment by catchment, High Risk Sites – Site Audits.
		Implementation of Universal Responses by all
		Final monitoring and modelling to determine overarching compliance with consent

9 Governance

This SMS for water quality requires the establishment of a robust governance structure that gives effect to the requirements of Te Mana o te Wai. This governance structure will require a strong focus on securing the required investment to deliver the objectives of this SMS. Our preferred governance structure needs to lead the implementation of this strategy by setting clear expectations and direction.

When developing the governance structure, we will apply the following five principles:

1. Give effect to Te Mana o te Wai:
    - Mana whenua must be at the heart of decision making
    - Asset Owners and investors must be represented.
    - Decision making must follow the hierarchy of obligations.
2. Enable investment to support the objectives:
    - Ties into Long Term Plan processes.
    - Considers a range of alternative forms of funding.
    - Realises that our investments are part of a bigger picture to achieve water quality outcomes.
3. Deliver prioritisation across the network:
    - Recognises that not everything can be delivered at once, requiring a framework for decision making to be developed.
4. Apply transparent and robust decision making
5. Are supported by Wellington Water

Wellington Water is the early stages of discussing this preferred governance structure with our mana whenua partners. Once we have an increased level of certainty, we will be able to include this structure in this SMS.

We expect that the governance structure will be an iterative cycle, aligned with the investment and implementation planning of the stormwater management strategy, and consideration of local government investment planning cycles. It is based on a 6 yearly planning, investment, and implementation to tie in with other Wellington Water Network Discharge Consent processes.

10 Delivering this SMS

Implementation of this SMS will require significant changes in current programmes of our work. Using the Governance approach presented in Chapter 9 we will:

- Develop investment plans to implement the identified Programmes of works for each of the Councils over the short-, medium- and long-term
- Use a set of approved performance measures to assess progress towards the objectives of this SMS. It is anticipated that a subset of these performance measures will be required conditions of consent for the Stage 2 Global Stormwater Discharge Consent.

10.1 Principles based

10.1.1 Mahi Tahi | Working together – the role of others

10.1.1.1 Mana whenua partners

In addition to mana whenua's collaborative governance role, mana whenua has roles as kaitiaki that include and will be expanded to include stormwater management programmes focussed on monitoring, restoration, and maintenance.

10.1.1.2 Other council departments and network owners

Council departments responsible for roading, parks, waste minimisation and urban growth have significant roles for the successful delivery of improved outcomes from stormwater discharges.

Operators of other significant networks such as Waka Kotahi and the airport that discharge to the council networks are responsible for managing the contaminants entering the public network through water sensitive opportunities and best practice management.

10.1.1.3 Community Groups and Individuals

The community includes individuals and groups who represent the interests of business, recreation, public health, economic and social well-being, and environmental health. The function of community groups will be to contribute through formal and informal channels, directly to the governance committee and to the councils' regulatory teams. The community's responsibility it to adopt and own this SMS outcomes and lead the community sectors towards improved water quality outcomes related to their areas of interest.

10.1.1.4 Council Regulatory Teams

Council regulatory teams will provide regulatory oversight to the progress with implementation and response to the regulatory authorities, make decisions on recommendations and considerations of community inputs aligned with achieving the outcomes of this SMS.

Taumata Arowai will have an oversight in the establishment of national standards, performance measures and targets to shine a light on the performance of certain stormwater networks (oversight will not commence until late 2023).

Council regulatory teams and local authority organisations will run programmes that support and empower community groups and individuals to participate in local government and community outcomes and this support may be accessible to assist local communities to participate in stormwater management.

10.1.2 Ki utu ki tai | Integrated Catchment Management

Integrated catchment management is a key non-asset solution which is being applied across the region. Working with our mana whenua partners, GWRC and key stakeholders, integrated catchment planning applies a holistic, strategy led approach to incrementally improving the health of the whole catchment from Mountains to Sea over time.

By combining research with monitoring and modelling to identify water quality and quantity issues we can collaborate to deliver the most appropriate, possible treatment and management options. This includes the interaction of wastewater with stormwater. The management of contaminants and their effects on the environment is a shared responsibility between the community and public agencies such as utility providers and consenting authorities. The integrated catchment management approach reflects this, taking a wider view of pollutant sources, effects, and controls.

As such, the principle of ki uta ki tai and integrated catchment management can result in works being reprioritised to get the 'best outcome for effort' across the whole catchment, through the appropriate consideration of where the best results will be delivered from one set of works over another. This could result in targeting specific parts of a wider sub-catchment or amending the overall catchment prioritisation based on new information.

10.1.3 Data, monitoring, and investment to support adaptive management

Adaptive management is an investigational approach to management, often defined as 'structured learning by doing'. It has three elements, (1) monitoring, (2) adapting and (3) learning, as presented in Figure 7.2 in Chapter 7.3.3.

The monitoring plan will assess success of the stormwater management relative to the Vision and Objectives in this SMS. As the information collated over time shares how our catchments are evolving, the prioritisation of SCaMPs and supporting activities, may evolve in response. An appropriately formed and funded governance group will support these shifts from a range of sources, such as community needs or changes in the environmental regulatory environment. As such, SCaMPs and resulting programmes of work may shift councils' Long-Term Plans.

As outlined in Chapter 9, the Implementation Plan will be reviewed six yearly, with annual progress reports produced that will support Wellington Water council-owner's Annual Plan and Long-term Planning processes. A continual review of the latest techniques and consideration of the performance of the implemented projects or management actions, with the governance group, will ensure that the expenditure is directed to projects and actions that will progressively address the Objectives of this SMS.

As outlined in Chapter 7.3.3, monitoring allows Wellington Water to evaluate the performance and progress of the stormwater management infrastructure to achieve these objectives and targets, and more importantly, trigger the identification of additional projects that would improve the outcomes of the stormwater system. The governance approach would then support the identification of where/when additional projects or management actions are required.

10.2 Challenges and Opportunities

Managing stormwater discharges to minimise the adverse effects on the wellbeing of our streams, rivers and harbours presents challenges as well as opportunities. The challenge and opportunities that Wellington Water faces in the delivery of this SMS, the consent, and the activities required, are described in the Table 10.1 below.

Table 10.1 - Challenges for Wellington Water in the implementation of this SMS and achieving NRP Objectives.

Challenge	Opportunity
Managing stormwater for water quality is a *new level of service*.	This new level of service results in progressive improvement of streams, rivers, and coastal areas.

Challenge	Opportunity
Retrofitting existing networks **with treatment devices to provide water quality benefits is more complex and typically constrained for space than building new networks. Historically the stormwater networks were built and managed for the purpose of conveying rainwater away from buildings and properties.**	Urban regeneration and infill development can provide opportunities to upgrade existing services as well as new funding mechanisms to help fix existing problems.
Current organisational roles and responsibilities for stormwater exclude ability to control the urban environment inputs to the stormwater system appropriately. ***This SMS has limits – It can't solve all the issues related to urban stormwater.***	Delivery of Integrated Catchment Management plans through Regional Council, will enable appropriate enforcement powers to be used where required from wider stakeholder group. Ability to deliver an integrated water quality programme, along with Human Health Mitigation Plans (Wastewater Network Overflow Reduction), influencing new development through work with Councils as well as other network owners and multitude of catchment restoration projects undertaken by councils and community groups.
Wellington Water's enforcement role and powers are limited.	SMS highlights the need for revised rules and regulations.
Collaborative governance is hard.	Stronger relationships/better governance
Other operators **are responsible for significant networks that discharge to the public network.**	Opportunity to engage and influence better stormwater management through Water Sensitive Design advocacy across the networks that Waka Kotahi and the airport, own and operate.
Available people **to deliver work across the industry with appropriate capabilities and capacity.**	Opportunity to implement a competency framework with career progression targeting capability and capacity building aligned with the needs of this SMS. Opportunity to engage and encourage diversity into workforce through targeted educational programmes and mātauranga Māori outreach / employment programmes.
Lack of a regional model for stormwater contaminant loading highlights the need to understand where the contaminants come from, where to prioritise action, and how much could it cost for NPSFM outcomes.	Development of a regional modelling tool will support catchment prioritisation, identification of the best solution as well as support awareness activities to enhance community willingness to pay. The development of this model is being led by GWRC.
O&M costs for stormwater water quality treatment devices *typically cost more to operate* than to build which is contrary to current asset management models	This will drive better life cycle cost benefit analysis – chance to redesign system over time to follow treatment train in public open spaces. Chance to avoid retrofitting high numbers of proprietary devices.
Stormwater treatment devices located in roads and reserves *require interdepartmental management agreements*	Supports mahi tahi and better outcomes – chance to redesign system over time to follow treatment train in public open spaces.
The *community is unaware* of ecosystem functions of stormwater networks	Better awareness will enable people to be guardians and kaitiaki

Challenge	Opportunity
Regional Plan rules **don't require stormwater discharges into the stormwater network to comply with (give effect to) this SMS**	A plan change to the Regional Plan is possible. Three Waters legislation may provide a way to give effect to this SMS.
Sediment from bulk earthworks and construction is managed by others **but if managed poorly, sediment can overwhelm other stormwater water quality devices managed by Wellington Water.**	Better working relationships, partnerships, education, and revised regulations.
Affordability **of a new programme of investment that is uncertain in relation to the certainty of achieving the delivery of the required Objectives / Outcomes**	Adaptive management of the consent and this SMS will enable the constant improvement of the approaches that Wellington Water and the wider community can take to unpicking a 100-year problem and prioritise investment into areas with greater certainty of achieving the NRP Water Quality objectives.

Section 4: Next Steps

11 Titiro ki mua | Next Steps

11.1 Whakarāpopoto | Summary

Through this SMS process we have explored our relationship with stormwater, with an identified need to change how we manage stormwater in our urban environments over a longer time horizon.

This SMS sets out a high-level strategic approach in managing stormwater quality to support the ***Journey to Wai Ora***. The strategy outlines a two workstream approach, which is a significant change from the historical management of stormwater only for the purpose of flood protection.

Managing stormwater quality within the context of Te Mana o te Wai requires collaborative governance with mana whenua, a significant number of new work programmes and the need to work in partnership with other council departments, stakeholders, and the community. These actions will be guided by the three principles of mahi tahi/working together, ki uta ki tai/integrated catchment management, and monitoring, investigations, and research.

The strategy requires the immediate implementation of a set of universal responses, as well as several actions that must occur in the short, medium, and long-term. To be successful, many of the work programmes will require detailed business plans, capacity building and analysis in the first three to six years to deliver on the strategic objectives of aquatic ecosystem health, Māori cultural values and sustainable growth in the medium and long-term. It is envisioned that the Stage 2 Global Stormwater Discharge Consent will include conditions of consent that specifically require milestones to be met for some of these critical programmes. In particular, the following next steps are required for this SMS to be successful:

- Consultation on the draft SMS with our mana whenua partners.
- Consultation on the draft SMS as a requirement of the Stage 1 Global Stormwater Discharge Consent, specifically with the Stormwater Working Group set up for that consent.
- Integration of this SMS with the Stage 2 Global Stormwater Discharge Consent. This SMS is an integral document that supports the application for this long-term consent.
- Collaborative governance structure established. As discussed in Chapter 9, the governance structure will also enable required funding requests to be elevated to the asset owners and supporting genuine partnership from mana whenua, including supporting the resourcing and capability development.
- Greater Wellington Regional Council development of a contaminant load model to improve our understanding of stormwater impacts, support the prioritisation of available investment and to assess the effectiveness of management options.
- Service Level Agreements with Roading and Parks Departments for asset management, including design approval and operations & maintenance, to achieve water quality objectives for stormwater water quality devices, such as wetlands, rain gardens and gross pollutant traps that are in the road or public reserves.

On ***Our Journey to Wai Ora***, we will use an adaptive approach to manage stormwater discharges. We will do this by using the best information available to inform the delivery of our implementation program, as supported by the key principle of monitoring, investigations, and research.

11.2 Arotake | Review

This SMS will be reviewed regularly and incorporate new information, changing best practice and community aspirations. To achieve this, the strategy will be reviewed on a six-yearly basis to match the Long-Term Plan[55] cycle,

[55] *The process to amend the SMS will be determined during future Consent stages.*

with a review recommended to occur in the year prior to a Long-Term Plan so that funding needs for specific projects or changes in priorities can be addressed.

It is intended that the review process would focus in on the prioritisation of future SCaMPs and the implementation programmes. It is anticipated that the core principles and objectives would remain consistent through the life of the Stage 2 Global Stormwater Discharge Consent, unless the Governance Group determine the need for them to be revisited.

11.2.1 Ono Tau | Six Yearly Review

The first review of the strategy is targeted at a six-yearly interval. The review of this SMS must consider and include the following:

- An assessment of the effectiveness of the stormwater management measures against the principles of Te Mana o te Wai and the SMS Objectives.
- Modelling and monitoring data trends with regards to water quality and the effects on the receiving environment.
- The outcomes of the governance group processes and potential improvements.

At the conclusion of each review a report shall be prepared on the outcome of the review and shall include a copy of a revised SMS if the review concludes that changes are necessary.

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Te tuarua: Tāhuhu korero

Part Two: Technical and background information

NOTE – Currently placeholder text
(Appendices being improved between Nov & May).

Appendix A
Glossary

Table A-1: Glossary

Item	Description
Bioretention Device (raingardens bioretention swales)	Vegetated filtration systems designed to provide enhanced water treatment through combined physical and biological processes.
Catchment	A catchment is a basin shaped area of land often bounded by hills or mountains. Rainwater that falls on a catchment is collected naturally in streams and channels where it flows to a common outlet, such as a river or ocean. Reticulated networks that collect rainwater don't always follow surface features and therefore reticulated urban stormwater networks and their outlet can also be used to define catchment boundaries. Please see the definition that follows below for 'sub-catchment'.
Contaminant	Contaminants of focus to this SMS include E. coli (in freshwater) or Enterococci (in coastal water) (as a bacterial indicator of wastewater), Nutrients (which promote algal growth), Heavy metals (copper and zinc) (which are toxic to aquatic life), Sediment from surface wash-off, stream scour (erosion and stream downcutting), and Gross pollutants
Cross-connection	Where a wastewater pipe has been connected to a stormwater pipe, resulting in a discharge of untreated sewage to the stormwater network and receiving environment.
Dry Pond/ Detention Basin	"a temporary pool formed by capturing and releasing stormwater at a slow rate which drains down to the base of the pond between storm events" for Water Quantity management
Global Stormwater Discharge Consent	Resource consent from Greater Wellington Regional Council for Wellington Water to discharge stormwater from the stormwater networks.
Green Infrastructure	Engineering structures built as part of water sensitive design (WSD), including constructed wetlands, rain gardens, permeable paving, swales, and green roofs.
Gross Pollutant Trap	A device that removes solids typically greater than 5mm conveyed by stormwater runoff. Structures that use physical processes to trap solid waste such as litter and coarse sediment. They are commonly used as the primary treatment because they mostly remove large, non-biodegradable pollutants
Hauora	Health and well-being
Hydraulic neutrality	Land development, including increased imperviousness, does not increase the peak design discharge (post development) to greater than the peak design discharge (pre-development) for all events up to and including the 1% AEP rainfall including the predicted impacts of climate change (taken from Regional Standard for Water Services v3.0).
Hydrocarbon Management/ Oil and Water Separator	A stilling tank configured to separate lighter oily matter, scums, and hydrocarbons from stormwater

Impermeable Impervious surfaces	Impervious surfaces mean those areas which prevent or impede the infiltration of stormwater into the soil, such as roads, paved areas, compacted soils or rock and buildings. as it entered in natural conditions prior to development.
Infiltration Device (Trench/Pit)	"devices that collect and hold (retain) water below ground for disposal to the groundwater table."
Integrated Catchment Management	A management approach that uses a catchment perspective for the provision of water services (drinking water, wastewater, and stormwater) in an integrated manner, in contrast to a piecemeal approach.
Ki uta ki tai	Translated as 'from the mountains to the sea'. This SMS uses ki uta ki tai as a concept that captures the practice of Integrated Catchment Management.
Living Roof (Green Roof)	"a roof largely covered by vegetation, growing in a substrate on top of waterproof and root-resistant layers."
Mahinga kai	As defined in the NRP - The customary gathering of food and natural materials, the food and resources themselves and the places where those resources are gathered.
Mana whakahaere	Power, authority, and obligations of tangata whenua to make decisions to uphold waterways as first priority
Mana whenua	The indigenous people (Māori) who have a historic and territorial rights over the land. It refers to iwi and hapū (Māori tribal groups) who have rights in the Wellington Region. As defined in the NRP- Māori with ancestral claims to a particular area of land and resources. Literally, translated as "authority over the land". Whanau, hapu and iwi are mana whenua of a particular rōhe, while Māori are tangata whenua of Aotearoa (New Zealand).
Manākitanga	Process by which tangata whenua show respect, generosity, and care for freshwater and for others
Māori customary use	As defined in the NRP - The interaction of Māori with fresh and coastal water for cultural purposes. This includes the cultural and spiritual relationships with water expressed through Māori practices, recreation and the harvest of natural materials.
Mauri	As defined in the NRP - An energy or life force that mana whenua consider exists in all things in the natural world, including people. Mauri binds and animates all things in the physical world. Without mauri, mana cannot flow into a person or object.
Pervious Paving	A constructed hard surface that allows water to pass through to the underlying soil layers. It can be used to reduce runoff and flooding; and help to replenish groundwater. Treatment processes provided by pervious paving are limited to filtration and sedimentation (with solids settling into the pore spaces of the pavement). Any system providing hard or trafficable areas which

	also provides for downward percolation of stormwater runoff." There are two types of pervious pavement: 1) Porous paving - surface paver blocks are pervious so water travels through the pavers. 2) Permeable paving; surface paver blocks are impervious and water travels through the gaps between blocks.
Rainwater Tank	Tanks which are used to collect water from the roof and detain it prior to release. (Auckland Council, 2017) Water collected in rainwater tanks can be re-used on site for household use or for the detention of water.
Rangatiratanga	Self-determination, sovereignty, independence, autonomy.
Riparian Planting	The planting of areas beside rivers and streams to enhance habitat quality, biodiversity and to reduce contaminants getting into water, stabilise banks, shade the water and provide natural inputs (leaf, insect, and wood fall) to the aquatic system to contribute food sources and habitat.
Sand Filters	Used in water purification treatment and consisting of layers of sand arranged with coarseness of texture increasing downwards. Picks up sediment and filters out chemicals in the water.
Stewardship	Obligation of all New Zealanders to manage freshwater for sustainability in present and future generations.
Stormwater Sub-Catchment Mgmt Plan (SCaMP)	Plan for managing stormwater runoff generated in a sub-catchment to meet specific water quality and quantity objectives.
Stormwater	As defined in the Natural Resources Plan - Runoff that has been intercepted, channelled, diverted, intensified, or accelerated by human modification of a land surface, or runoff from the external surface of any structure, because of precipitation and including any contaminants contained therein. For the avoidance of doubt, stormwater excludes discharges associated with earthworks, vegetation clearance, break-feeding and cultivation that are managed under rules in section 5.3 of the Plan.
Stormwater Network	As defined in the Natural Resources Plan - The network of devices designed to capture detain, treat, transport, and discharge stormwater, including but not limited to kerbs, intake structure, pipes, soak pits, sumps, swales, and constructed ponds and wetlands, and that serves a road or more than one property.
Sub-catchment	The distinction between a catchment and sub-catchment is a management decision. Every catchment can be geographically divided into numerous smaller and smaller sub-catchments. To this SMS, a sub-catchment is a geographically defined management unit.

Swale	Planted channels used to treat stormwater runoff. They direct and slow stormwater across vegetation, grass, or similar ground cover and through the soil."
Te Ika Rō Wai	Wellington Water's shared vision for safe and healthy water, respect for the environment, and a resilient network.
Te Mana o Te Wai	Te Mana o te Wai – the status of water - refers to the vital importance of water. When managing freshwater, it ensures the health and well-being of the water is protected and human health needs are provided for before enabling other uses of water. It expresses the special connection all New Zealanders have with freshwater.
Territorial Authorities	City and District councils.
Wai ora	Water which gives life
Wastewater overflows	A site where underground flows of wastewater can overflow into the stormwater network when the pipe capacity of the sewer network is exceeded, typically during wet weather (driven from inflow of rainwater and infiltration of groundwater), untreated wastewater overflows out of network. Unconstructed wastewater overflows can occur at manholes and gully traps. Constructed wastewater overflows are designed fail-safes to ensure that sewage does not backflow into residential properties or onto land where it could cause an immediate health risk, but instead results in discharges to the stormwater network or directly to land or water.
Water Sensitive Design (WSD)	A stormwater engineering principle that seeks to maintain and enhance the natural water cycle for the built environment, resulting in better water quality, flood mitigation and enhanced natural character.
Wet Pond/ Retention Basin	Detains stormwater inflows in a permanent pond or basin and then releases the water in a controlled manner.
Wetland	Densely vegetated with water-loving plants that mimic the treatment processes of natural wetlands with detention, fine filtration, and biological adsorption, to remove contaminants from stormwater runoff."
Whaitua	Whaitua is the Māori word for catchment or space. For the purposes of the Greater Wellington Natural Resources Plan, the Wellington Region is divided into five Whaitua. Two Whaitua within the Wellington Region are of focus in this SMS – Te Awarua-o-Porirua Whaitua and Whaitua te Whanganui-a-Tara.

Appendix B
Schedule N: Stormwater Management Strategy

Natural Resource Plan for the Wellington Region - Schedule N: Stormwater management strategy

The purpose of a stormwater management strategy for a local authority or state highway stormwater network is to:

- provide a strategy for how sub-catchments within the stormwater network will be managed in accordance with any relevant objectives identified in this Plan, including any relevant Whaitua-specific objectives, and
- describe how the stormwater network will be managed in accordance with good management practice, that evolves through time, to minimise the adverse acute, chronic, and cumulative effects of stormwater discharges on fresh and coastal water.

The detail of a stormwater management strategy shall correspond with the level of risk to receiving water quality arising from stormwater discharges in each catchment or sub-catchment. Detailed asset information and management strategies need not be included in the stormwater management strategy where this is set out in a related asset, or other management plan that is provided to the Wellington Regional Council.

At a minimum, a stormwater management strategy shall:

Management objectives

(a) identify the relevant water quality objectives in this Plan that the local authority or state highway stormwater network is to be managed in accordance with, and
(b) identify any other relevant objectives for which the local authority or state highway stormwater network will be managed, and
(c) for discharges via another stormwater network, identify the requirements of any relevant discharge consents for the receiving network and integrate the strategies to the extent practicable, and

Catchment characteristics

(d) include plans and descriptions of the local authority or state highway stormwater network within each catchment or sub-catchment, including identifying:
    (i) catchment areas, boundaries, major stormwater infrastructure and monitoring points, and
    (ii) piped streams within the network that are of significance to mana whenua, as identified with mana whenua, and
    (iii) constructed overflows, pump stations and other wastewater infrastructure for local authority stormwater networks, and
    (iv) existing and potential future land uses (including roads) and categorisation of these for their likely contribution of contaminants to stormwater, and
    (v) contaminated land and Hazardous Activities and Industries List (HAIL) activities at a high risk of contributing contaminants to stormwater, and
(e) using the above to identify the key risks associated with activities and land uses in the catchment or sub-catchment to receiving water quality from stormwater discharges, and

Strategic actions

(f) prioritise all catchments or sub-catchments covered by the consent for implementation actions or mitigation measures, based on monitoring carried out in accordance with Policy P74 and the assessment of effects, in order to maintain or improve the receiving water quality, and
(g) where relevant, describe how water quality will be improved in any water body identified as a priority for improvement in Schedule H2 or in any fresh or coastal water body that fails to meet a national bottom line for a relevant value in the National Objectives Framework, and
(h) describe how discharges from the local authority or state highway stormwater network will be maintained or improved, through time, to meet the objectives described in (a), (b) and(c), including any relevant targets, timeframe and methods, and

Management options

(i) describe how stormwater discharges from new impervious surfaces from greenfields and brownfields development and/or new or redeveloped roads will be managed to minimise the adverse quality and quantity effects of post-development stormwater discharges, including in accordance with Policies P83 and P84, and

(j) identify options for minimising contaminant inputs into the local authority or state highway stormwater network from land use activities at high risk of generating stormwater contaminants, such as contaminated land, road intersections, interchanges and overpasses with high traffic volumes, areas with significant galvanised steel roofing and HAIL activities, and

(k) describe how for local authority stormwater networks, the adverse effects of wastewater interaction with stormwater will be minimised in accordance with Policies P87 and P88, and

Localised effects

(l) using a risk based approach, identify stormwater discharge points where there are more likely to be significant adverse effects as a result of a specific discharge, with consideration of attributes that are targeted to the relevant receiving environment and implement an appropriate monitoring programme.

(m) when the monitoring in (1) above provides evidence of significant adverse effects resulting from a specific stormwater discharge, describe how the localised adverse effects of discharges from the local authority or state highway stormwater networks will be prioritised for reduction.

Appendix C
Wastewater Network Overflow Programme

Our wastewater network is a critical public health intervention that has saved numerous lives. It originated in the 1890s to reduce outbreaks illness, such as typhoid and dysentery, that sweep through the urbanised areas. Today the council-owned wastewater networks are vast series of pipes and connections that carries waste from toilets and sinks from private properties to one of four wastewater treatment plants in Porirua, Karori and Miramar in Wellington, and Seaview in Lower Hutt. After being treated, it is discharged via long outfalls to the ocean.

However untreated wastewater can get into the stormwater system (and stormwater discharges) which can result in unsafe water for swimming and playing, excessive algal growth that degrades ecosystem health and contaminated shellfish that are unhealthy for humans to eat. The four most typical ways that untreated wastewater gets into the stormwater network is shown in the table below.

Table C-1 Four typical ways that untreated wastewater gets into the stormwater network

What	How Wastewater can get into Stormwater Discharges
Private cross connections	Mistakenly connecting private wastewater laterals from a building's toilet to the stormwater system is a potential source of stormwater contamination. Connections of roof downpipes directly to the wastewater lateral or mistakenly connecting stormwater laterals to the wastewater system can also cause rainwater to overwhelm the sewer pipes resulting in overflows of untreated wastewater from gully traps and manholes.
Wastewater overflows.	Where wastewater networks have insufficient capacity due to excessive infiltration of rainwater or groundwater, overflows of untreated wastewater can occur into stormwater network during high rainfall events or through leaks in the wastewater system contributing to the stormwater networks. Constructed overflows provide a pressure release mechanism which allows for wastewater (which is untreated but may be diluted through an increase in rainwater) to enter the stormwater network, rather than have untreated wastewater spill onto land creating an immediate public health risk.
Leaking Private Public Wastewater Networks	Aging and poor condition public and private wastewater networks that are leaking into the ground through pipe failures or leaking joints in the infrastructure. This wastewater is leaching into the ground and is connecting with high ground water tables or seeping into public stormwater networks or waterways.
Public Manhole and Pump Station overflows, including Gully trap overflows	This is public and private networks that have blocked or network condition issues resulting in network backing up and surcharging through manholes etc. These overflows typically overflow on land, but through natural flow paths can make their way to stormwater networks or water ways. This can also occur when networks are in poor condition and allow infiltration into network through rain events that can result in mixing of stormwater and result in overflows in public and private networks, through manhole lids, chamber lids or private gully traps.

Figure C 1 illustrates how an integrated approach between wastewater management and stormwater management is needed to reduce the discharge of intreated wastewater to the environment.

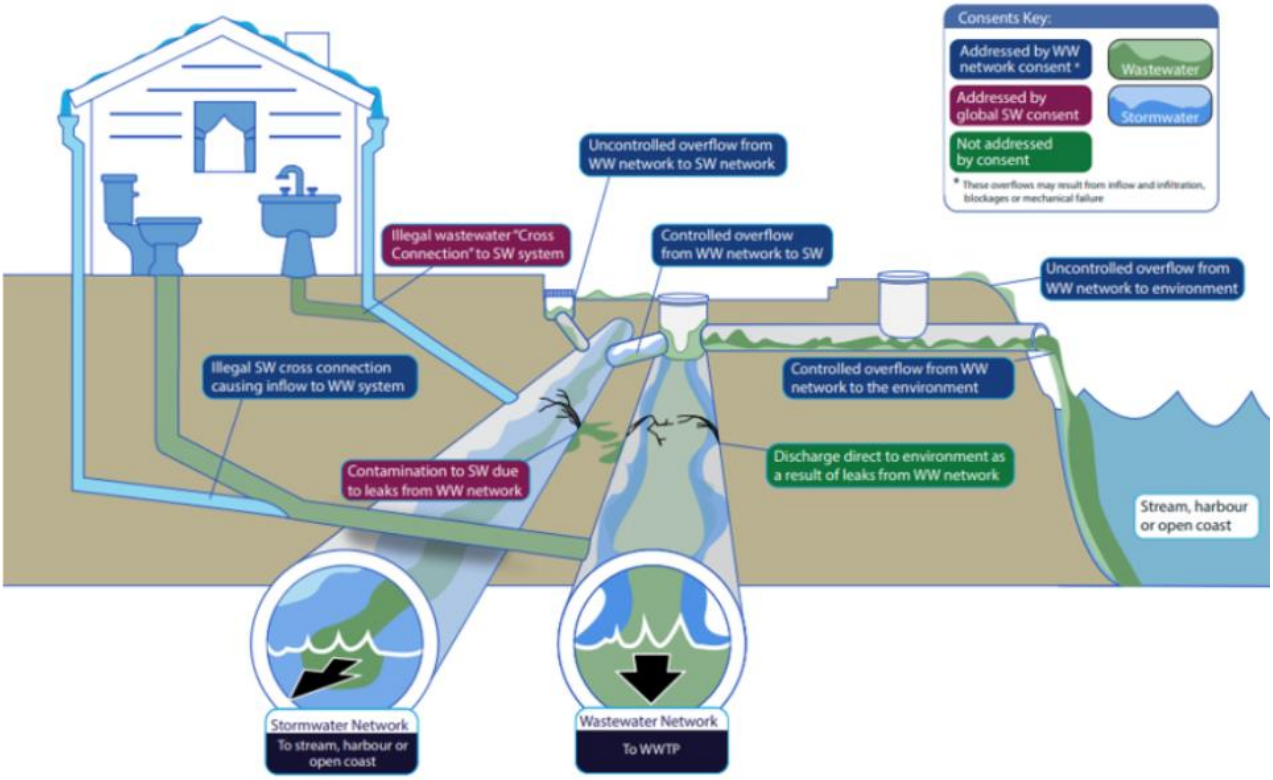


Figure C 1 Untreated wastewater can discharge to the environment when wastewater pipes are overwhelmed with rainwater and when wastewater is connected to stormwater

This SMS includes work programmes to monitor for indicators of wastewater in stormwater discharges and to respond where wastewater occurs. Where the wastewater originates from faults in the public wastewater network, the management approach to rectify these faults will be directed by the Wastewater Network Overflow Programme, which will be subject to specific consent conditions.

Appendix D
Catchment Characteristics
DRAFT

Introduction

This appendix presents the catchment characteristics for the stormwater catchments in three sections – Te Awarua-o-Porirua, Te Whanganui-a-Tara: Wellington Harbour and Te Whanganui-a-Tara: Te Awa Kairangi / Hutt River Catchment.

Each section provides an overview of the catchment locations, urban stormwater network and waterways of significance. This is followed by a summary of water quality based on the monitoring results from the Stage 1 Global Stormwater Discharge Consent and one page summaries of each sub-catchment.

This appendix is draft, and the final SMS will provide more detail as well as links to publicly available online maps to illustrate this information.

Te Awarua-o-Porirua Whaitua

The Te Awarua-o-Porirua Whaitua encompasses all of Porirua including Pukerua Bay at the northern end and the residential areas of Whitby to the east, as well as the northern suburbs of Wellington as shown in Figure D 1 to Figure D 3.

There are seven sub-catchments and over 275 km of streams in Te Awarua-o-Porirua Whaitua. Two of these sub-catchments primarily discharge to the western coastal areas of Porirua, three sub-catchments which primarily flow into the two arms of the Porirua Harbour and two of these sub catchments that have discharges to both the coast and harbour. The largest streams are the Porirua (including Kenepuru Stream), Pauatahanui and Horokiri Stream. Descriptions of each sub-catchment can be found below.

Most of the urban area lies within the Onepoto Arm catchment, with other areas located along the fringes of the Pauatahanui Arm and within the Titahi Bay, Pukerua Bay and Taupō Stream catchments. These urban areas provide for a mix of residential, commercial, and industrial land uses.

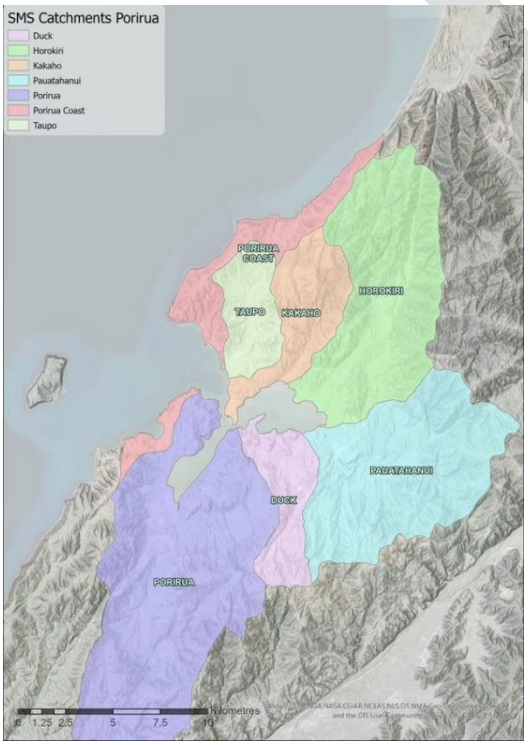


Figure D 1 Map showing the Stormwater network Porirua

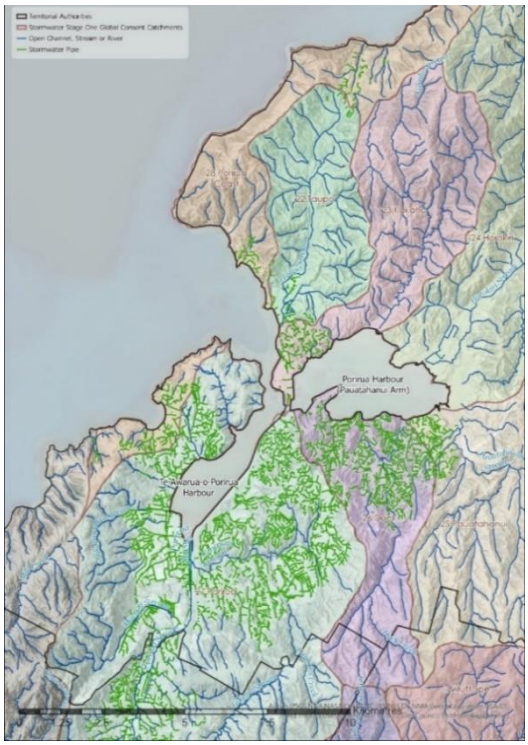


Figure D 2 Map showing the Stormwater in network in Porirua

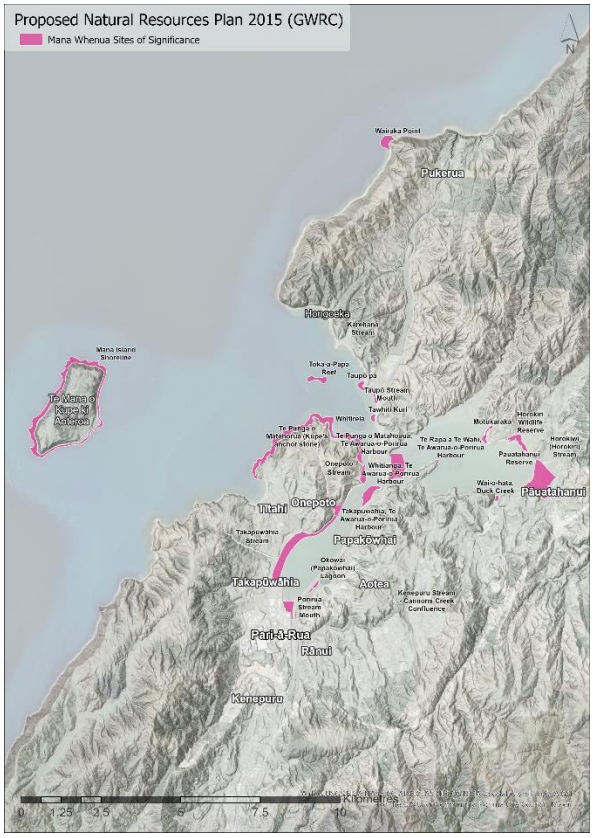


Figure D 3 Map showing the outstanding water bodies, Ngā Taonga Nui-a-Kiwa and aquatic sites with significant mana whenua values identified (Sch A-C of NRP).

Current State

There are multiple pressures on water bodies throughout Te Awarua-o-Porirua – some historical and others new. In urban areas, impervious surfaces created by roofs, roads, parking lots and driveways increase water volumes and flow peaks when it rains, flooding streams and causing streambank erosion.

Many of the lower urban reaches of streams have been modified, channelised, straightened, piped, and offer limited habitat for aquatic life. Stream mouths have been modified by reclamation, earthworks and the building of the railway line and state highways, resulting in the loss of important spawning, nursery and feeding grounds for freshwater and marine life as well as birds.

Under Schedule H2 of the NRP waterways that are prioritised for improvement of fresh and coastal water quality for contact recreation and mana whenua customary use include, Titahi Bay at South Beach Access Road, and Te Awarua-o-Porirua Harbour (Onepoto Arm) at Rowing Club

Excessive rates of sedimentation in the harbour are a considerable problem, where the main source of sedimentation in the harbour is terrestrial, originating from erosion prone land, stream bank erosion, and development of urban and rural areas. This sedimentation has adverse effects on the aquatic flora and fauna, amenity values, social and cultural values, and general water quality.

Monitoring results [56] from the Stage 1 Global Stormwater Discharge Consent shown in Figure D 4 **Error! Reference source not found.** coli, copper, zinc and nutrients, as shown below in ⁰⁰Table D 1⁰⁰**Error! Reference source not found.**

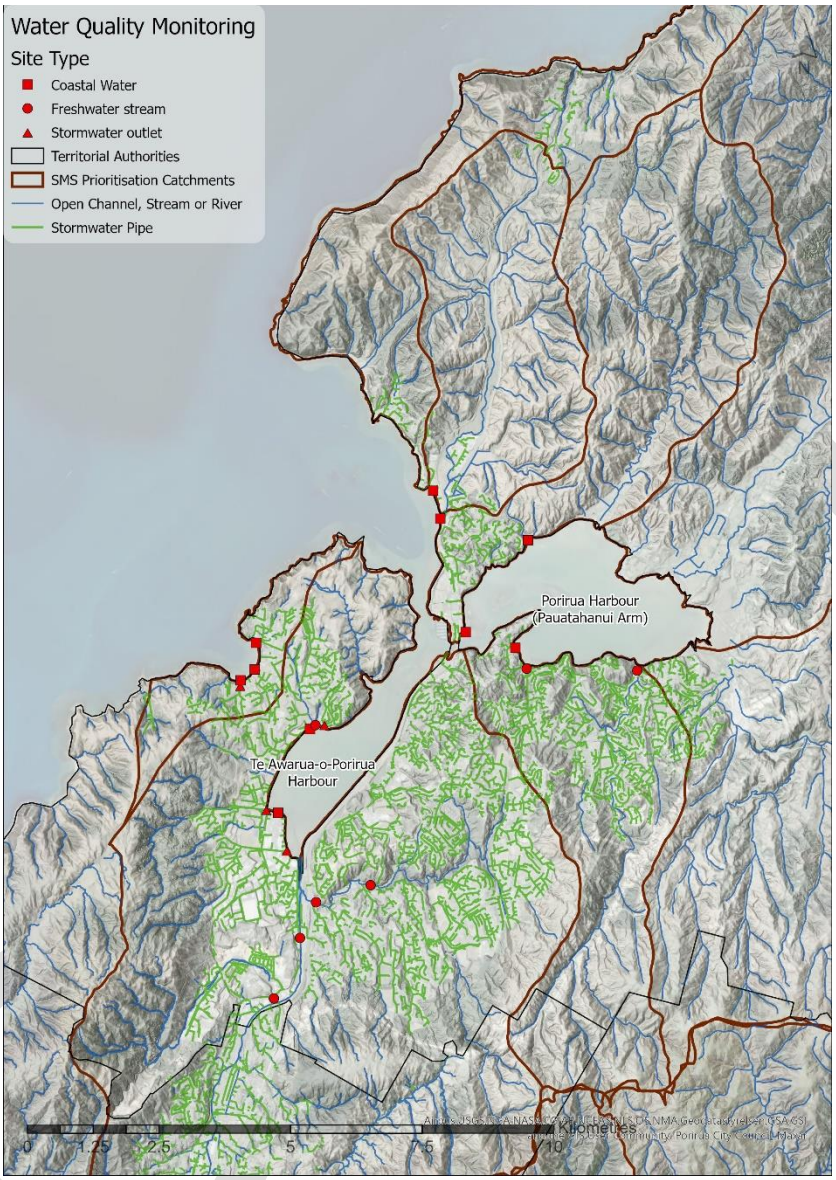


Figure D 4 Monitoring locations for the Stage 1 Global Stormwater Discharge Consent in Te Awarua-o-Porirua Whaitua.

Table D 1 Overview of receiving environment water quality across the Porirua catchments, based on monitoring data collected for the Stage 1 Global Stormwater Monitoring consent (Stormwater Monitoring Plan Annual Report 2021-2022).

Water Quality parameter	Porirua	Kakaho	Duck	Taupo Stream	Porirua Coast
E. coli (freshwater, NPS attribute state)	E	E	E	E	NM
E. coli (freshwater, NRP O18-95%ile <540)	Not met	Not met	Not met	Not met	NM
	Not met (Onepoto)	Met (at 1 of 2 sites)		NM	Met (at 2 of 3 sites Titahi Bay)

[56] *Stormwater Monitoring Plan Annual Report 2020-2021*

Water Quality parameter	Porirua	Kakaho	Duck	Taupo Stream	Porirua Coast
Enterococci (coastal water recreation, NRP 018-95%ile <540)			Not met (at 1 of 1 sites)		Not met (Plimmerton Beach)
Dissolved reactive phosphorus (NRP attribute state)	D	NM	NM	D	NM
Nitrate-N (nutrient, ANZG 2018)	Not met	NM	NM	Not met	NM
Nitrate-N (toxicity NPS attribute state)	A	NM	NM	A	NM
Ammonia-N (toxicity NPS attribute state)	B	NM	NM	B	NM
Dissolved copper (ANZG 2018)	Not met	Not met	Not met	Not met	NM
Dissolved zinc (ANZG 2018)	Not met	Not met	Not met	Met	NM

Note: The current state summary provided above is an indicative assessment based on the results of one or more individual sites reflecting the dominant condition of the waterbody. As instream conditions may differ between sites within a water body the reader is directed to the source document for site specific benchmarking against the NRP, NPS and ANZG. NM=Not measured.

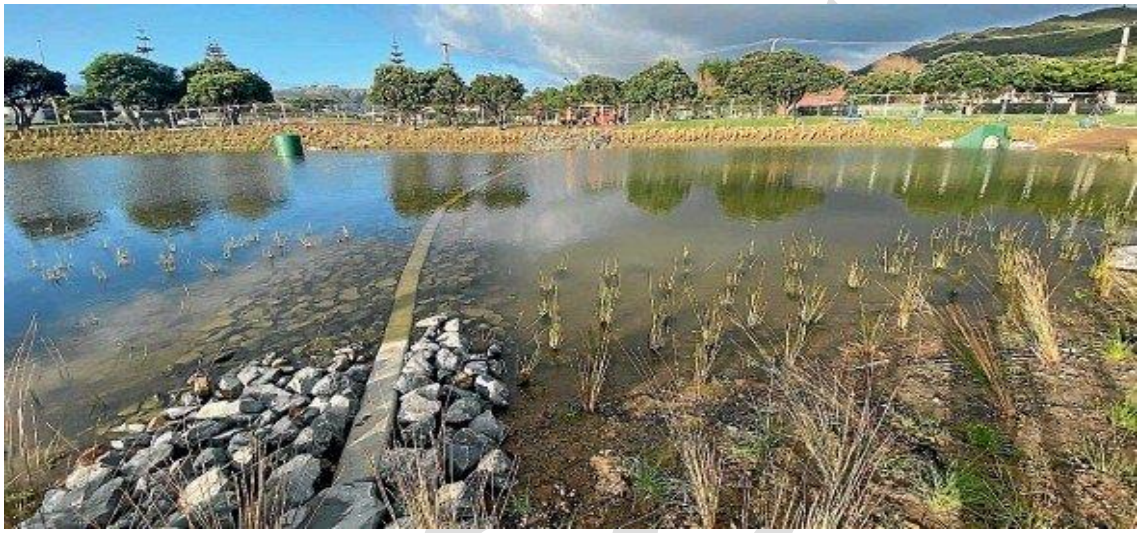
What is currently being done to support our journey to wai ora?

A transformational programme to improve the water quality and biodiversity of Porirua's stream began in 2021 that involves that implementation of a stream management and planting programme throughout the Porirua district. The programme has the vision to improve the mauri of Te Awarua-o-Porirua/Porirua Harbour and its waterways, and their biological and ecological health by planting the banks of all the streams that run into the harbour, from the top of Paekakariki Hill in the north, to Churton Park and Newlands in the south.

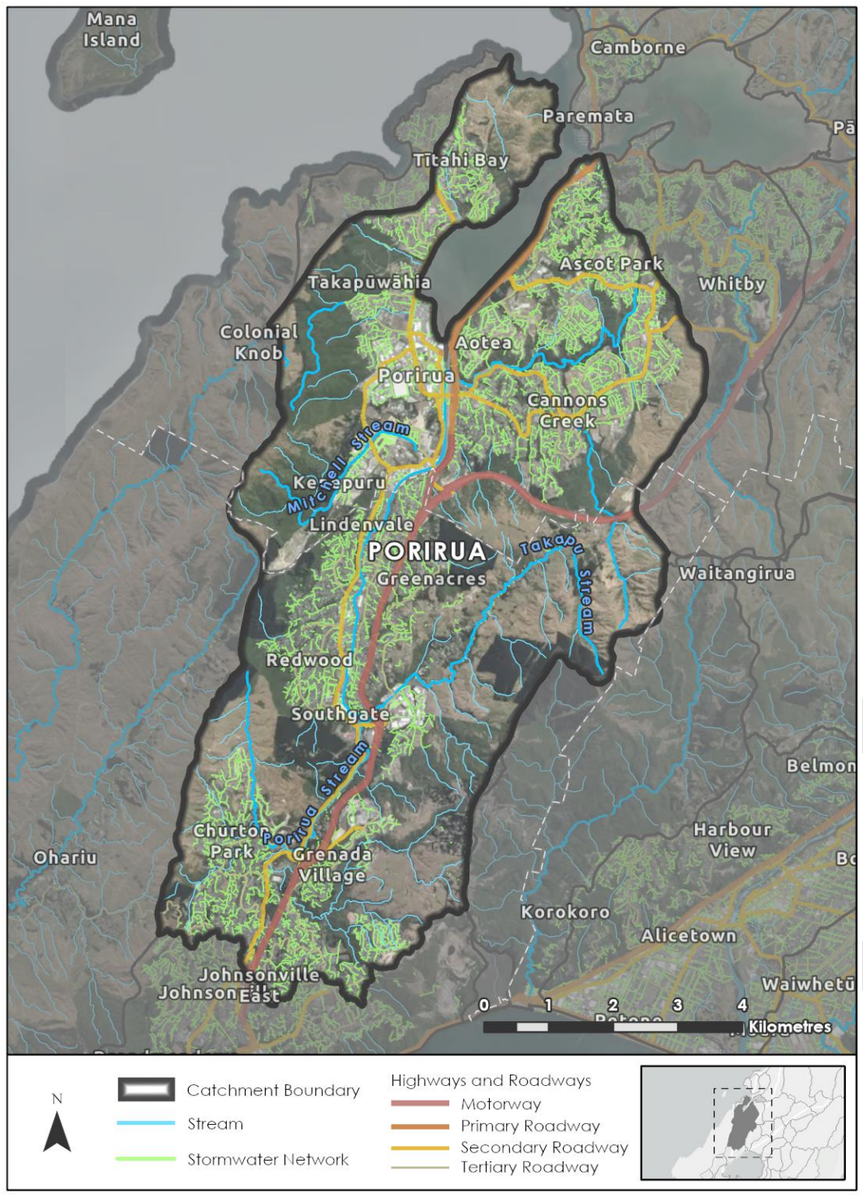
Case Study 3: Te Kukuwai o Toa - Elsdon Park Stormwater improvement

This wetland is an important part of the journey to wai ora in Te Awarua o Porirua. The whenua in which the wetland now sits was a significant site for Ngāti Toa in the past where they gathered kai moana and essential resources for the iwi. Te Kukuwai o Toa when translated means The Wetlands of Toa in reference to its presence in the heart of Takapuwahia.

The wetland has been developed in partnership between Wellington Water, Porirua City Council and Ngāti Toa with funding from the MfE Freshwater Improvement Fund. It will help reduce flooding and naturally filter stormwater before it runs into Te Awarua-o-Porirua Harbour.



Stormwater Catchment	Priority Ranking
Porirua	1 (highest)



Key Issues for Stormwater Management

- The catchment is bisected by State Highway 1 and State Highway 59
- Highly urbanised (modified) zones which include operating railway areas, industrial zones, and significant commercial and community infrastructure.
- Operating landfill (Spicers Landfill)
- Closed landfills (Porirua Hospital, Northern Landfill, Sievers Grove and Churton Park).
- Te Awarua-o-Porirua (Porirua Harbour, including contributing streams) is listed as Ngā Taonga Nui a Kiwa (wai tai) in Schedule B of the NRP
- Kenepuru Stream, Porirua Stream mouth, Okowai (Papakowhai) Lagoon, Onepoto Stream, Karehana Stream and Takapūwāhia Stream are listed in Schedule C of the NRP as sites of significance to mana whenua.
- Te Awarua-o-Porirua at the Rowing Club is identified in Schedule H2 (Contact recreation and Māori customary use) of the NRP.

Predominant existing land use

Land use proportions (%)[1]		Hazardous Activities and Industries within catchment [2]	
Rural	24	SLUR sites (%)[2]	20
Open Space	18	Predominant HAIL activities	• Cemeteries and waste recycling, treatment, and disposal. The dominant sites included within this category are the landfills – Spicer Gully (still in operation), Sievers Grove (closed in 1976), Northern (closed), Churton Park (closed). • Chemical manufacture, application, and bulk storage. The largest sites under this category are associated with Kenepuru Hospital and a Packaging corporation • Mineral extraction, refining and reprocessing, storage, and use. • Vehicle refuelling, service, and repair.
Outer residential	12		

Existing Monitoring

18 monitoring sites (2 coastal sites, 3 stormwater discharge sites, 13 freshwater sites)

Preferred Management Approach

The Porirua sub-catchment has moderate residential and commercial development and therefore will require management options that can be applied to both brownfield and greenfield developments. Management approaches that are preferred for consideration in brownfield developments in Porirua include:

- Raingardens to improve stormwater quality, detention, and amenity. These can be applied in urban and industrial areas.
- Tree-pits and planter boxes, as part of street-scale upgrades, to slow surface water flow and improve stormwater quality and general amenity
- Infiltration trenches /basins with adjoining filter strips to improve stormwater quality and reduced flow velocity. These options are suitable for precinct sizes areas and in both high- and low-density zones where space to implement management options is limited.

Management approaches that are preferred across greenfield development in Porirua include:

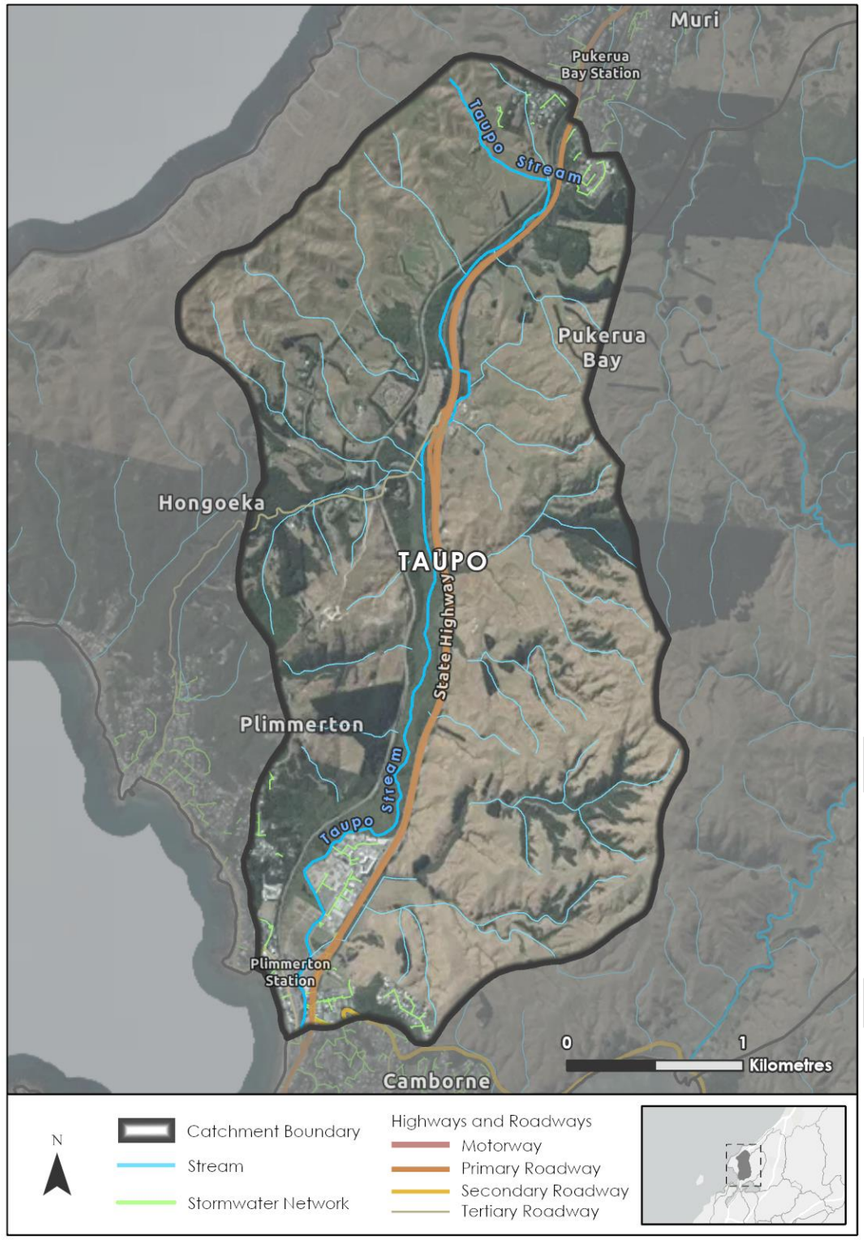
- Infiltration soakage methods such as infiltration basis, permeable pavements, and filter strips to improve infiltration and improve stormwater quality.
- Rainwater collection tanks in urban and commercial zones to improve water harvesting and re-use and provide for a detention and slow-release function which has been shown to reduce stream erosion.
- Bioretention (raingardens, tree pits etc) to improve stormwater quality and add amenity and ecological value.

Given the high portion of open space in the Porirua catchment consideration should also be given to the following management options where space is permitted:

- Constructed wetlands for water quality treatment, and detention ponds to help control quantity of stormwater. These could be implemented together as community scale devices.
- Stream daylighting to improve natural values, peak flows and storage capacity as well as adding amenity a community value.

1 Three highest land use proportions displayed as % of total area; 2 Only selected SLUR sites with verified history of HAIL, or confirmed contamination are included in the assessment. Unverified/ remediated sites have been excluded.

Stormwater Catchment	Priority Ranking
Taupō	2



Key Issues for Stormwater Management

- The catchment is bisected by State Highway 1 and State Highway 59
- Being predominantly rural land, the catchment is prone to runoff from pasture and shrubs
- The Taupō Swamp complex is identified as an outstanding water body (wetland) in Schedule A of the NRP and identified in Schedule F1 (Rivers and lakes with significant indigenous ecosystems) of the NRP.
- South Beach at Plimmerton is identified in Schedule H2 (Contact recreation and Māori customary use) of the NRP.
- Te Awarua-o-Porirua is listed as Ngā Taonga Nui a Kiwa in Schedule B of the NRP
- Taupō Stream is identified in Schedule F1 (watercourse with significant indigenous ecosystem value) of the NRP

Predominant existing land use

Land use proportions (%)[1]		Hazardous Activities and Industries within catchment [2]	
Rural lifestyle	24	**SLUR sites (%)[2]**	21
Future urban	18	**Predominant HAIL activities**	• Cemeteries and waste recycling, treatment, and disposal (including the closed (1975) Pukerua Bay Landfill which is now a Pony Club and the Whenua Tapu cemetery and crematorium) • Vehicle refuelling, servicing, and repair
General rural	11		

Existing Monitoring

5 monitoring locations (3 coastal sites, 1 stormwater discharge site, 1 freshwater site)

Preferred Management Approach

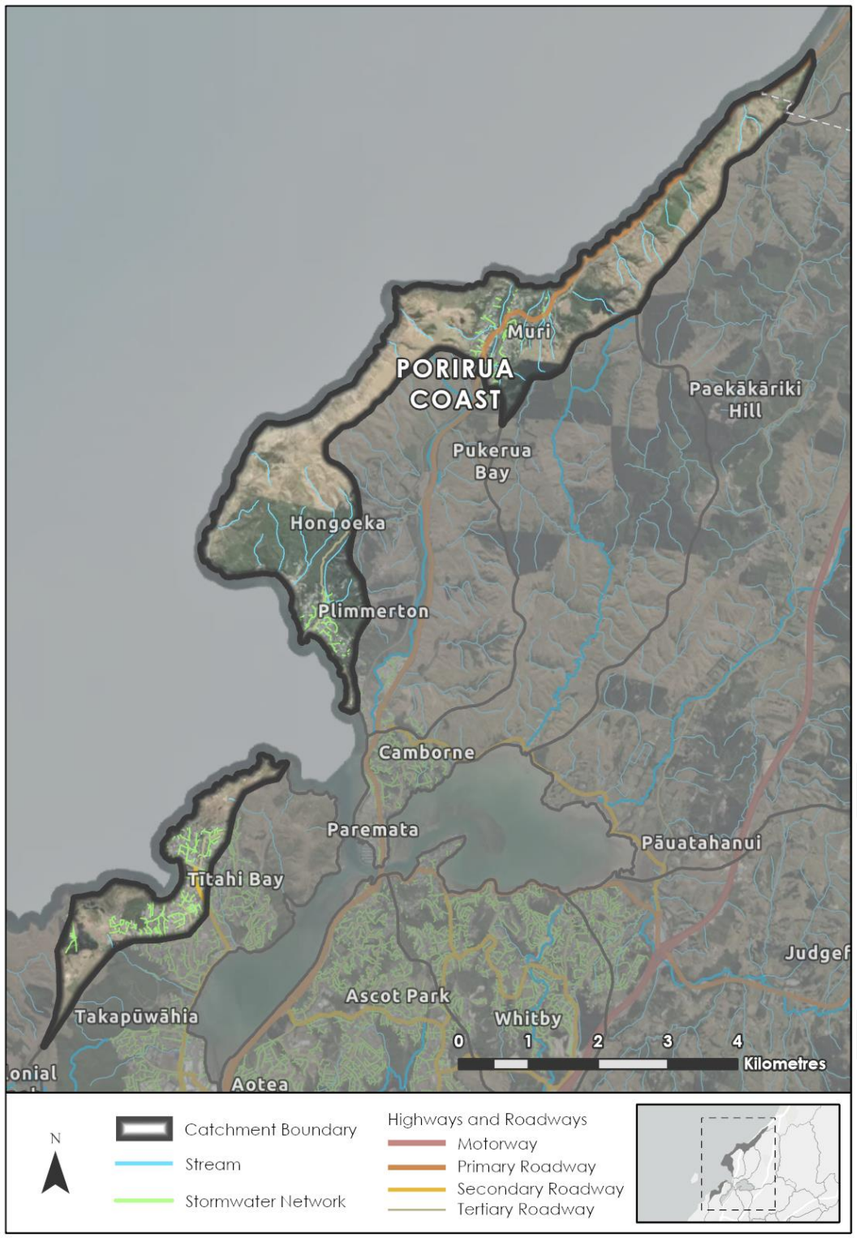
The Taupō catchment provides a great opportunity for the inclusions of WSD management options as it is likely to undergo future growth with greenfield development. The preferred management approaches for the Taupō sub-catchment include:

- Development of community scale devices such as constructed wetlands and ponds at the base of catchments (including large catchments), or in shared areas, to capture, attenuate, and release stormwater in controlled volumes to the receiving environment. Community scale devices also help add amenity and biodiversity value.
- Reducing the degree of imperviousness through infiltration soakage controls in green and brownfield developments such as inclusion of infiltration basins, permeable paving, vegetated swales (in gently sloping or low laying areas), inclusion of filter strips, tree-pits, and planter boxes. Infiltration soakage controls help improve water quality. The inclusion of vegetation and vegetated management controls also plays an important role in sediment and erosion control.
- Riparian planting programmes to help maintain the natural environment and provide protection for streams and rivers by creating a 'buffer' zone.
- Inclusion of water harvest and reuse practices (storage tanks) in urban, commercial, and industrial development areas to add water harvesting and re-use and provide for a detention and slow-release function.

Given the lack of existing infrastructure and development in this catchment WSD should be implemented early on and should include basic principles such as sighting of land that is appropriate for development and working with the natural environment (not against) to maintain natural hydrology and ecological values.

1 Three highest land use proportions displayed as % of total area; 2 Only selected SLUR sites with verified history of HAIL, or confirmed contamination are included in the assessment. Unverified/ remediated sites have been excluded.

Stormwater Catchment	Priority Ranking
Porirua Coast	3



Key Issues for Stormwater Management

- A collection of minor sub-catchments draining to the west coast.
- The area is partially urbanised, particularly in Tītahi Bay, Plimmerton and Pukerua Bay. Urbanised areas are a significant source of road and vehicle related pollution.
- State Highway 59 passes through the northern part of the catchment
- Tītahi Bay at South Beach Access Road is identified in Schedule H2 (Contact recreation and Māori customary use) of the NRP.

Predominant existing land use

Land use proportions (%)[1]		Hazardous Activities and Industries within catchment [2]	
General rural	42	SLUR sites (%)[2]	35
Māori purpose (Hongoeka)[3]	17	Predominant HAIL activities	• Cemeteries and waste recycling, treatment, and disposal (primarily the Porirua sewage treatment plant) • Chemical manufacture, application, and bulk storage (primarily Plimmerton quarry)
General residential	17		

Existing Monitoring

3 monitoring locations (all coastal sites)

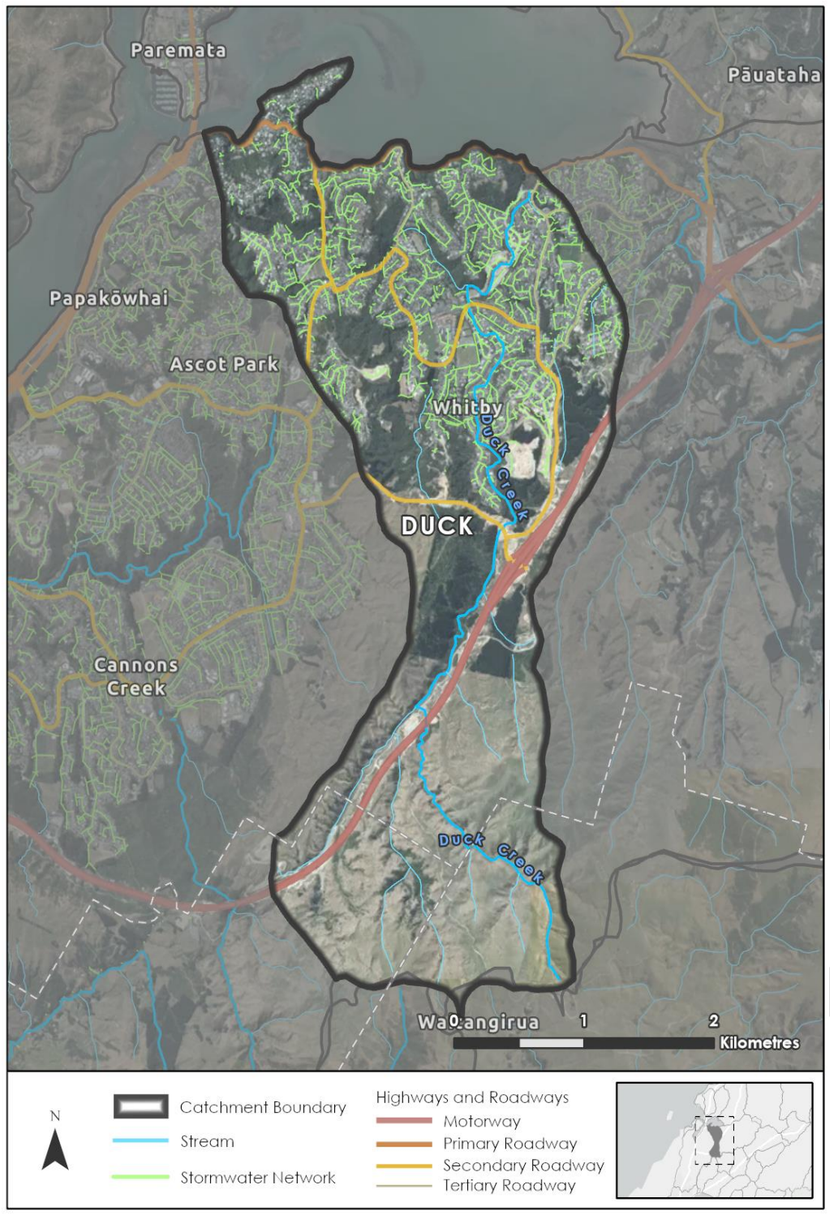
Preferred Management Approach

The smaller nature of the Porirua Coast catchments means focus should be placed on maintain and improving the existing ecological and cultural values with management approaches suitable for smaller scales. The preferred management approaches include:

- Reducing the degree of imperviousness through controls on green and brownfield developments such as inclusion of permeable paving, vegetated swales (in gently sloping or low laying areas), retrofitting of filter strips and tree-pits and planter boxes.
- Improving infiltration through infiltration enabling devices in precinct sized developments
- Where space is permitted developing treatment, storage, and detention systems (such as constructed wetlands or ponds) to control peak flows and improve stormwater quality at the base of catchments
- Including proprietary treatment devices, like gross pollutant traps, other in catchpit devices and oil/water separators, as part of the treatment train to improve stormwater quality by removing larger litter items, particulates and separating out certain contaminants.

1 Three highest land use proportions displayed as % of total area; 2 Only selected SLUR sites with verified history of HAIL, or confirmed contamination are included in the assessment. Unverified/ remediated sites have been excluded. 3 Hongoeka is situated at the northern coastal end of Plimmerton and consists of a residential area, including the marae and wharenui, surrounded by six large land blocks. It is the largest area of Māori owned land in Porirua.

Stormwater Catchment	Priority Ranking
Duck	4



Key Issues for Stormwater Management

- State Highway 1 passes through this catchment
- The lower half of the catchment includes the urban area of Whitby, which also includes light commercial areas.
- This catchment drains to the Pauatahanui Inlet of which the tidal flats and saltmarsh are identified as an outstanding water bodies (wetlands) in Schedule A of the NRP
- Duck Creek (Wai-o-hata) is listed in Schedule C and Schedule F1 of the NRP.
- Te Awarua-o-Porirua is listed as Ngā Taonga Nui a Kiwa in Schedule B of the NRP

Predominant existing land use

Land use proportions (%)[1]		Hazardous Activities and Industries within catchment [2]	
General residential	43	SLUR sites (%)[2]	0.2
Open space	24	Predominant HAIL activities	• Explosives and ordinances production, storage, and use (located in the headwaters at the upper most part of the catchment reach)
Rural	11		

Existing Monitoring

4 monitoring locations (2 coastal sites, 2 freshwater sites)

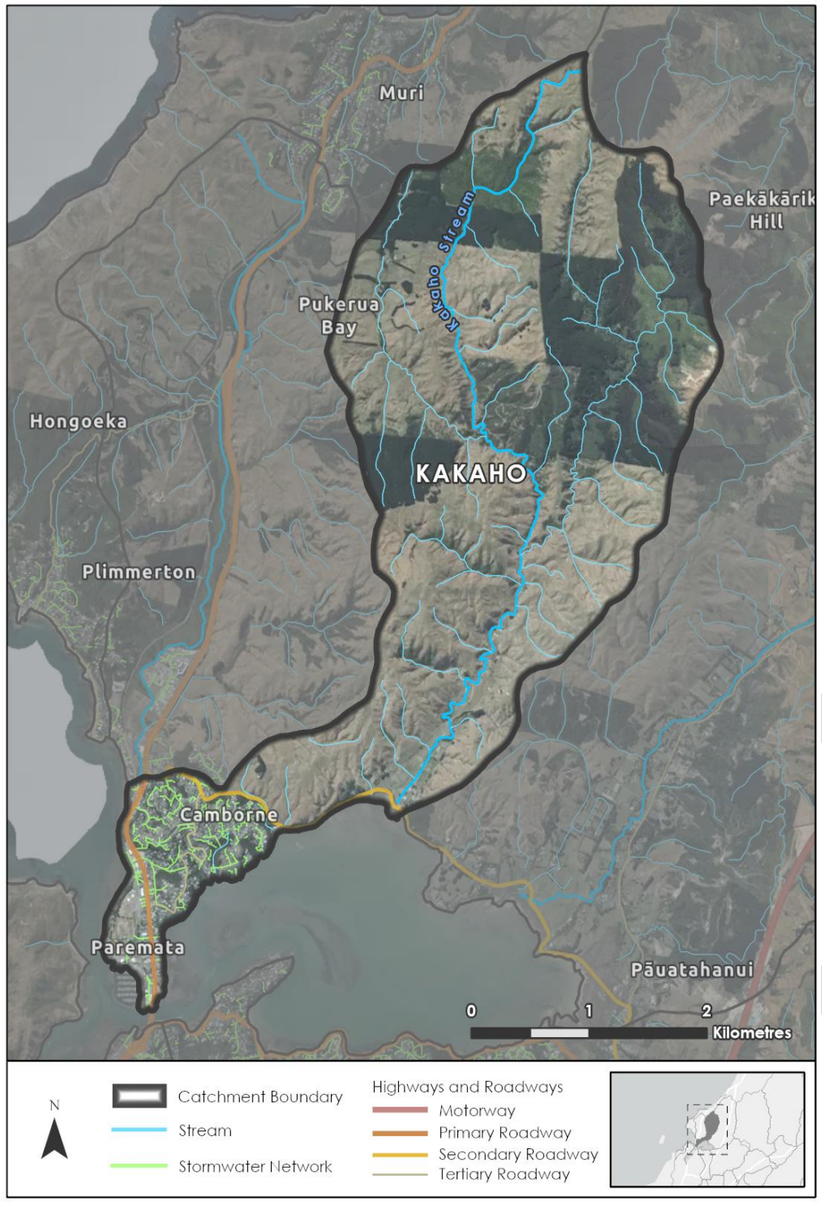
Preferred Management Approach

The Duck sub-catchment has residential and commercial development in the lower catchment and has also been identified as future growth area. This catchment will require management options that can be applied to both brownfield and greenfield developments. Management approaches that are preferred include:

- Development of community scale devices such as constructed wetlands and ponds at the base of catchments (including large catchments), or in shared areas, to treat, capture, attenuate, and release stormwater in controlled volumes to the receiving environment. Community scale devices also help add amenity and biodiversity value.
- Raingardens to improve stormwater quality, detention, and amenity. These can be installed in new developments or retrofitted and applied in urban and commercial areas.
- Tree-pits and planter boxes, as part of street-scale upgrades, to slow surface water flow and improve stormwater quality and general amenity
- Infiltration trenches /basins with adjoining filter strips to improve stormwater quality and reduced flow velocity. These options are suitable for precinct sizes areas and in both high- and low-density zones where space to implement management options is limited.

1 Three highest land use proportions displayed as % of total area; 2 Only selected SLUR sites with verified history of HAIL, or confirmed contamination are included in the assessment. Unverified/ remediated sites have been excluded.

Stormwater Catchment	Priority Ranking
Kakaho	5



Key Issues for Stormwater Management

- State Highway 59 briefly passes through the lower end of the catchment
- Being predominantly rural land, the catchment is prone to runoff from pasture and shrubs
- The lower half of the catchment includes the urban area of Camborne, which also includes light commercial areas and the marina
- This catchment drains to the Pauatahanui Inlet of which the tidal flats and saltmarsh are identified as an outstanding water bodies (wetlands) in Schedule A of the NRP
- Te Awarua-o-Porirua is listed as Ngā Taonga Nui a Kiwa in Schedule B of the NRP

Predominant existing land use

Land use proportions (%)[1]		Hazardous Activities and Industries within catchment [2]	
General rural	49	SLUR sites (%)[2]	2
Rural lifestyle	32	Predominant HAIL activities	• Vehicle refuelling, servicing, and repair (all located in the lower portion of the catchment
General residential	5		

Existing Monitoring

1 coastal monitoring site (at the Pauatahanui Inlet water ski club)

Preferred Management Approach

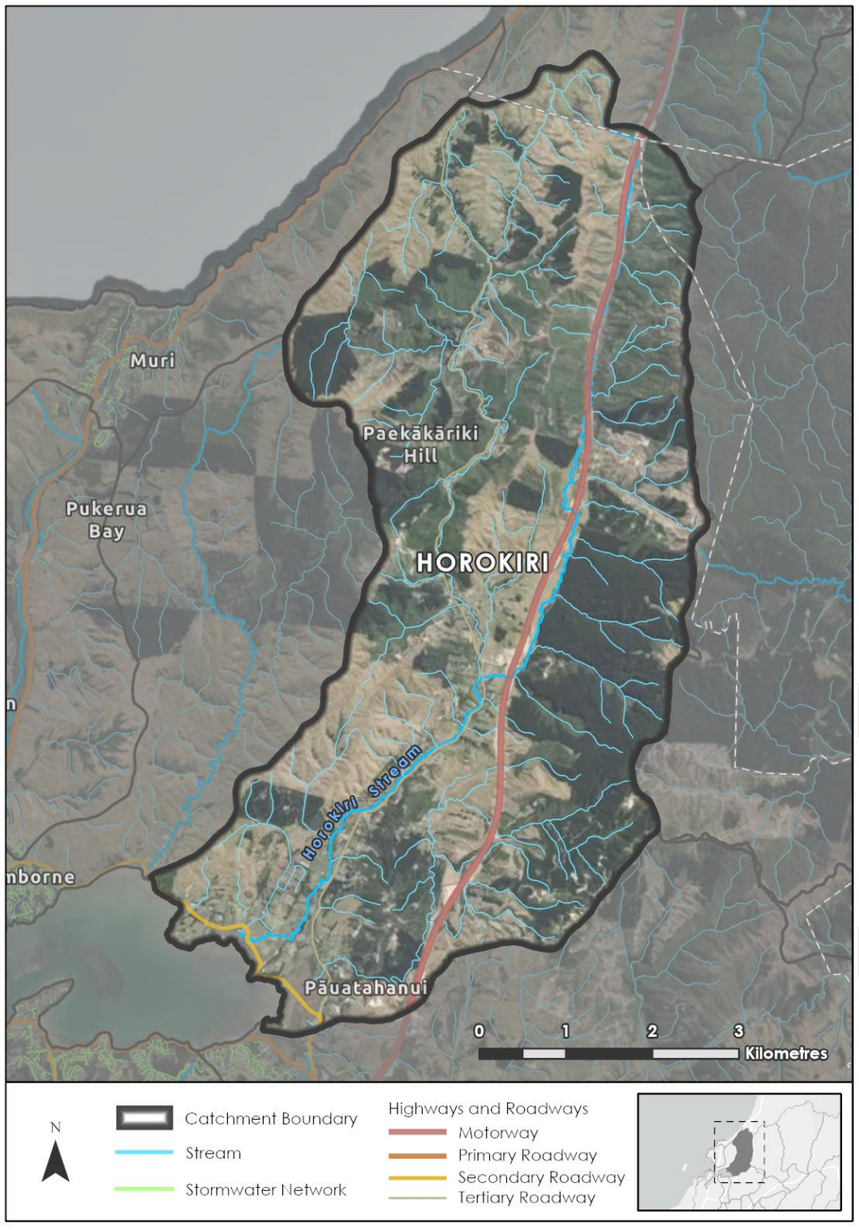
The Kakaho sub-catchment is like the Duck sub-catchment and has residential and commercial development in the lower catchment and will require management options that can be applied to both brownfield and greenfield developments. Management approaches that are preferred include:

- Development of community scale devices such as constructed wetlands and ponds at the base of catchments (including large catchments), or in shared areas, to capture, attenuate, and release stormwater in controlled volumes to the receiving environment. Community scale devices also help add amenity and biodiversity value.
- Raingardens to improve stormwater quality, detention, and amenity. These can be installed in new developments or retrofitted and applied in urban and commercial areas.
- Tree-pits and planter boxes, as part of street-scale upgrades, to slow surface water flow and improve stormwater quality and general amenity
- Infiltration trenches /basins with adjoining filter strips to improve stormwater quality and reduced flow velocity. These options are suitable for precinct sizes areas and in both high- and low-density zones where space to implement management options is limited.
- Riparian planting programmes to help maintain the natural environment and provide protection for streams and rivers by creating a 'buffer' zone.
- Inclusion of water harvest and reuse practices (storage tanks) in urban, commercial, and industrial development areas to add water harvesting and re-use and provide for a detention and slow-release function.

Given this catchment has been identified as a location of likely future growth WSD should be implemented early on and should include basic principles such as sighting of land that is appropriate for development and working with the natural environment (not against) to maintain natural hydrology and ecological values.

1 Three highest land use proportions displayed as % of total area; 2 Only selected SLUR sites with verified history of HAIL, or confirmed contamination are included in the assessment. Unverified/ remediated sites have been excluded.

Stormwater Catchment	Priority Ranking
Horokiri	6



Key Issues for Stormwater Management

- The catchment is bisected by State Highway 1
- Being predominantly rural land, the catchment is prone to runoff from pasture and shrubs
- This catchment drains to the Pauatahanui Inlet of which the tidal flats and saltmarsh are identified as an outstanding water bodies (wetlands) in Schedule A of the NRP
- Horokiri (Horokiwi) Stream is listed in Schedule F1 and Schedule C (site of significance to mana whenua) of the NRP.
- Te Awarua-o-Porirua is listed as Ngā Taonga Nui a Kiwa in Schedule B of the NRP

Predominant existing land use

Land use proportions (%)[1]		Hazardous Activities and Industries within catchment [2]	
General rural	63	SLUR sites (%)[2]	5
Rural lifestyle	28	Predominant HAIL activities	• Explosives and ordinances production, storage, and use (associated with the ex Pauatahanui Military Camp) • Chemical manufacture application and bulk storage
Open space	6		

Existing Monitoring

No established monitoring locations

Preferred Management Approach

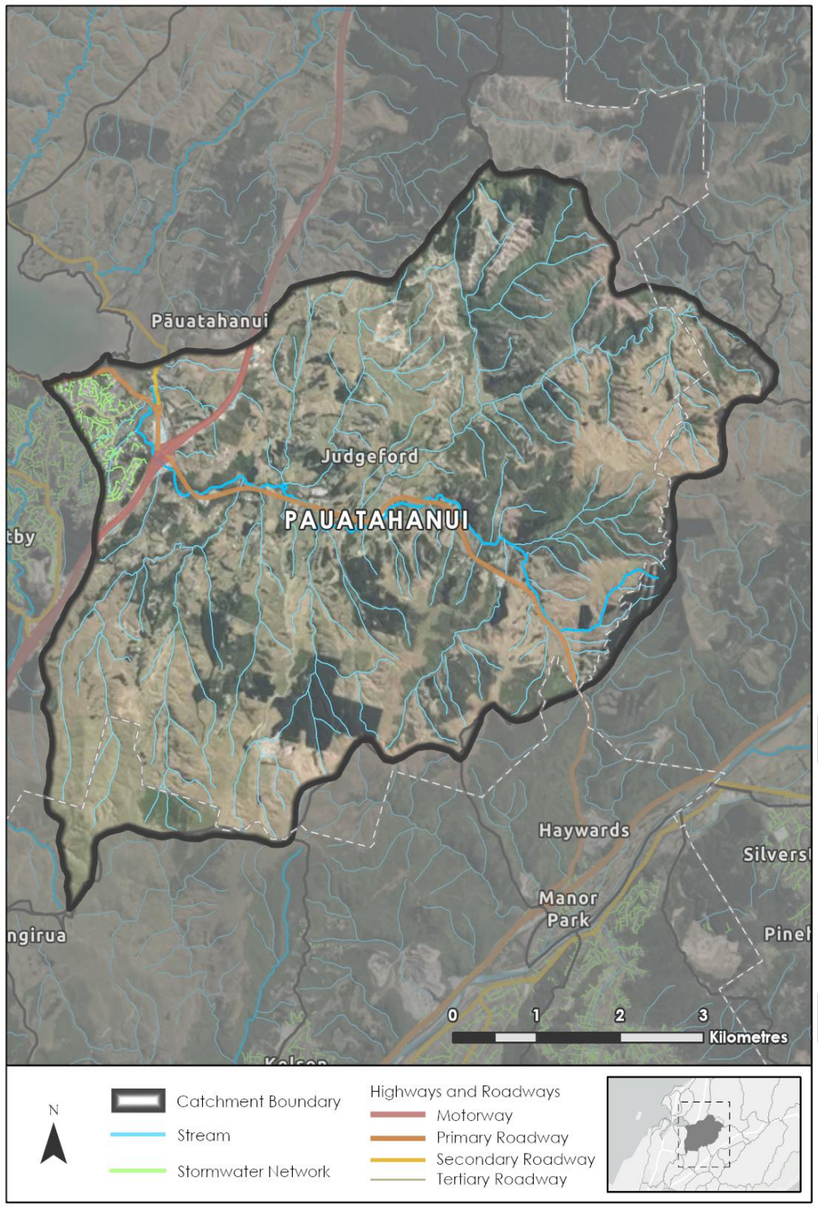
The Horokiri catchment provides a great opportunity for the inclusions of WSD management options as it has little development (no stormwater network) and has a decent proportion of open space. The preferred management approaches include:

- Options for a 'pipeless' network, which favour open conveyance development over a piped network
- Development of community scale devices such as constructed wetlands and ponds at the base of catchments (including large catchments), or in shared areas, to capture, attenuate, and release stormwater in controlled volumes to the receiving environment. Community scale devices also help add amenity and biodiversity value.
- Raingardens to improve stormwater quality, detention, and amenity. These can be installed in new developments or retrofitted and applied in urban and commercial areas.
- Reducing the degree of imperviousness through infiltration soakage controls in green and brownfield developments such as inclusion of infiltration basins, permeable paving, vegetated swales (in gently sloping or low laying areas), inclusion of filter strips, tree-pits, and planter boxes. Infiltration soakage controls help improve water quality.
- Riparian planting programmes to help maintain the natural environment and provide protection for streams and rivers by creating a 'buffer' zone.
- Inclusion of water harvest and reuse practices (storage tanks) in urban, commercial, and industrial development areas to add water harvesting and re-use and provide for a detention and slow-release function.

Given this catchment has no existing stormwater network but is identified as a potential area for future growth, it provides a rare opportunity to implement alternative network approaches. Considering the little existing infrastructure WSD should be implemented early on and should include basic principles such as sighting of land that is appropriate for development and working with the natural environment (not against) to maintain natural hydrology and ecological values.

1 Three highest land use proportions displayed as % of total area; 2 Only selected SLUR sites with verified history of HAIL, or confirmed contamination are included in the assessment. Unverified/ remediated sites have been excluded.

Stormwater Catchment	Priority Ranking
Pauatahanui	7 (Lowest)



Key Issues for Stormwater Management

- This catchment is bisected by State Highway 58 and 1.
- Being predominantly rural land, the catchment is prone to runoff from pasture and shrubs.
- There is a small portion of the Whitby urban area within the catchments, and this catchment has been noted for future urban development.
- This catchment drains to the Pauatahanui Inlet of which the tidal flats and saltmarsh are identified as an outstanding water bodies (wetlands) in Schedule A of the NRP
- Pauatahanui Stream is listed in Schedule C and Schedule F1 of the NRP.
- Te Awarua-o-Porirua is listed as Ngā Taonga Nui a Kiwa in Schedule B of the NRP
-

Predominant existing land use

Land use proportions (%)[1]		Hazardous Activities and Industries within catchment [2]	
General rural	70	SLUR sites (%)[2]	9
Rural lifestyle	10	Predominant HAIL activities	• Cemeteries and waste recycling, treatment, and disposal (a portion of which was landfill – Brittons, Haywards Hill). • Chemical manufacture, application and bulk storage, and mineral extraction, refining and reprocessing, storage and use
Future urban	5		

Existing Monitoring

No established monitoring locations

Preferred Management Approach

Like the Horokiri and the Taupō catchments the Pauatahanui sub-catchment provides an opportunity for the inclusions of many WSD management options in greenfield developments, with future growth predicted in the sub-catchment and little existing development. The preferred management approaches for this catchment include:

- Development of community scale devices such as constructed wetlands and ponds at the base of catchments (including large catchments), or in shared areas, to capture, attenuate, and release stormwater in controlled volumes to the receiving environment. Community scale devices also help add amenity and biodiversity value.
- Raingardens to improve stormwater quality, detention, and amenity. These can be installed in new developments or retrofitted and applied in urban and commercial areas.
- Reducing the degree of imperviousness through infiltration soakage controls in green and brownfield developments such as inclusion of infiltration basins, permeable paving, vegetated swales (in gently sloping or low laying areas), inclusion of filter strips, tree-pits, and planter boxes. Infiltration soakage controls help improve water quality.
- Riparian planting programmes to help maintain the natural environment and provide protection for streams and rivers by creating a 'buffer' zone.
- Inclusion of water harvest and reuse practices (storage tanks) in urban, commercial, and industrial development areas to add water harvesting and re-use and provide for a detention and slow-release function.

Again, given this catchment has been identified as a location of likely future growth WSD should be implemented early on and should include basic principles such as sighting of land that is appropriate for development and working with the natural environment (not against) to maintain natural hydrology and ecological values.

1 Three highest land use proportions displayed as % of total area; 2 Only selected SLUR sites with verified history of HAIL, or confirmed contamination are included in the assessment. Unverified/ remediated sites have been excluded.

Whaitua te Whanganui-a-tara

Whaitua te Whanganui-a-Tara encompasses Upper Hutt, Hutt City and the majority of Wellington City.

Wellington Catchment

Wellington's stormwater network has developed in correspondence with the city's growth in population. Over its development natural water courses within the urban edge have become increasingly confined or piped to allow more intensive use of the land. There are nine sub-catchments in the Whanganui-a-Tara Wellington Harbour Catchment, four of which discharge out to the south coast and five that discharge to the Whanganui-a-Tara inner harbour, shown within Figure D 5 to Figure D 8.

While some urban streams remain, including the Kaiwharawhara that flows to the Whanganui-a-Tara inner harbour, Ōwhiro, and Karori streams that flow out to the South Coast and Cook Straight, most of Wellington's historical streams have been piped.

Wellington's stormwater network is made up of nearly 700 km of pipelines, 2.2 km of tunnels, over 15,000 inlets/outlets, 1 pump station and 2,700 associated fittings. These structures include kerbs, channels, and sumps.

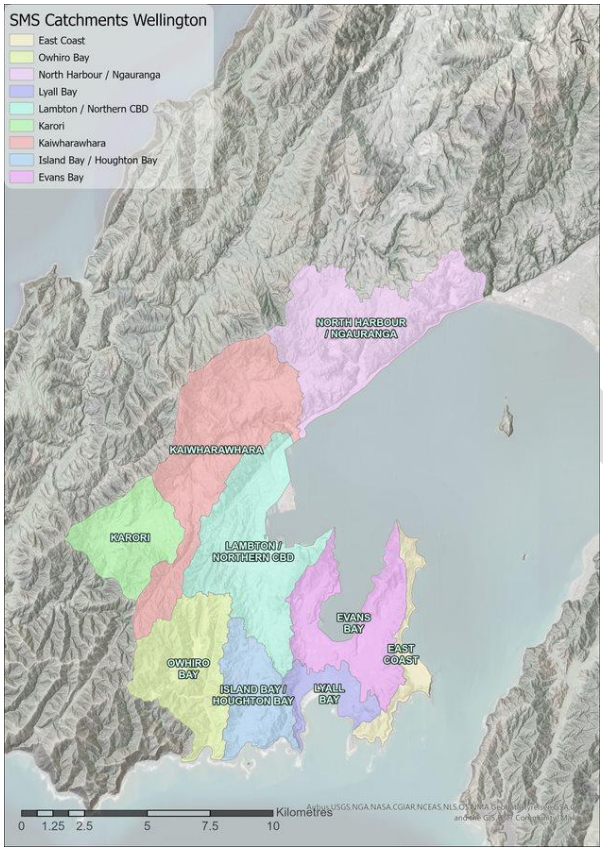


Figure D 5 Map showing the Wellington City catchments.

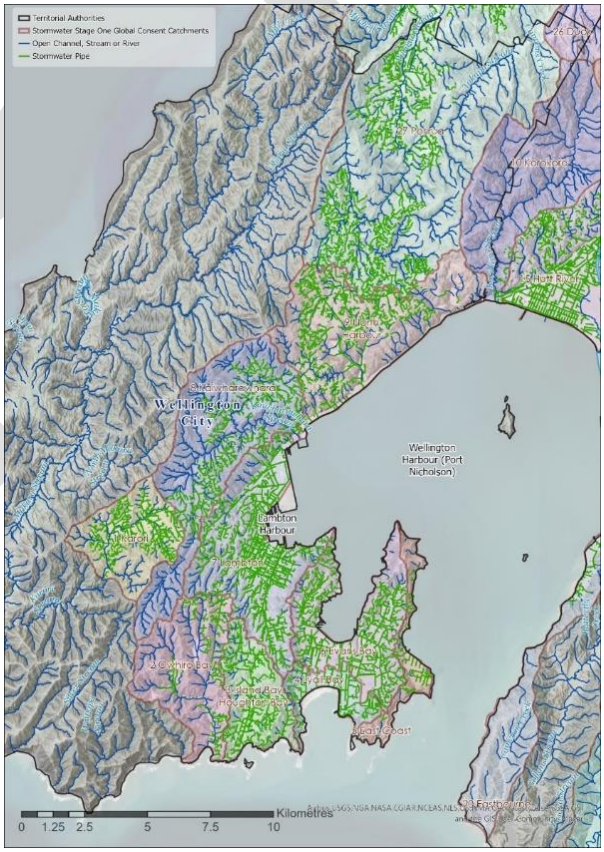


Figure D 6 Map showing the stormwater network in Wellington City.

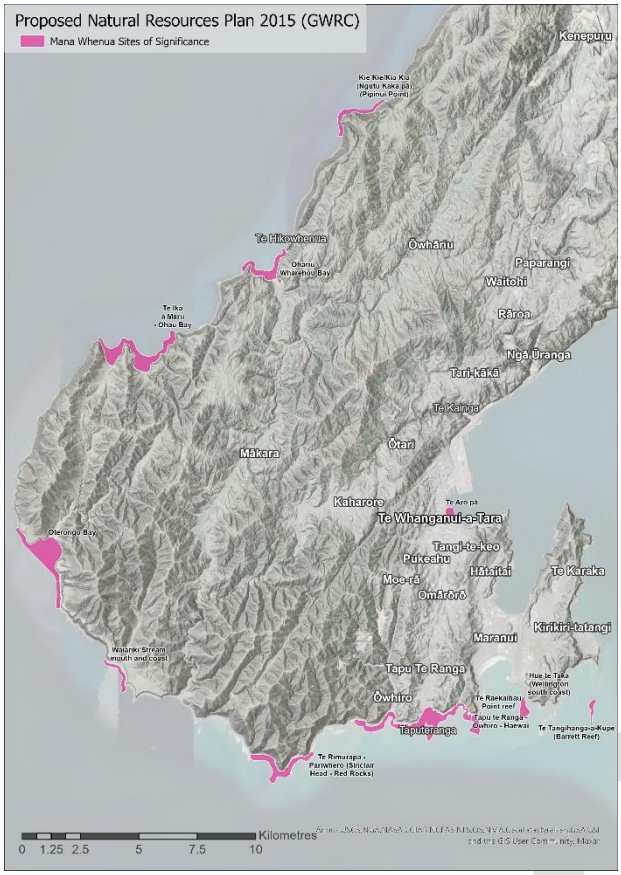


Figure D 7 Map showing the outstanding water bodies, Ngā Taonga Nui-a-Kīwa and aquatic sites with significant mana whenua values identified (Sch A-C of NRP).

Current State

Wellington City and its surrounds are mainly urban areas with some indigenous vegetation on the city fringes, town belt and in the headwaters of the streams. Most streams in the city have been heavily modified or piped, with only small (mainly headwater) reaches still open to daylight. If the current trend of reclamation and encroachment continues, we risk losing connection with these urban streams and the mauri they provide.

Under Schedule H2 of the NRP waterways that are prioritised for improvement of fresh and coastal water quality for contact recreation and mana whenua customary use include, Karori Stream, Island Bay at Derwent Street, Island Bay at Reef St Recreation Ground, Island Bay at Surf Club, Owhiro Bay, Wellington Harbour (Port Nicholson) at Harris Street, Wellington Harbour (Port Nicholson) at Hunter Street, and Wellington Harbour (Port Nicholson) at Tory Street

Monitoring results [57] from the Stage 1 Global Stormwater Discharge Consent shown in Figure D 8 indicate poor water quality regarding E. coli, copper, zinc and nutrients.

The open coastal waters are in a moderate state, although sediment inputs and faecal contamination after rainfall may continue to impact recreation the collection of mahinga kai at Ōwhiro Bay. The stretch of coastline which contains the Taputeranga Marine Reserve may also be affected by poorly understood freshwater impacts, including emerging contaminants[58].

[57] *Stormwater Monitoring Plan Annual Report 2020-2021*

[58] *as identified in the Whaitua Implementation Programme web document - https://www.gw.govt.nz/assets/Documents/2021/12/Te-Whaitua-te-Whanganui-a-Tara-Implementation-Programme_web.pdf*

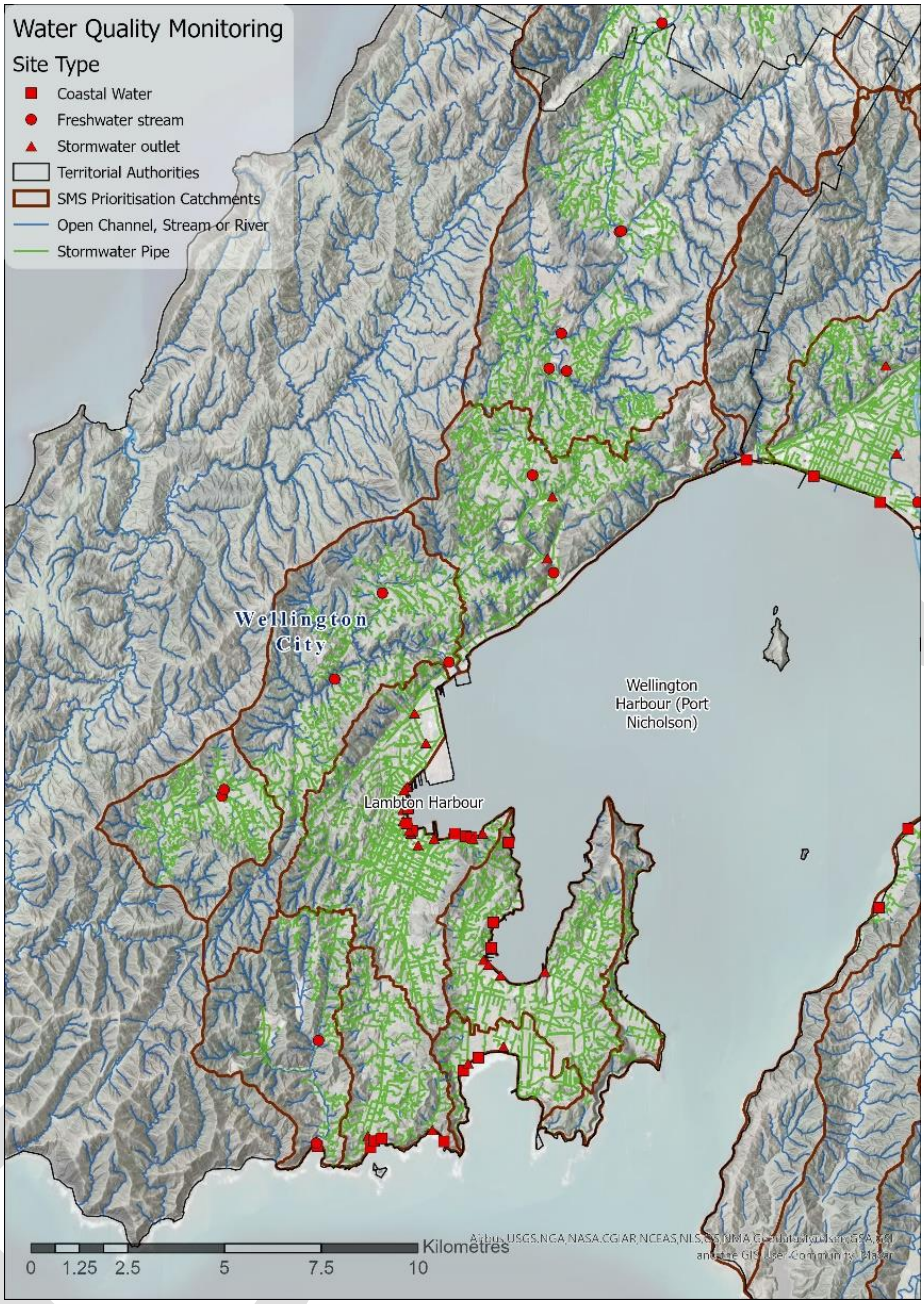


Figure D 8 Monitoring locations for the Stage 1 Global Stormwater Discharge Consent in the Wellington City catchments.

Table D 2 Overview of receiving environment water quality across the Wellington catchments, based on monitoring data collected for the Stage 1 Global Stormwater Monitoring consent (Stormwater Monitoring Plan Annual Report 2021-2022).

Water Quality parameter	Karori	Owhiro	Wellington south coast	Evans Bay	Lambton CBD	Kaiwhara-whara	Waitohu
E. coli (freshwater, NPS attribute state)	E	E	NM	NM	NM	E	E
E. coli (freshwater, NRP O18-95%ile <540)	Not met	Not met	NM	NM	NM	Not met	Not met
Enterococci (coastal water recreation, NRP 018-95%ile <540)	NM	Not met	Met	Met	Met (at Wairepo Lagoon and Oriental Bay Not met (Waterfront at Shed 6 and Taranaki Diving Platform)	NM	NM
Dissolved reactive phosphorus (NRP attribute state)	D	D	NM	NM	NM	C	NM
Nitrate-N (nutrient, ANZG 2018)	Not met	Not met	NM	NM	NM	Not met	NM
Nitrate-N (toxicity NPS attribute state)	B	B	NM	NM	NM	A	NM
Ammonia-N (toxicity NPS attribute state)	B	B	NM	NM	NM	B	NM
Dissolved copper (ANZG 2018)	Not met	Not met	NM	NM	NM	Not met	Not met
Dissolved zinc (ANZG 2018)	Not met	Met	NM	NM	NM	Not met	Not met

Note: The current state summary provided above is an indicative assessment based on the results of one or more individual sites reflecting the dominant condition of the waterbody. As instream conditions may differ between sites within a water body the reader is directed to the source document for site specific benchmarking against the NRP, NPS and ANZG. NM=Not measured.

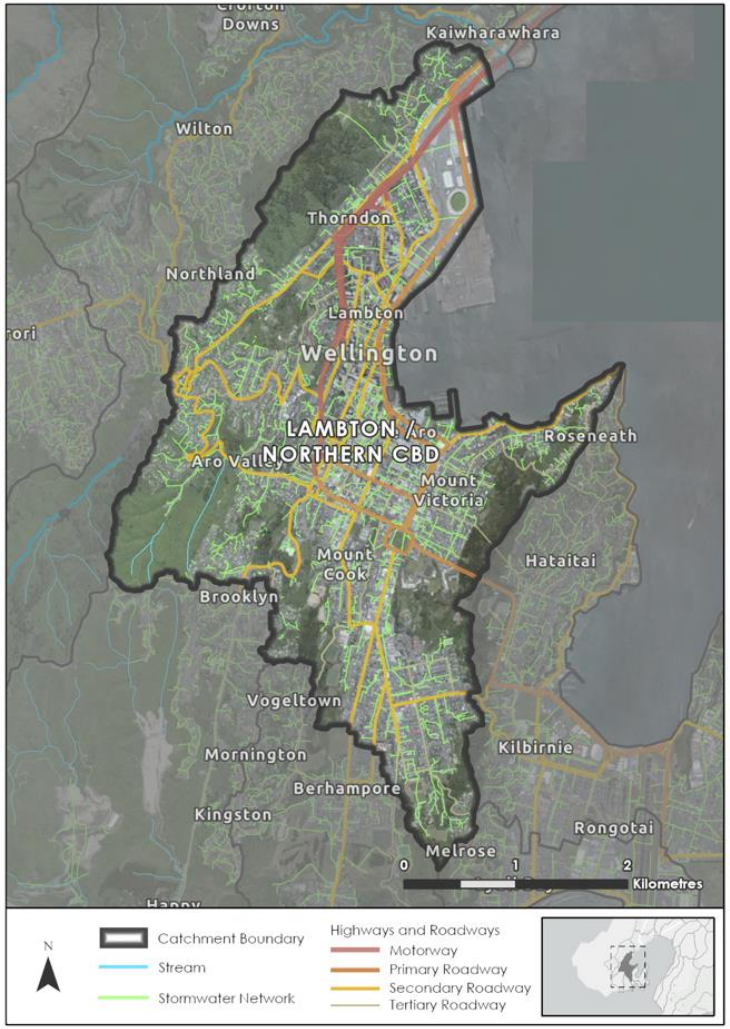
What is currently being done to support our journey to wai ora?

The case study of the Waitangi Park Wetland below is an early example of water sensitive design within the Wellington urban area. It is an internationally recognised response to urban stormwater management in Wellington City.

Case Study 4: Waitangi Park Wetland, Wellington City

One of Wellington City's largest urban stormwater catchments drains into the harbour through a culvert that runs through Waitangi Park. The 448 ha catchment, of which 262 ha is impervious, includes the suburbs of Mt Victoria, Newtown and Mt Cook. Flows within the Waitangi Park wetland are treated through filtration, absorption, and biological/chemical transformation, through a train of treatment devices including, treatment ponds and raingardens. Treated stormwater from the wetland is used to irrigate the park and the neighbouring grounds of Te Papa (National Museum of New Zealand).

Stormwater Catchment	Priority Ranking
Lambton	1 (highest)



Key Issues for Stormwater Management

In general, changes in stormwater related risk profile for this catchment are mainly associated with brownfield redevelopment opportunities focused activity on ages infrastructure, and closure/redevelopment of HAIL sites. The following outlines key issues for stormwater management related to this catchment:

- Significant port and railway areas, motorways, stadium, and commercial and industrial zones.
- Town belt is a large area of open space, densely forested in parts, balancing the high imperviousness of the Wellington CBD. Highly urbanised (modified); highest threat to stormwater quality compared to other catchments
- Te Whanganui-a-Tara (Wellington Harbour) is listed as Ngā Taonga Nui a Kiwa (wai tai) in Schedule B of the NRP; no sites of significance to mana whenua are listed in NRP Schedule C.

Predominant existing land use

Land use proportions (%)[1]		Hazardous Activities and Industries within catchment	
Open Space C:	19	**SLUR sites (%)[2]**	9.56
Inner Residential:	20	**Predominant HAIL activities**	• A17 (storage tanks or drums for fuel, chemicals, or liquid waste); F7 (service stations including retail or commercial refueling facilities) • G3 (landfill sites) • B3 (Electronics including the commercial manufacturing, reconditioning, or recycling of computers, televisions, and other electronic devices) • C1 (explosive or ordinance production, maintenance, dismantling, disposal, bulk storage, or re-packaging)
Central Area:	15		

Existing Monitoring

18 locations (12 stormwater discharges, 6 coastal sites)

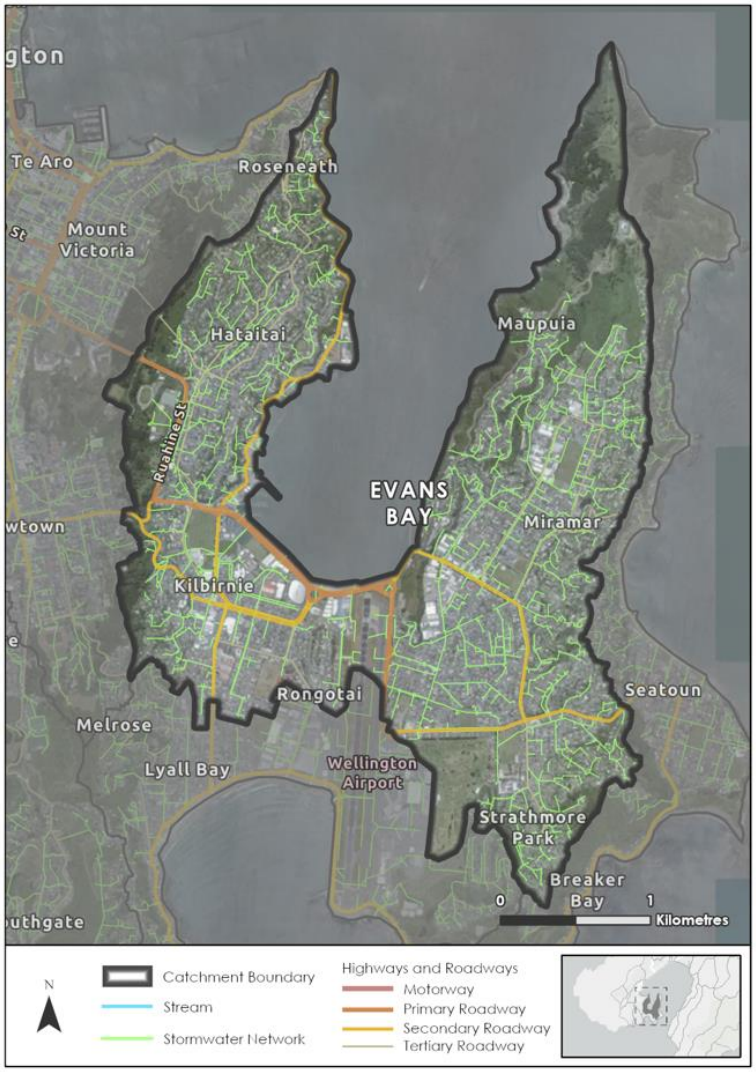
Preferred Management Approach

- Renewal of aging stormwater infrastructure (pipelines, pump stations) within 5-10 years
- Green roofs on 'flagship' and/or large new commercial buildings, precincts; controls on building materials within redevelopments (e.g., roofing materials which contribute less zinc)
- Retrofitting of proprietary devices in commercial and industrial areas
- Tree pits as part of streetscape upgrades
- Small-scale swales (e.g., in public reserve areas)
- Seek opportunities to add stormwater treatment to highly trafficked roads, options vary from changes in catchpit maintenance regime, catchpit insert devices and roadside treatment facilities.

This catchment has less opportunities for greenfield development as it is already heavily urbanised with dense commercial and residential development especially in the Wellington CBD. Therefore, the stormwater management approach is limited to retrofitting where possible (e.g., for brownfield re-development) and managing existing discharges e.g., via roads and large impervious areas. The latter can be achieved via a combination of engineered approaches (e.g., swales, tree pits as listed above) and non-engineering approaches as described in this SMS.

1 Three highest land use proportions displayed as % of total area; 2 Only selected SLUR sites with verified history of HAIL, or confirmed contamination are included in the assessment. Unverified/ remediated sites have been excluded

Stormwater Catchment	Priority Ranking
Evans Bay	2



Key Issues for Stormwater Management

- Secondary contact recreation may occur via wading in shallow waters near the marina, along with some passive recreation (e.g., walking along the foreshore).
- The northern shores of the Bay are occasionally affected by debris, including plastic litter, but this is likely to come from the marina; aesthetics are generally good at the Cobham culvert.
- Some scums/suspended matter, oil and grease, biological growth and die-off and discoloration are observed at the Hataitai and Kilbirnie outfalls, which are also closer to the marina.
- Te Whanganui-a-Tara (Wellington Harbour) is listed as Ngā Taonga Nui a Kiwa (wai tai) in Schedule B of the NRP.
- No sites of significance to mana whenua are listed in NRP Schedule C.

Predominant existing land use

Land use proportions (%)[1]		Hazardous Activities and Industries within catchment [2]	
Outer Residential:	48	SLUR sites (%)	4.46
Open Space B:	9	Predominant HAIL activities	• A17 (*storage tanks or drums for fuel, chemicals, or liquid waste)* • F7 (*service stations including retail or commercial refueling facilities*) • G3 (*landfill sites)*
Airport:	5		

Existing Monitoring

7 locations (3 stormwater discharges, 4 coastal sites)

Preferred Management Approach

- Renewal of aging stormwater infrastructure (pipelines, pump stations) within 5-10 years
- Storage and detention in new developments or re-developments , as multiple greenfield developments are planned or already underway in this catchment through to 2050 and beyond. Detention systems control peak flows and reduce runoff velocities which help contaminants to settle and be treated naturally prior to being discharged into the receiving environment.
- Bioretention, e.g., green roofs for flagship re-developments / medium to high density housing, big box retail etc

Greatest opportunity for improvements to stormwater quality in this catchment will come from controls implemented through greenfield developments, in alignment with WSD guidelines (as per this SMS) from the outset.

1 Three highest land use proportions displayed as % of total area; 2 Only selected SLUR sites with verified history of HAIL, or confirmed contamination are included in the assessment. Unverified/ remediated sites have been excluded.

Stormwater Catchment	Priority Ranking
Island Bay & Houghton Bay	3

Key Issues for Stormwater Management

In general, changes in stormwater related risk profile for this catchment are mainly associated with brownfield redevelopment opportunities focused activity on ages infrastructure, and closure/redevelopment of HAIL sites. The following outlines key issues for stormwater management related to this catchment:

- Receiving environment is coastal
- Six closed landfills; located at Macalister Park, Martin Luckie Park, Tapu Te Ranga Marae, Southgate Reserve, Melrose Road/Albert Street and Wye Street. The closed Houghton Bay landfill (operational between 1951-1971) is a known source of leachate to Houghton Bay.
- Leachate migrates along the valley floor resulting in orange-coloured plumes in the bay.
- Cook Strait (Raukawa Moana) is identified as Ngā Taonga Nui a Kiwa (wai tai) in Schedule B of the NRP.
- Six sites of significance to mana whenua are listed in NRP Schedule C – Island Bay at Derwent Street, Reef Street and Surf Club (3 sites); Houghton Bay (1 site); Princess Bay (1 site)

Predominant existing land use

Land use proportions (%)[1]		Hazardous Activities and Industries within catchment [2]	
Outer residential:	43	SLUR sites (%)[2]	6.81
Open Space C:	20	Predominant HAIL activities	• G3 (*landfill sites)* • A17 *(storage tanks or drums for fuel, chemicals, or liquid waste)* • F7 (*service stations including retail or commercial refueling facilities*)
Open Space B:	9		

Existing Monitoring

6 locations (2 stormwater discharges, 4 coastal sites)

Preferred Management Approach

- Living Streams (for example, tributaries on flat land close to coast)
- Infiltration Basins (flat topography closer to coast)
- Storage and detention
- Bioretention

This catchment has larger areas of open space than other catchments in Wellington City, and flat topography especially down to the coast. This provides opportunity for the implementation of measures which require more space (e.g., bioretention) to treat stormwater before it reaches the coastal receiving environment.

1 Three highest land use proportions displayed as % of total area; 2 Only selected SLUR sites with verified history of HAIL, or confirmed contamination are included in the assessment. Unverified/ remediated sites have been excluded.

Stormwater Catchment	Priority Ranking
Lyall Bay	4

Key Issues for Stormwater Management

- Receives surface runoff from the southern parts of Miramar Golf Course and Wellington Airport, and part of Moa Point Wastewater Treatment Plant
- Airport accounts for over 1/3 of total catchment area; degree of imperviousness is significantly high compared to other catchments.
- Receiving environment is coastal.
- Cook Strait (Raukawa Moana) is identified as Ngā Taonga Nui a Kiwa (wai tai) in Schedule B of the NRP.
- There are no sites of significance to mana whenua listed in Schedule C of the NRP for Lyall Bay.

Predominant existing land use

Land use proportions (%)[1]		Hazardous Activities and Industries within catchment [2]	
Outer residential:	36	SLUR sites (%)[2]	6.82
Airport	35	Predominant HAIL activities	• A17 *(storage tanks or drums for fuel, chemicals, or liquid waste* • D5 (*engineering workshops with metal fabrication)* • G3 (*landfill sites)*
Open Space B:	11		

Existing Monitoring

6 locations (2 stormwater discharges, 4 coastal sites)

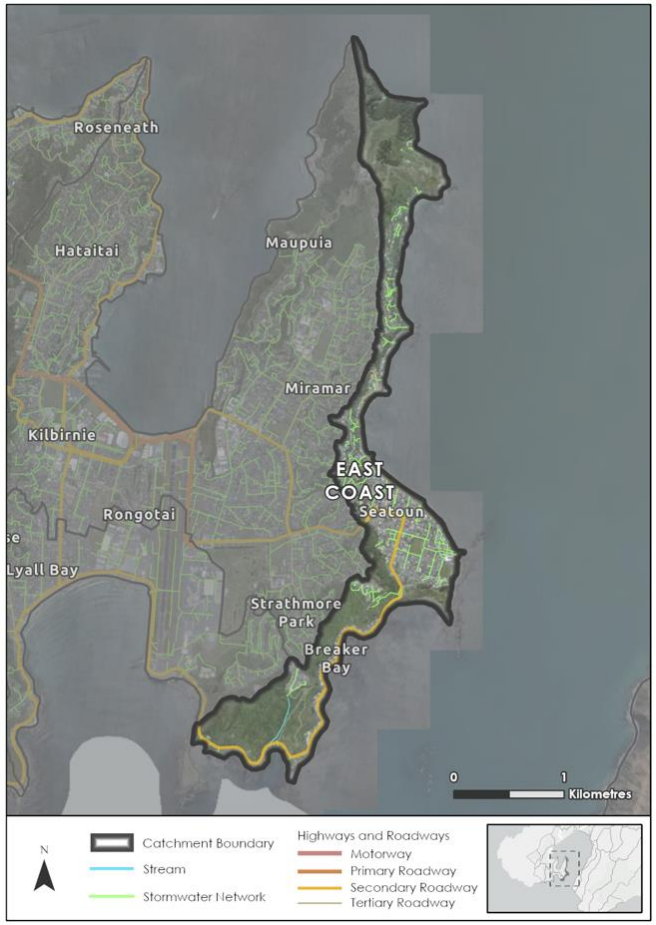
Preferred Management Approach

- Living Streams
- Infiltration Basins (flat topography closer to coast)
- Storage and detention
- Bioretention
- Use of proprietary devices to control private discharges (e.g., from airport)
- Non-engineering approaches (e.g., education programmes, awareness) for various dischargers in the catchment to improve stormwater management practices, especially for large impervious areas

Primary sources of contaminants are likely to be the airport and surrounding industrial areas; some of which are not directly within the control of WCC. Best opportunities for diffuse stormwater treatment will be via bioretention, storage and detention, in open space areas close to coast.

1 Three highest land use proportions displayed as % of total area; 2 Only selected SLUR sites with verified history of HAIL, or confirmed contamination are included in the assessment. Unverified/ remediated sites have been excluded.

Stormwater Catchment	Priority Ranking
East Coast	5



Key Issues for Stormwater Management

- Sub-catchments draining to the east coast are comparatively small due to steep topography and confined valleys.
- Discharges to the ocean are quickly dispersed into the Harbour due to currents coming along the exposed southern and eastern coasts of the peninsula.
- Te Whanganui-a-Tara (Wellington Harbour) is listed as Ngā Taonga Nui a Kiwa (wai tai) in Schedule B of the NRP.
- No sites of significance to mana whenua are listed in NRP Schedule C.

Predominant existing land use

Land use proportions (%)[1]		Hazardous Activities and Industries within catchment [2]	
Outer Residential:	36	**SLUR sites (%)[2]**	0.3
Open Space B:	34	**Predominant HAIL activities**	• A17 (*storage tanks or drums for fuel, chemicals, or liquid waste)* • G3 (*landfill sites)* • G6 (*waste recycling or waste or wastewater treatment)* • C1 *(explosive or ordinance production, maintenance, dismantling, disposal, bulk storage, or re-packaging)*
Conservation:	11		

Existing Monitoring

No established monitoring locations

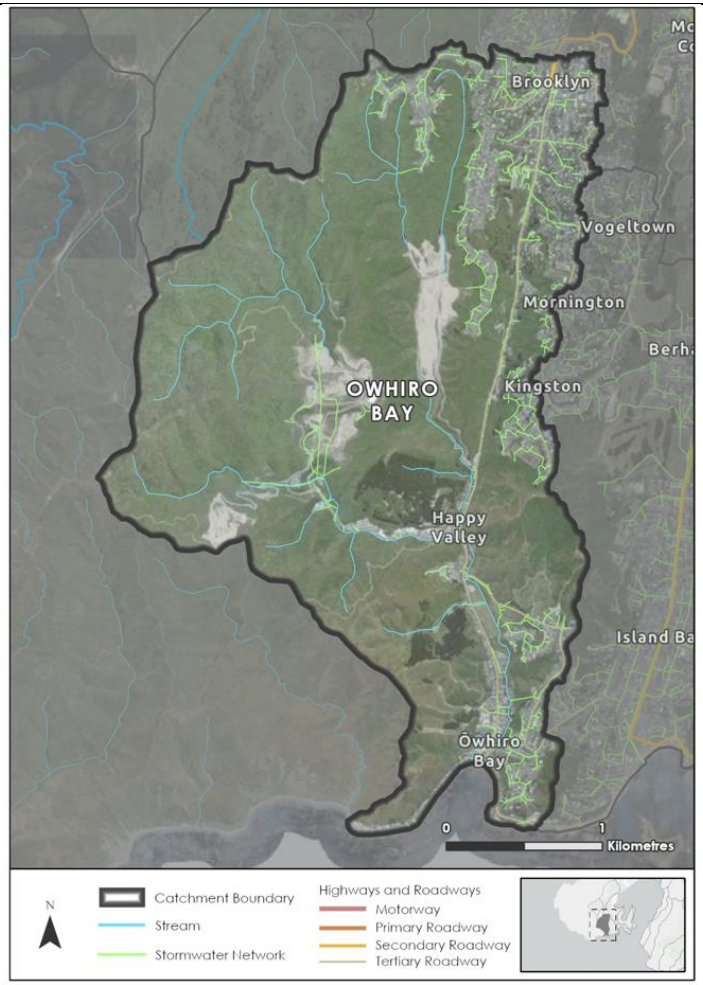
Preferred Management Approach

- Focus on maintaining and improving on existing ecological and cultural values
- Renewal of wastewater infrastructure (pipelines, pump stations) within 5-10 years
- Reduce degree of imperviousness through controls on new developments (e.g., permeable paving; proportion of property which is paved; swales; constructed wetlands) and by retrofitting in small areas (e.g., filter strips)
- Install GPTs at coastal discharge points

Future greenfield development will not be as prevalent in this catchment as in others across Wellington City; opportunities for improvement of stormwater quality are more likely within existing developed areas, and in the use of open space for approaches that require more space (e.g., Wetlands).

1 Three highest land use proportions displayed as % of total area; 2 Only selected SLUR sites with verified history of HAIL, or confirmed contamination are included in the assessment. Unverified/ remediated sites have been excluded.

Stormwater Catchment	Priority Ranking
Owhiro Bay	6



Key Issues for Stormwater Management

- Owhiro Stream which has three main tributaries draining Carey's Gully (occupied by Southern Landfill and C&D Landfill), Kowhai Park Gully (occupied by T&T Landfill) and urban Brooklyn (which is largely culverted).
- Industrial activity is clustered around Landfill Road while commercial properties are concentrated on Owhiro Road and Cleveland Road in Brooklyn.
- The urbanised areas of Brooklyn, Mornington and Kingston are a significant source of road and vehicle related pollution.
- One site of significance to mana whenua is listed in NRP Schedule C - Owhiro Bay

Predominant existing land use

Land use proportions (%)[1]		Hazardous Activities and Industries within catchment [2]	
Open Space B:	52	SLUR sites (%)[2]	5.08
Outer residential:	20	Predominant HAIL activities	• G3 (*landfill sites)* • A17 *(storage tanks or drums for fuel, chemicals, or liquid waste)*
Rural:	19		

Existing Monitoring

10 monitoring locations along Owhiro Stream

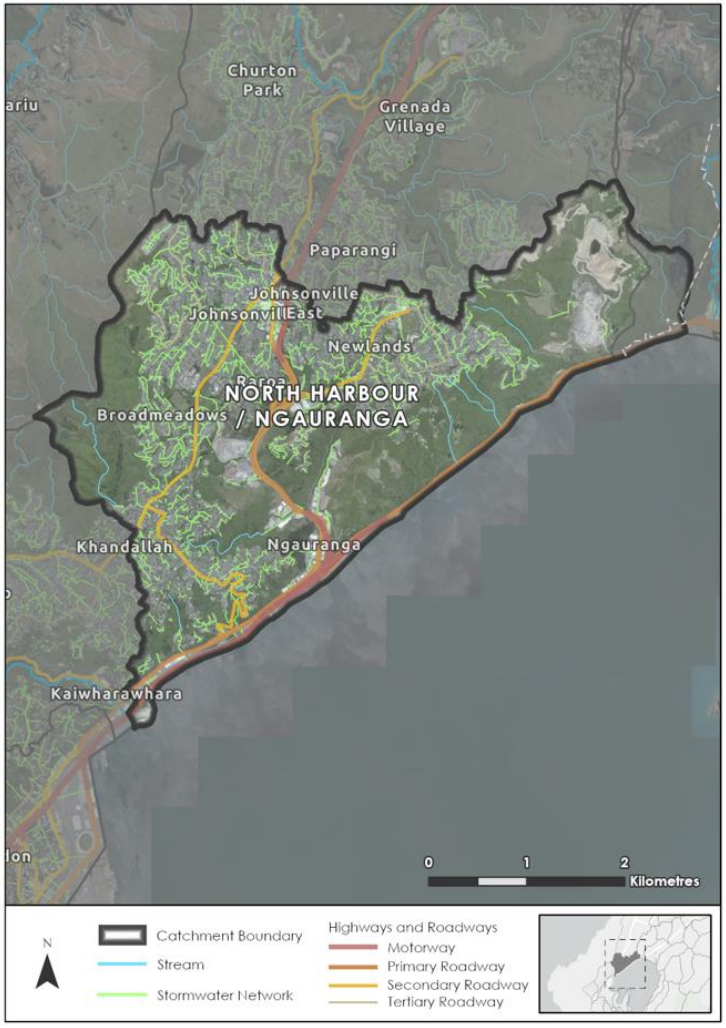
Preferred Management Approach

- Focus on maintaining and improving existing values
- Storage and detention in new residential and commercial developments (Owhiro Bay scored highly for predicted future growth in no. of households)
- Bioretention (due to available open space)
- Living Streams
- Daylighting

Greatest opportunities for improvements to stormwater quality in this catchment will come from controls implemented through greenfield developments from the outset, in alignment with WSD guidelines (as per the SMS), and in management of discharges from known SLUR sites (particularly closed and active landfills).

1 Three highest land use proportions displayed as % of total area; 2 Only selected SLUR sites with verified history of HAIL, or confirmed contamination are included in the assessment. Unverified/ remediated sites have been excluded

Stormwater Catchment	Priority Ranking
Ngauranga	7



Key Issues for Stormwater Management

In general, changes in stormwater related risk profile for this catchment are mainly associated with brownfield redevelopment opportunities focused activity on ages infrastructure, and closure/redevelopment of HAIL sites. The following outlines key issues for stormwater management related to this catchment:

- Significant commercial and light industry zones in Johnsonville, Newlands and Ngauranga, including the Kiwi Point Quarry and Taylor Preston Abattoir.
- A landfill was previously operated at Raroa Park (1961 – 1971) but has since been closed.
- The catchment is bisected by the Wellington to Porirua motorway (State Highway 1).
- No sites of significance to mana whenua are listed in NRP Schedule C.

Predominant existing land use

Land use proportions (%)[1]		Hazardous Activities and Industries within catchment [2]	
Outer Residential:	33	**SLUR sites (%)[2]**	6.47
Rural:	17	**Predominant HAIL activities**	• B4 (*power stations, substations, or switchyards)* • F7 (*service stations including retail or commercial refueling facilities*) • G3 (*landfill sites)*
Open Space B:	14		

Existing Monitoring

Four locations (two on Waitohu Stream, two stormwater discharges)

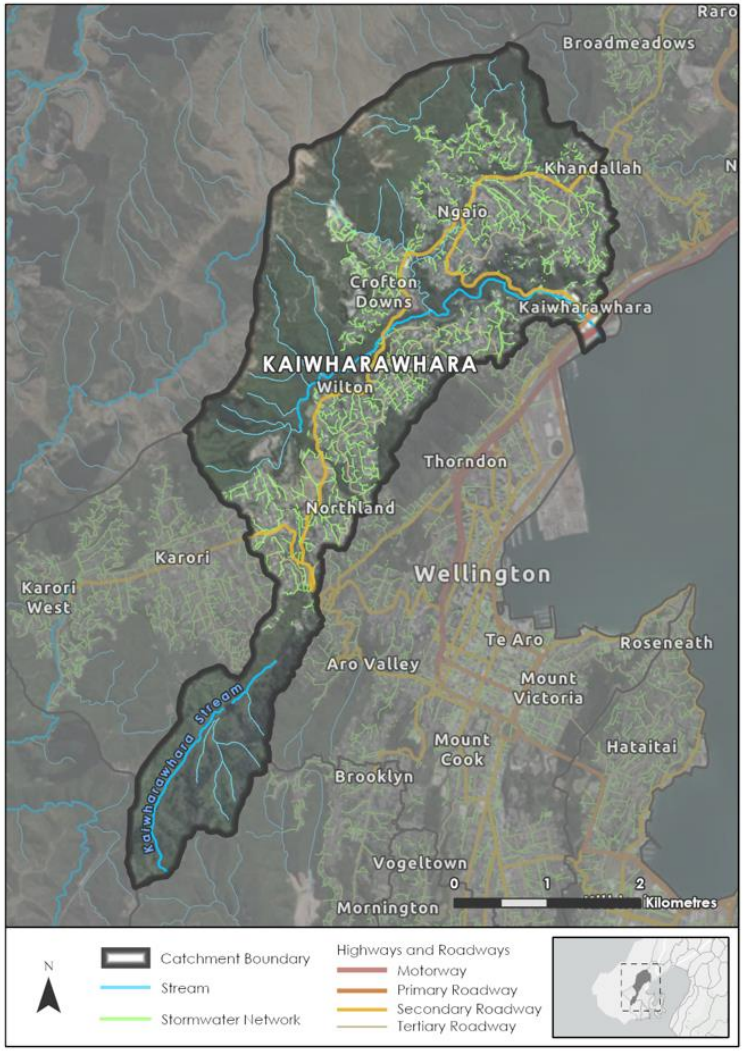
Preferred Management Approach

- Storage and detention in new residential and commercial developments
- Infiltration and soakage – industrial and commercial precincts (e.g., filter strips, permeable paving where space is restricted)
- Retro-fit proprietary devices when redeveloping, expanding, or upgrading existing industrial/commercial areas
- Seek opportunities to add stormwater treatment to highly trafficked roads, options vary from changes in catchpit maintenance regime, catchpit insert devices and roadside treatment facilities.

Brownfield redevelopment presents the best opportunity to manage stormwater quality and quantity in this catchment. The overall preferred management approach is to reduce impervious surfaces, encourage more stormwater discharges to ground through methods such as bioretention and install appropriate stormwater treatments where possible / practicable.

1 Three highest land use proportions displayed as % of total area; 2 Only selected SLUR sites with verified history of HAIL, or confirmed contamination are included in the assessment. Unverified/ remediated sites have been excluded.

Stormwater Catchment	Priority Ranking
Kaiwharawhara	8



Key Issues for Stormwater Management

- Large areas of open space within the Karori Wildlife Sanctuary, to the west of Crofton Downs and west of Ngaio. Kaiwharawhara Stream passes through two water supply reservoirs and is then piped under closed landfills at Ian Galloway Park and Appleton Park; lead is a contaminant of concern (has been an issue in the past).
- Additional disused landfills at Anderson Park, Otari Plant Museum and Creswick Terrace Park.
- Kaiwharawhara Stream is identified in Schedule B (Ngā Taonga Nui-a-Kiwa) and Schedule F1b (inanga spawning habitat within CMA) of the NRP.
- No sites of significance to mana whenua are identified in NRP Schedule C.

Predominant existing land use

Land use proportions (%)[1]		Hazardous Activities and Industries within catchment [2]	
Outer Residential:	33	**SLUR sites (%)[2]**	5.65
Conservation:	32	**Predominant HAIL activities**	• A17 (*storage tanks or drums for fuel, chemicals, or liquid waste)* • F7 (*service stations including retail or commercial refueling facilities*) • F4 (*motor vehicle workshops*) • G6 (*waste recycling or waste or wastewater treatment)* • G3 (*landfill sites)*
Open Space B:	21		

Existing Monitoring

1 location on Kaiwharawhara Stream

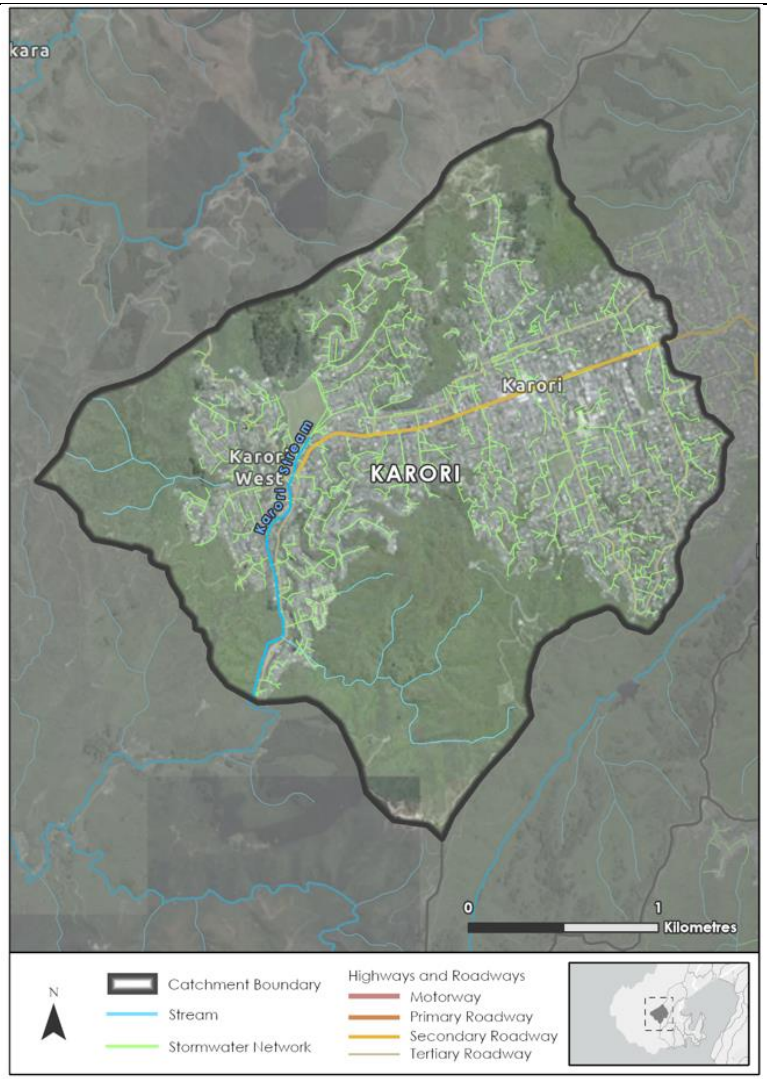
Preferred Management Approach

- Focus on maintaining and improving existing values
- Bioretention
- Living Streams
- Proprietary devices to filter and treat zinc, lead from roads and older housing stock
- Monitoring of closed landfills for leachate entering surface water and groundwater / migrating through soils

Brownfield redevelopment presents opportunities to better manage stormwater quality and quantity, with additional approaches involving community-led projects to build on existing high ecological and cultural value sites along Kaiwharawhara Stream (such as daylighting, planting, and further non-engineered approaches as described in the SMS).

1 Three highest land use proportions displayed as % of total area. 2 Only selected SLUR sites with verified history of HAIL, or confirmed contamination are included in the assessment. Unverified/ remediated sites have been excluded.

Stormwater Catchment	Priority Ranking
Karori	9 (lowest)



Key Issues for Stormwater Management

- The urbanised area of Karori is predominantly residential, but with significant commercial and community infrastructure.
- Closed landfills are located at Futuna Retreat (Friend Street) and Ben Burn Park, but none are currently operating. The Western Wastewater Treatment Plant is located downstream of the urban area on South Karori Road. The treated wastewater is piped to Wellington's South coast near the Karori Stream mouth.
- Karori Stream is listed in NRP Schedule I (important trout fishery rivers and spawning waters); no sites listed in Schedule C of NRP (sites with significant mana whenua value).

Predominant existing land use

Land use proportions (%)[1]		Hazardous Activities and Industries within catchment [2]	
Outer Residential:	44	SLUR sites (%)[2]	0.08
Conservation:	34	Predominant HAIL activities	• F7 (*service stations including retail or commercial refueling facilities*) • F4 (*motor vehicle workshops*) • A17 (*storage tanks or drums for fuel, chemicals, or liquid waste)*
Open Space B:	9		

Existing Monitoring

1 monitoring location on Karori Stream at Makara Peak

Preferred Management Approach

- Focus on maintaining and improving existing values
- Renewal of wastewater infrastructure (pipelines, pump stations) within 5-10 years
- Living Streams
- Daylighting

Brownfield redevelopment and retrofitting of proprietary devices to control private discharges (such as those from service stations, workshops, and other light industrial activities) presents the best opportunity to manage stormwater quality and quantity in this catchment. The overall preferred management approach is to reduce impervious surfaces, encourage more stormwater discharges to ground through methods such as bioretention and install appropriate stormwater treatments where possible / practicable for activities known to contribute contaminants such as hydrocarbons and heavy metals.

1 Three highest land use proportions displayed as % of total area. 2 Only selected SLUR sites with verified history of HAIL, or confirmed contamination are included in the assessment. Unverified/ remediated sites have been excluded.

Te Awa Kairangi / Hutt River Catchment

There are 12 sub-catchments within the Te Awa Kairangi/Hutt River Harbour Catchment, most of which flow into the Te Awa Kairangi/Hutt River, the major river system in Te Whanganui-a-Tara, as shown in Figure D 9 to Figure D 12.

The land use within the catchment varies significantly. Water supply areas and regional parks feature large areas of native vegetation, while grassland and peatland dominate the Tangaroa Valley side on the river's eastern side. The Western Hills are a mix of grassland, exotic forest, native vegetation, and urban areas, while the entire length of the valley floor is heavily urbanised. State Highway 2 and the railway shadow the river from Lower Hutt to the base of the Remutaka Range.

The lower part of the Te Awa Kairangi/Hutt River enters Te Whanganui-a-Tara/Wellington Harbour via the Waiwhetū Awa. While the lower reach of the Waiwhetū Awa is heavily channelised and polluted, the mid-range of the awa still retains āhua (natural character), and considerable investment in its restoration has brought the community together.

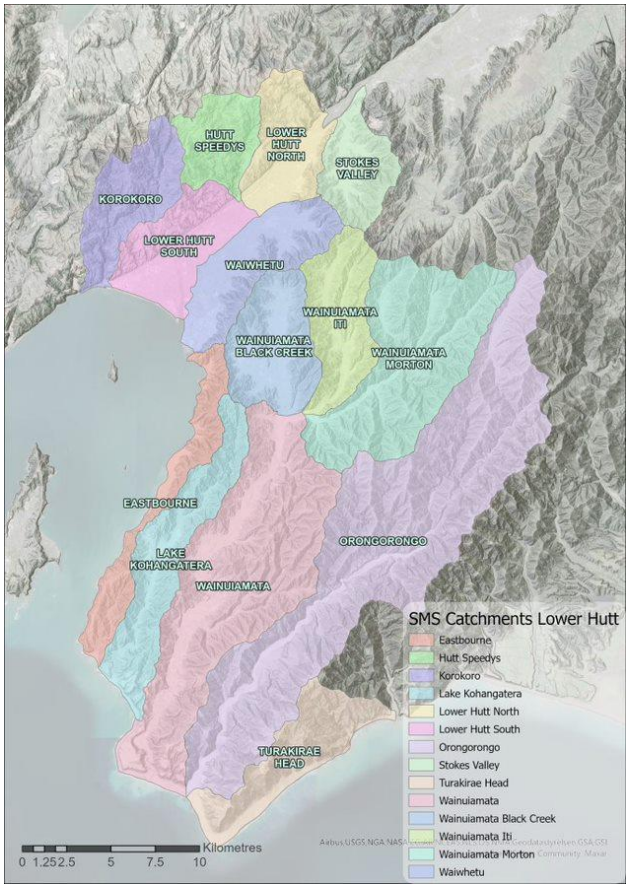


Figure D 9 Map showing Hutt City Catchments

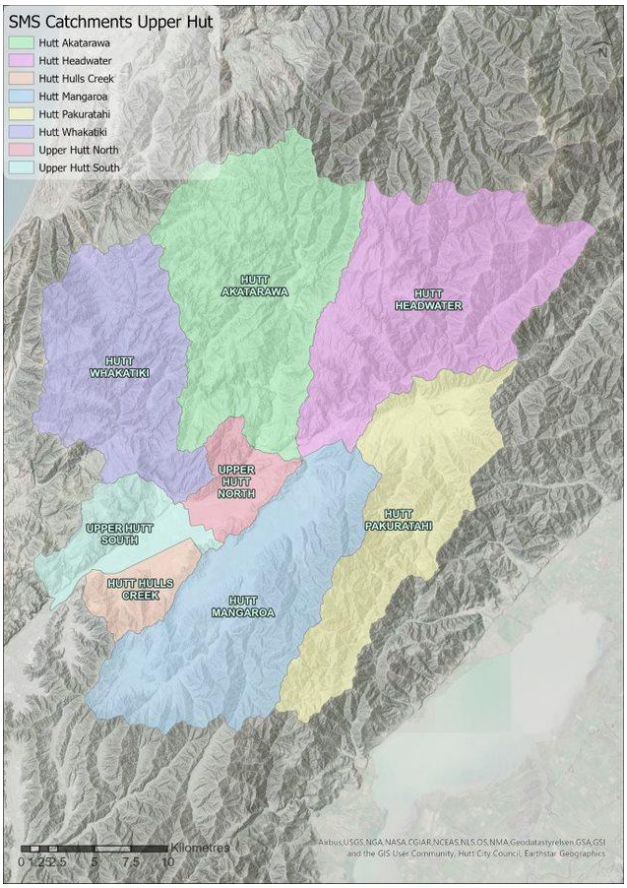


Figure D 10 Map showing Upper Hutt City Catchments

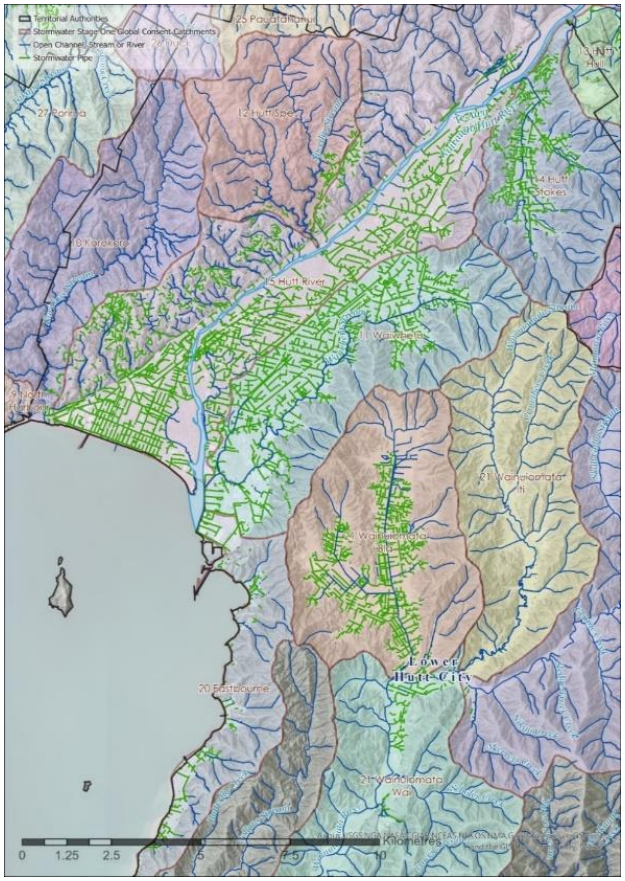


Figure D 11 Map showing the Stormwater network in City

Figure D 12 Map showing the outstanding water Hutt bodies, Ngā Taonga Nui-a-Kīwa and aquatic sites with significant mana whenua values identified (Sch A-C of NRP)

Current State

Te Awa Kairangi and Waiwhetū are typical of heavily urbanised catchments, with urban development and encroachment, channelisation, pathogens and stormwater contaminants degrading its water quality. The aquifer, which is an essential source of the current water supply system, is also at risk of being contaminated by the city above it.

Most of the urbanised lower reaches of the Hutt Valley is serviced by a piped stormwater network. Under Schedule H2 of the NRP waterways that are prioritised for improvement of fresh and coastal water quality for contact recreation and mana whenua customary use include, Te Awa Kairangi/Hutt River, and Wainuiomata River.

Monitoring results [59] from the Stage 1 Global Stormwater Discharge Consent shown in Figure D 13 and **Error! Reference source not found.** indicate better water in the upper reaches of the Hutt River, but other sites have poor water quality in regards to E. coli, copper, zinc and nutrients, shown in Table D 3 and Table D 4.

[59] *Stormwater Monitoring Plan Annual Report 2020-2021*

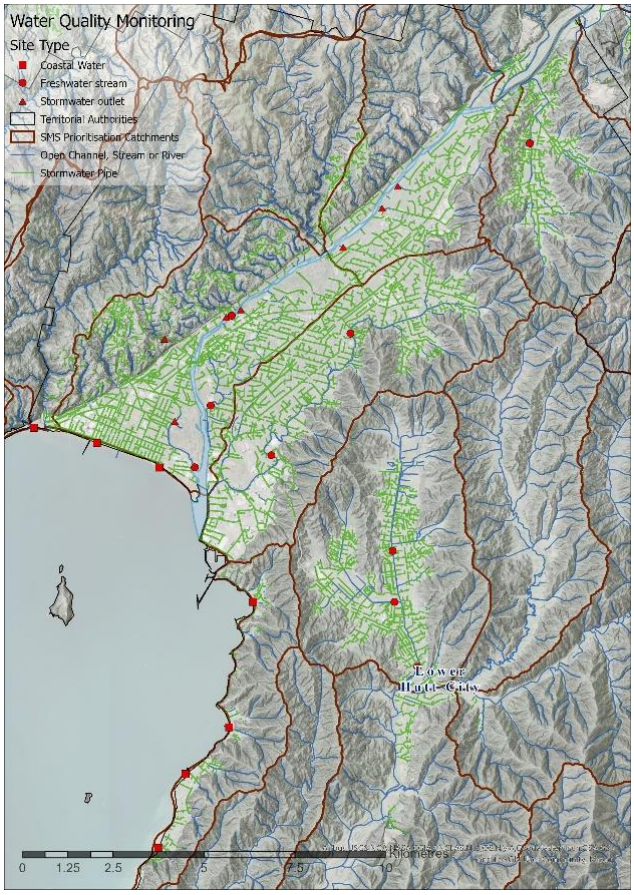


Figure D 13 Monitoring locations for the Stage 1 Stormwater Discharge Consent in Hutt City catchments.

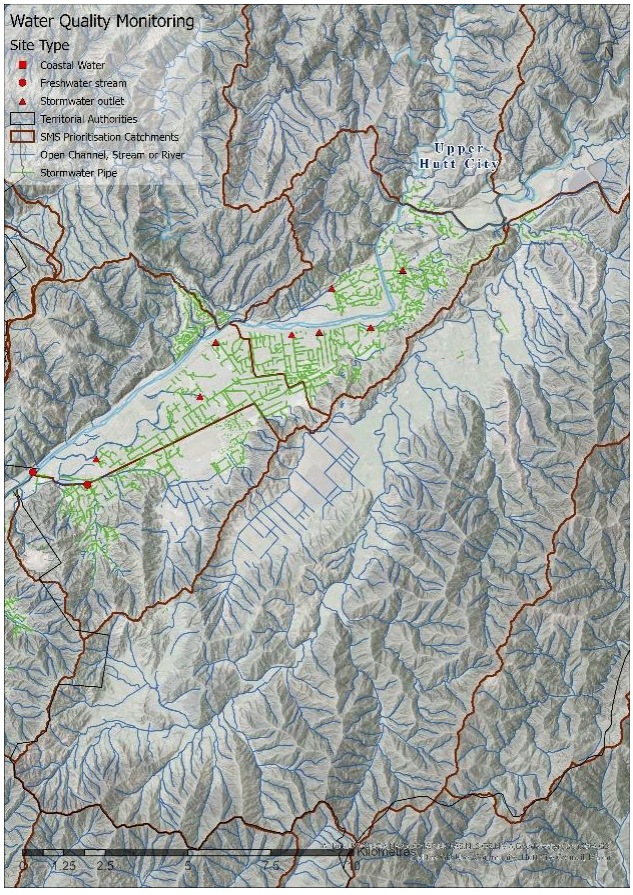


Figure D 14 Monitoring locations for the Stage 1 Global Global Stormwater Discharge Consent in Upper Hutt Catchments

Table D 3 Overview of receiving environment water quality across the Hutt River catchments, based on monitoring data collected for the Stage 1 Global Stormwater Monitoring consent (Stormwater Monitoring Plan Annual Report 2021-2022).

Water Quality parameter	Hutt @Te Marua Lakes	Hutt @Manor Park	Hutt @Boulcott	Hutt @Silverstream	Hutt @Melling Bridge	Petone Beach
E. coli (freshwater, NPS attribute state)	A	D	D	B	E	NM
E. coli (freshwater, NRP O18-95%ile <540)	Met	Not met	Not met	Met	Not met	NM
Enterococci (coastal water recreation, NRP 018-95%ile <540)	NM	NM	NM	NM	NM	Not met
Dissolved reactive phosphorus (NRP attribute state)	A	A	A	NM	NM	NM
Nitrate-N (nutrient, ANZG 2018)	Met	Not met	Not met	NM	NM	NM
Nitrate-N (toxicity NPS attribute state)	A	A	A	NM	NM	NM

Water Quality parameter	Hutt @Te Marua Lakes	Hutt @Manor Park	Hutt @Boulcott	Hutt @Silverstream	Hutt @Melling Bridge	Petone Beach
Ammonia-N (toxicity NPS attribute state)	A	A	A	NM	NM	NM
Dissolved copper (ANZG 2018)	NM	Met	Met	NM	NM	NM
Dissolved zinc (ANZG 2018)	NM	Met	Met	NM	NM	Not met

Note: The current state summary provided above is an indicative assessment based on the results of one or more individual sites reflecting the dominant condition of the waterbody. As instream conditions may differ between sites within a water body the reader is directed to the source document for site specific benchmarking against the NRP, NPS and ANZG. NM=Not measured.

Table D 4 Overview of receiving environment water quality across Black Creek and the Hutt River Tributaries, based on monitoring data collected for the Stage 1 Global Stormwater Monitoring consent (Stormwater Monitoring Plan Annual Report 2021-2022).

Water Quality parameter	Black Creek	Opahu Stream	Hulls Creek	Stokes V. Stream	Te Mome Stream	Waiwhetu Stream
E. coli (freshwater, NPS attribute state)	E	E	E	E	E	E
E. coli (freshwater, NRP O18-95%ile <540)	Not met	Not met	Not met	Not met	Not met	Not met
Enterococci (coastal water recreation, NRP 018-95%ile <540)	NM	NM	NM	NM	NM	NM
Dissolved reactive phosphorus (NRP attribute state)	D	NM	D	D	NM	C
Nitrate-N (nutrient, ANZG 2018)	Not met	NM	Not met	Not met	NM	Not met
Nitrate-N (toxicity NPS attribute state)	A	NM	A	A	NM	NM
Ammonia-N (toxicity NPS attribute state)	B	NM	B	B	NM	NM
Dissolved copper (ANZG 2018)	Not met	Not met	Not met	Not met	NM	Not met
Dissolved zinc (ANZG 2018)	Not met	Not met	Not met	Not met	NM	Not met

Note: The current state summary provided above is an indicative assessment based on the results of one or more individual sites reflecting the dominant condition of the waterbody. As instream conditions may differ between sites within a water body the reader is directed to the source document for site specific benchmarking against the NRP, NPS and ANZG. NM=Not measured.

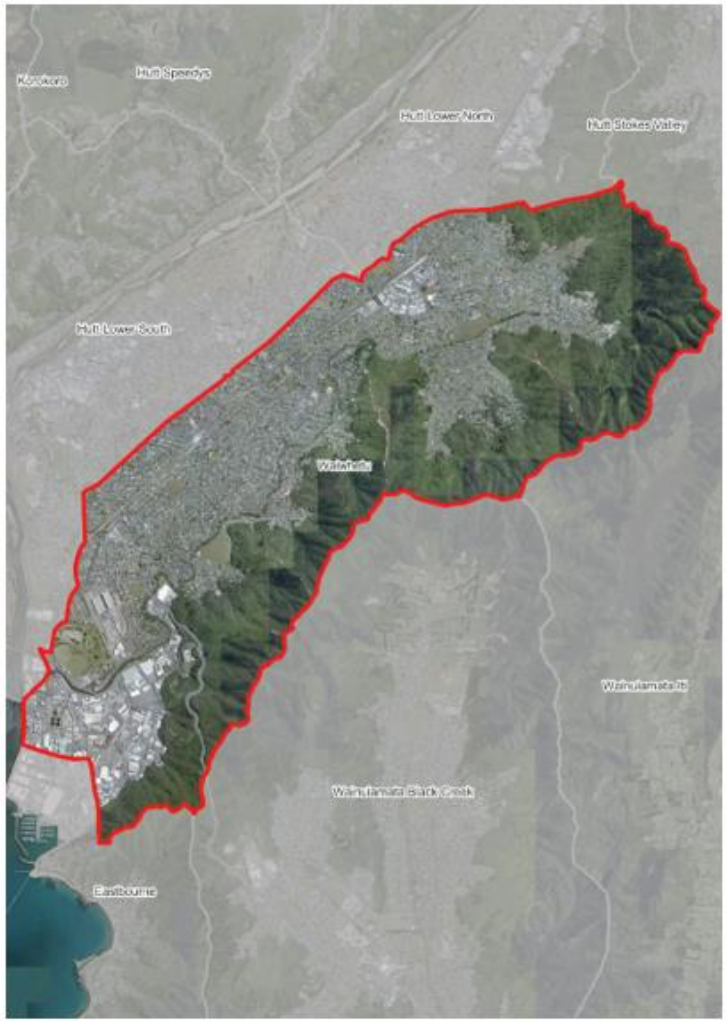
What is currently being done to support our journey to wai ora?

The Riverlink project in Hutt City in the case study below highlights several challenges and opportunities for stormwater management where the available space to incorporate and retrofit water quality devices is limited within the existing urban footprint.

Case Study 5: Riverlink Project (Belmont Wetland)

In the River Link project location there is no treatment of stormwater discharges to the Te Awa Kairangi/Hutt River. The proposed stormwater design for the Riverlink Project at the Belmont Wetland includes treatment of discharges from the area of the highway upgrade, the railway station development, the new bridge and areas of road narrowing and carpark upgrade. The addition of treatment at Belmont Wetland will result in a reduction in the contaminant load discharged to the Te Awa Kairangi/Hutt River. This will result in improvements in water quality in the receiving environment, particularly during and immediately following rainfall events.

Waiwhetu



Catchment Description

The Waiwhetu catchment is located between the Lower Hutt and Wainuiomata boundaries. It has an area of [redacted] and the Waiwhetu Stream is the primary channel. The Wainuiomata Hills are to the west of the catchment with some low-lying land at the base of the hills. Settlement, gorse and broom, and broadleaved indigenous forest dominate the land use types and there are over 20 contaminated land sites which include a railway, landfill and metal works. There is a small area to the northeast of the catchment that is susceptible to a 0.1% AEP flood event from the Wainuiomata River.

Modelled Priority Outcomes

Priority ranking: **High Priority**

Pollution Sources			Social Consequences		Contaminant Risk
Asset Management	Natural Environment	Land Use	Social Values	Cultural Values	
Over half of the stormwater and wastewater pipes are in poor condition. Contamination risk is high.	17.74% of the catchment is natural. Modification to the natural environment is extensive.	7.8% of the catchment area is contaminated land and there is low contamination risk from road sources.	Due to pollution bathing does not occur. There is no data for public engagement.	No Data in this field.	High Risk

Te Oranga Wai Kaupapa Classification: ⚠ **Wai Mate – Dead water**

Management Options

- Upgrading and refitting wastewater and stormwater pipes.
- Infiltration device.
- Biorientation Device.
- Stream naturalisation.

Eastbourne

Catchment Description

Located along the eastern shoreline of the Wellington Harbour, the Eastbourne Catchment is primarily a coastal area with steep hills reaching elevations up to 343m. The catchment area is [] and Collans Stream is the primary channel. There is some settlement with indigenous forest and broadleaved indigenous hardwoods being the primary land use. Eastbourne has no classified flood risk and there are more than 20 contaminated land sites including chemical and fuel storage.

Modelled Priority Outcomes

Priority ranking: **High Priority**

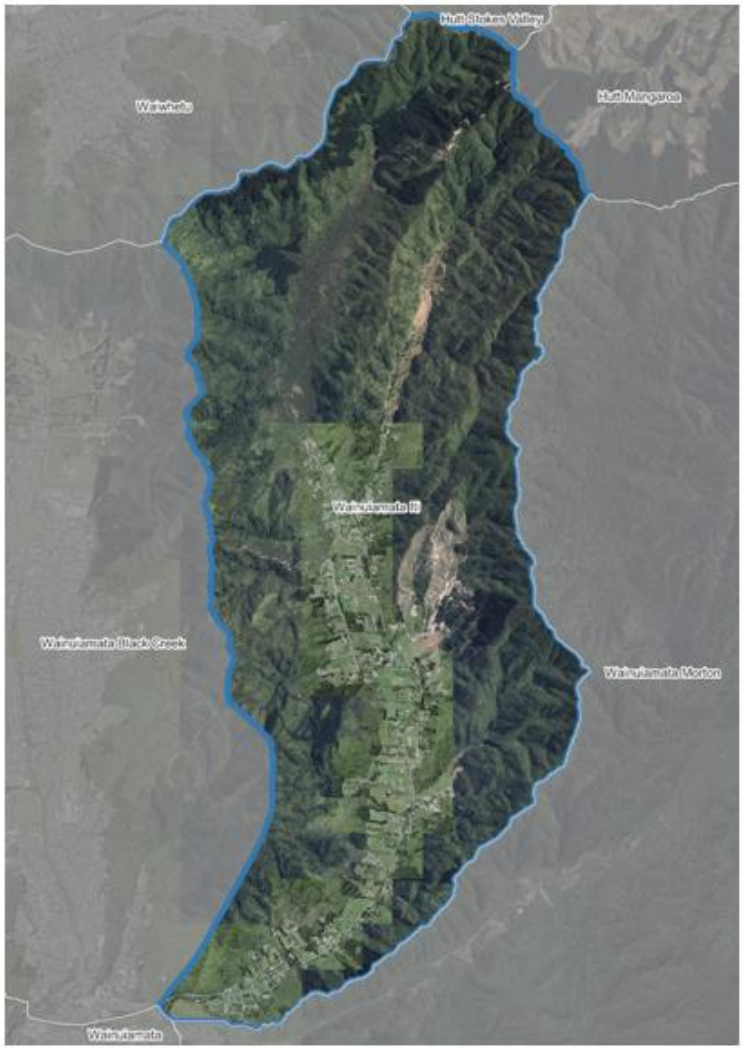
Pollution Sources			Social Consequences		Contaminant Risk
Asset Management	Natural Environment	Land Use	Social Values	Cultural Values	
Over half of the stormwater and wastewater pipes are in poor condition. Contamination risk is high.	86.68% of the catchment is natural. Modification to the natural environment is low.	0.1% of the catchment area is contaminated land and there is low contamination risk from road sources.	Bathing does occur. There is no data for public engagement.	No Data in this field.	High Risk

Te Oranga Wai Kaupapa Classification: ⚠ **Wai Kautu – At risk.**

Management Options

- Upgrading and refitting wastewater and stormwater pipes.
- Gross pollutant trap.
- Swale.

Wainuiomata - Iti



Catchment Description

The Wainuiomata – Iti catchment is located west of the Wainuiomata township. The Wainuiomata Stream runs through the valley in the catchment and is surrounded by steep hillslopes. High producing grassland, Manuka and Kanuka and settlement are common land use types and there are no contaminated land sites. The areas south east of the catchment is susceptible to flooding from the Wainuiomata River in a 0.1% AEP event.

Modelled Priority Outcomes

Priority ranking: **Low Priority**

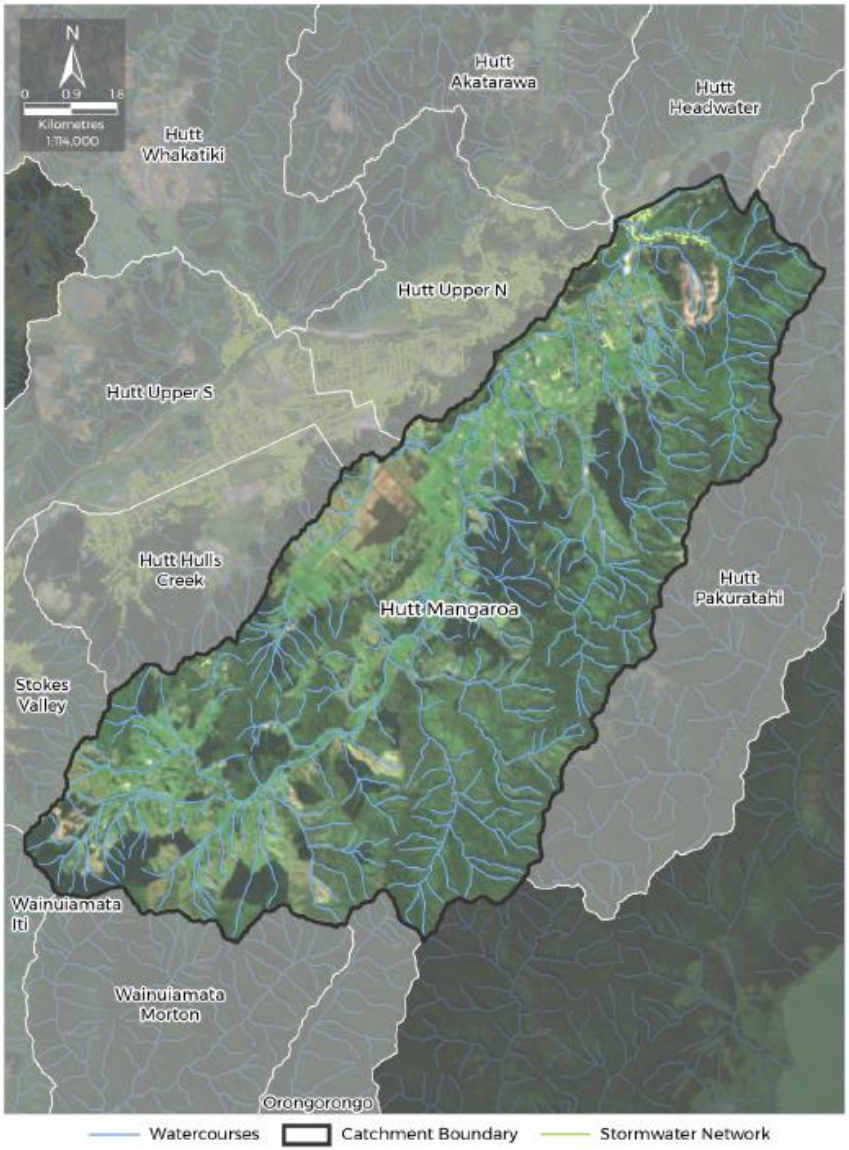
Physical Consequences			Social Consequences		Contaminant Risk
Asset Management	Natural Environment	Land Use	Social Values	Cultural Values	
There is only 4.79km of stormwater pipes and these are in excellent condition. Contamination risk is very low.	93% of the catchment is natural. Modification to the natural environment is low.	There are no contaminated land sites and there is no contamination risk from road sources.	No bathing occurs and there is no data for community engagement.	No Data in this field.	Low Risk

Te Oranga Wai Kaupapa Classification: ⚠ **Wai Kino – Dangerous polluted water.**

Management Options

- Wetland
- Bioretention Device
- Wet Pond/Retention Basin

Hutt – Mangaroa



Catchment Description

The Hutt – Mangaroa catchment is the largest catchment in the area covering the eastern areas of Upper Hutt through to Stokes Valley. The topography is steep and land use is primarily indigenous forest and high producing exotic grassland as well as some settlement. There are ten contaminated land sites which include a landfill and chemical storage. The around surrounding the Mangaroa River, which flows through the centre of the catchment, are susceptible to a 1% AEP flood event.

Modelled Priority Outcomes

Priority ranking: **Medium priority**

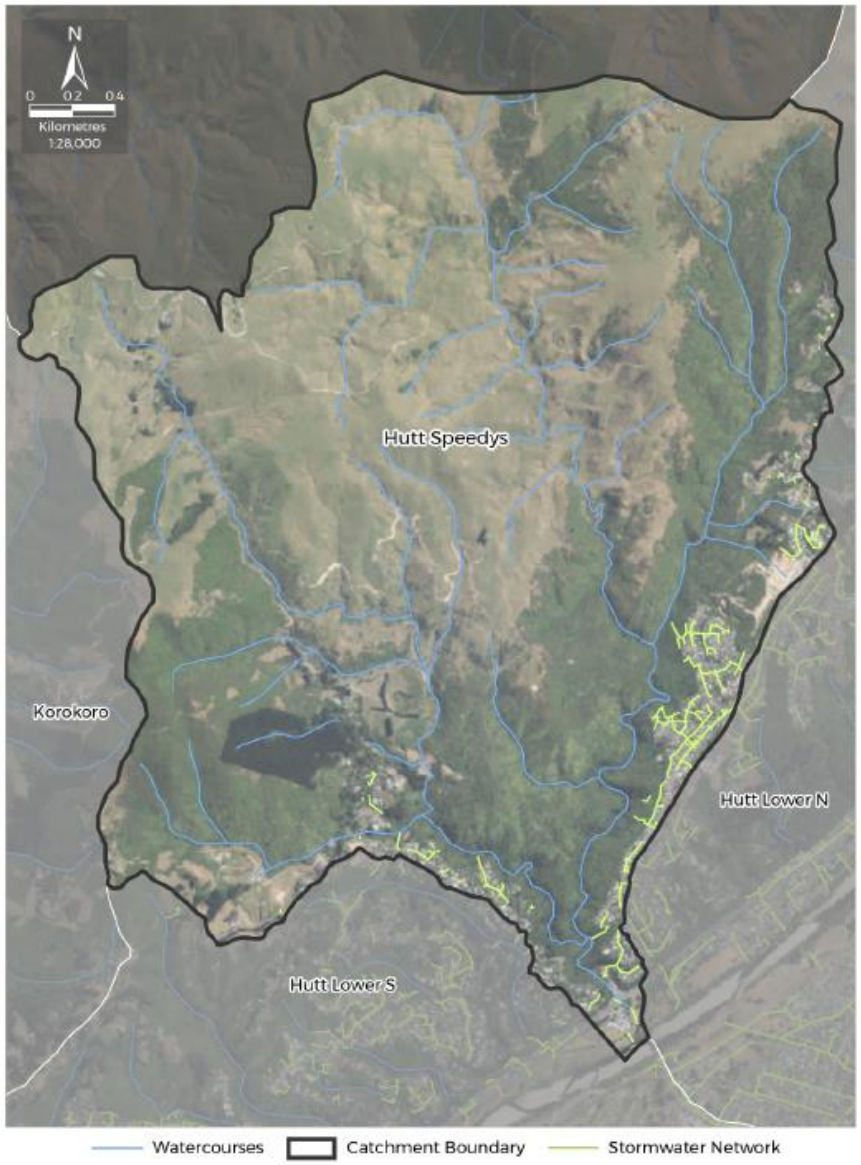
Physical Consequences			Social Consequences		Contaminant Risk
Asset Management	Natural Environment	Land Use	Social Values	Cultural Values	
96.1% and 43.8% of the wastewater and stormwater infrastructure is in moderate to very poor condition.	Modification to the natural environment is very low.	SLUR sites and roads account for less than 30% of the total land area. Risk of contamination is low.	Bathing sites are not monitored by GWRC. There is no data for public engagement.	No Data in this field.	Moderate risk

Te Oranga Wai Kaupapa Classification: **Wai Kino – Dangerous polluted water**

Management Options

•

Hutt – Speedys



Catchment Description

Located on the hills to the west of Lower Hutt the Hutt – Speedys catchment resides on the rolling hills that slope into the Hutt Valley. High producing grassland and broadleaved indigenous hardwoods are the predominant land uses with one historic contaminated land site. There is no flood risk classified in this catchment.

Modelled Priority Outcomes

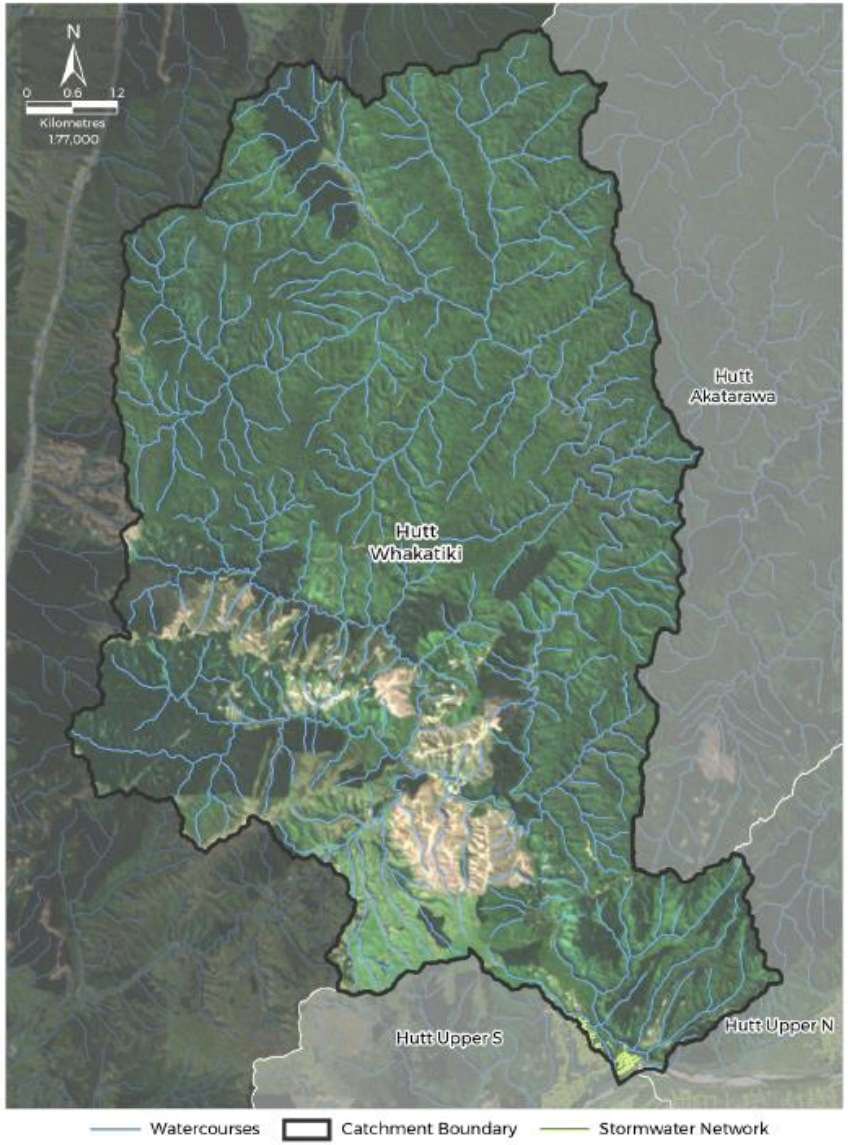
Priority ranking: **Medium priority**

Physical Consequences			Social Consequences		Contaminant Risk
Asset Management	Natural Environment	Land Use	Social Values	Cultural Values	
11.2% and 54.5% of the stormwater and wastewater network is in moderate to very poor condition.	Natural environment is not degraded.	There is no contamination from SLUR sites or roads.	Bathing sites are not monitored by GWRC. There is no data for public engagement.	No Data in this field.	Moderate risk

Te Oranga Wai Kaupapa Classification: **Wai Mate – Dead water**

Management Options

Hutt – Whakatikei



Catchment Description

The Hutt – Whakatikei catchment is located to the west of Upper Hutt. The topography of the catchment is made up of hills that slope into the Hutt Valley. Native forest, indigenous forest and exotic forest are the key land use types and there are no contaminated land sites. Areas within this catchment have been classified as susceptible to a 0.23% AEP flood event, located at the confluence of the Whakatikei and Hutt Rivers.

Modelled Priority Outcomes

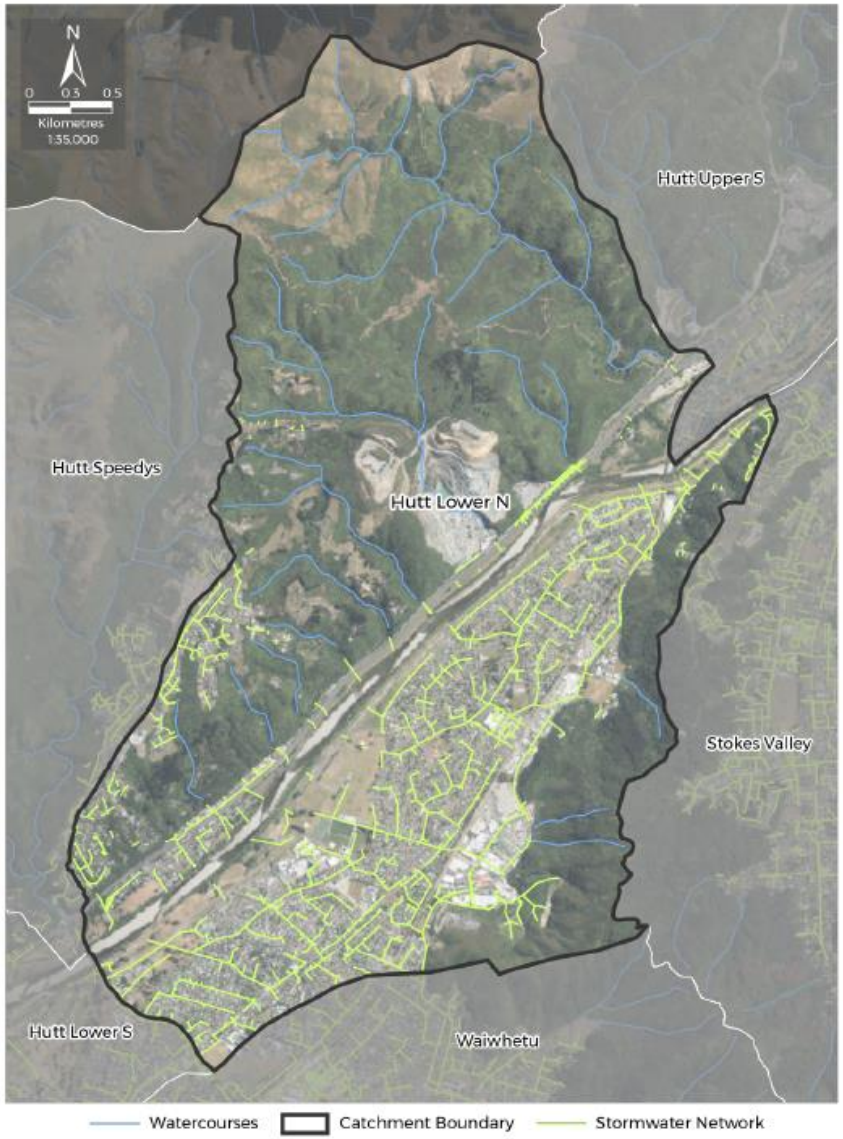
Priority ranking: **Lowest priority**

Physical Consequences			Social Consequences		Contaminant Risk
Asset Management	Natural Environment	Land Use	Social Values	Cultural Values	
There are 12 known overflow locations. Contamination risk is low.	Very low modification to the natural environment.	There is no contamination from SLUR sites or roads.	Bathing sites are not monitored by GWRC. There is no data for public engagement.	No Data in this field.	Very low risk.

Te Oranga Wai Kaupapa Classification: **Wai Ora – Healthy water**

Management Options

Hutt – Lower North



Catchment Description

Hutt – Lower North is an urban catchment with State Highway 2 running through the catchment following the Hutt River. The topography is relatively flat, due to being located on the flood plain of the Hutt River, and rolling hills are located to the east and west side of the catchment. The land use type is predominantly settlement, gravel rock, and gorse and broom. There are more than 20 contaminated land sites which include service stations and mining sites. The catchment is susceptible to a 0.23% AEP flood event with the most at risk areas located around the river as well as the suburbs Avon and Wingate.

Modelled Priority Outcomes

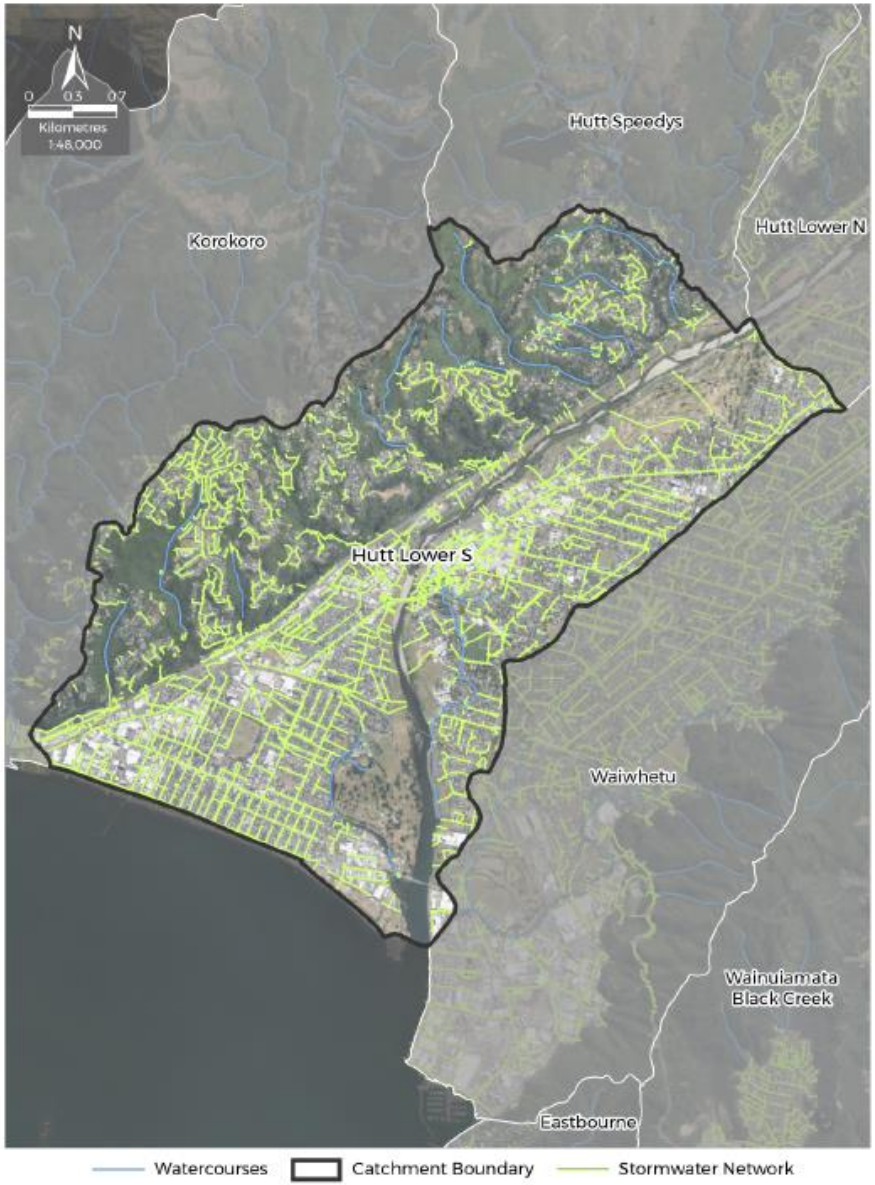
Priority ranking: **High priority**

Physical Consequences			Social Consequences		Contaminant Risk
Asset Management	Natural Environment	Land Use	Social Values	Cultural Values	
71.5% and 82.2% of the stormwater and wastewater infrastructure, respectfully, are in moderate to very poor condition.	Moderate modification.	SLUR sites account for 7.572% of the total land area.	Bathing sites are not monitored by GWRC. There is no data for public engagement.	No Data in this field.	High risk

Te Oranga Wai Kaupapa Classification: **Wai Mate – Dead water**

Management Options

Hutt – Lower South



The Hutt – Lower South catchment is primarily urban and contains the suburbs of Lower Hutt and Petone, as well as the mouth of the Hutt river into the Wellington Harbour. The topography is predominantly flat and coastal. Settlement and transport infrastructure are the major land use types and there are more than 20 contaminated land sites. Areas within the catchment are susceptible 0.23% AEP flood events with the areas surrounding the Hutt River and the entire Petone area at risk. Petone Seaview is also susceptible to a 0.1% AEP flood event.

Modelled Priority Outcomes

Priority ranking: **High priority**

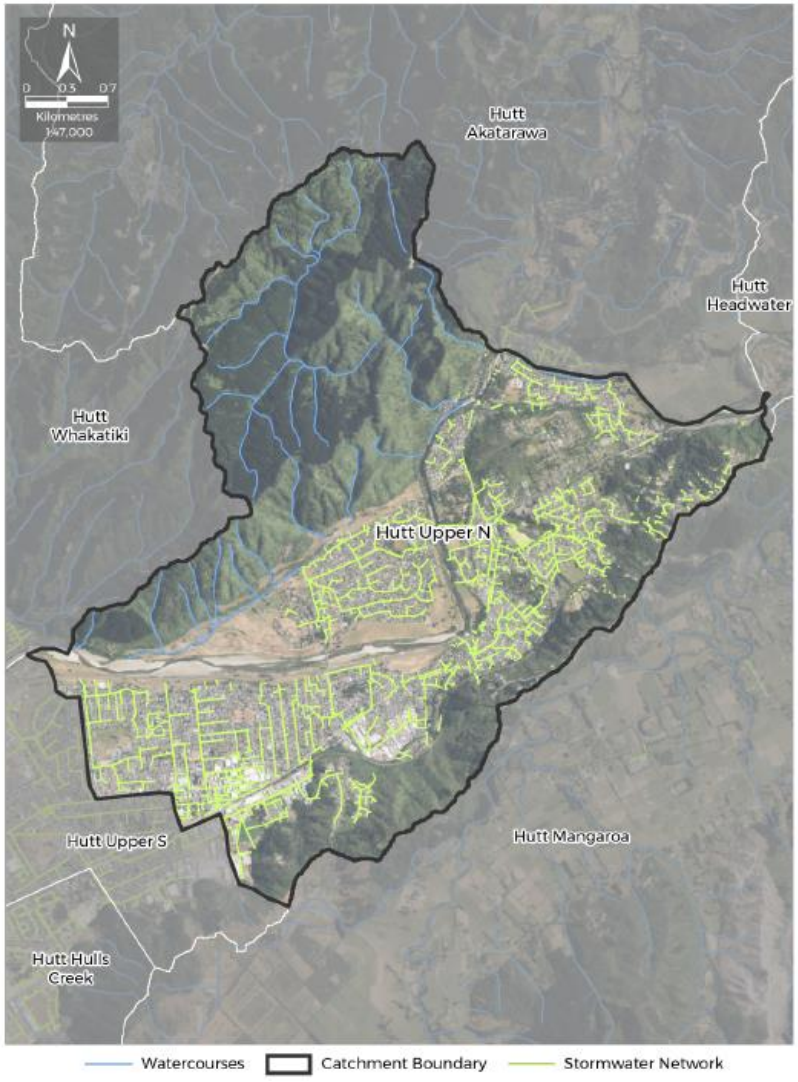
Physical Consequences			Social Consequences		Contaminant Risk
Asset Management	Natural Environment	Land Use	Social Values	Cultural Values	
More than half the stormwater and wastewater infrastructure are in moderate to very poor condition.	Natural environment is moderately degraded.	SLUR sites and roads account for 4.01% and 68.38% of the total land area respectfully.	Bathing sites are monitored by GWRC. There is no data for public engagement.	No Data in this field.	High risk

Te Oranga Wai Kaupapa Classification: **Wai Mate – Dead water**

Management Options

- Upgrading and refitting wastewater and stormwater pipes.
- Infiltration device.
- Biorientation Device.
- Stream naturalisation.

Hutt – Upper North



Catchment Description

Located north of the Hutt Valley from Upper Hutt Central to Te Marua is the Hutt – Upper North catchment. This catchment is primarily flat land with rolling hills that slope towards the Hutt River with settlement and broadleaved indigenous forest dominating the land use types. There are more than 20 contaminated land sites, and the catchment is susceptible to a 0.23% AEP flood event. Areas most susceptible to flooding are located on the flat land surrounding the Hutt River.

Modelled Priority Outcomes

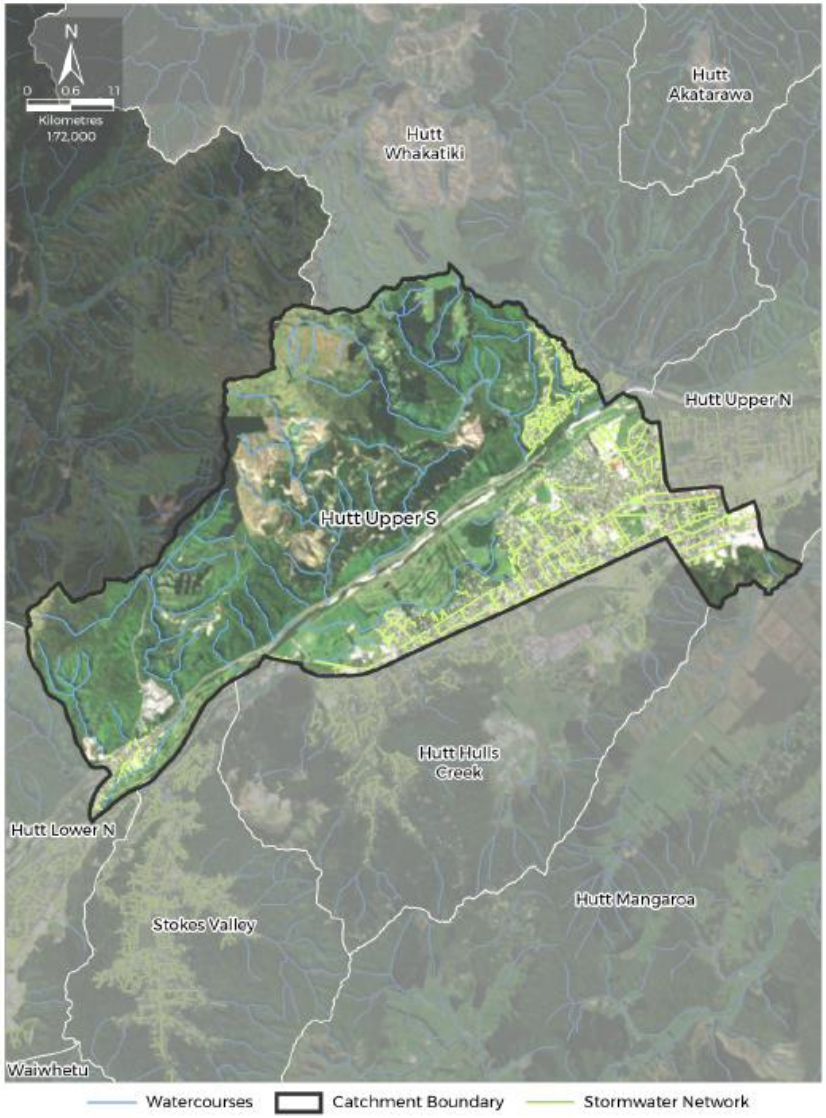
Priority ranking: **Medium to high priority**

Physical Consequences			Social Consequences		Contaminant Risk
Asset Management	Natural Environment	Land Use	Social Values	Cultural Values	
Less than half of the wastewater and stormwater network are in moderate to very poor condition.	Natural environment if moderately degraded.	SLUR sites and roads account for 2.02% and 20.51% of the total land area respectfully.	Bathing sites are monitored by GWRC. There is no data for public engagement.	No Data in this field.	Moderate risk

Te Oranga Wai Kaupapa Classification: **Wai Mate – Dead water**

Management Options

Hutt – Upper South



Catchment Description

The Hutt – Upper South catchment is in the Hutt Valley between Lower Hutt and Eldersea. Many tributaries of the Hutt River flow trough this catchment. The topography is flat with the Hayward Hills to the eastern side of the catchment. Transport infrastructure, settlement and broadleaved indigenous hardwoods are the main land use types and there are more than 20 contaminated land sites. The catchment is susceptible to a 0.23% AEP flood event with the flat urban land being the most at risk areas.

Modelled Priority Outcomes

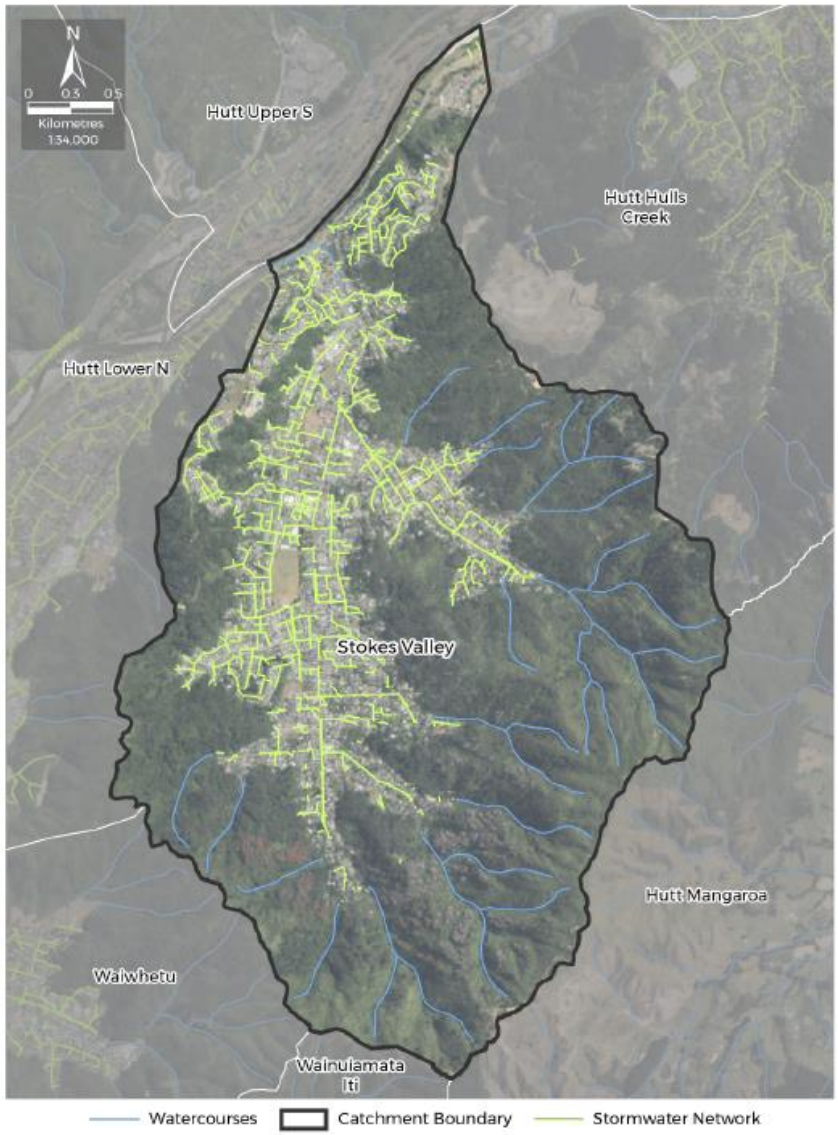
Priority ranking: **High priority**

Physical Consequences			Social Consequences		Contaminant Risk
Asset Management	Natural Environment	Land Use	Social Values	Cultural Values	
57.8% and 63.8% of the stormwater and wastewater infrastructure, respectfully, are in moderate to very poor condition.	Low modification of the natural environment.	SLUR sites and roads account for 6.79% and 23.92% of the total land area respectfully.	Bathing sites are monitored by GWRC. There is no data for public engagement.	No Data in this field.	High risk

Te Oranga Wai Kaupapa Classification: **Wai Mate – Dead water**

Management Options

Hutt – Stokes Valley



Catchment Description

Located to the east of Lower Hutt bordering the boundary with Upper Hutt, the Hutt – Stokes Valley Catchment is a low-lying catchment nestled into valleys of steep hills. The catchments land use is predominantly settlement and broadleaved indigenous hardwoods. There are four contaminated land sites which include mechanics and the Silverstream Landfill. Areas within the catchment are susceptible to a 0.23% AEP flood event with the most at risk areas at the confluence of the Stokes Valley Stream and the Hutt River.

Modelled Priority Outcomes

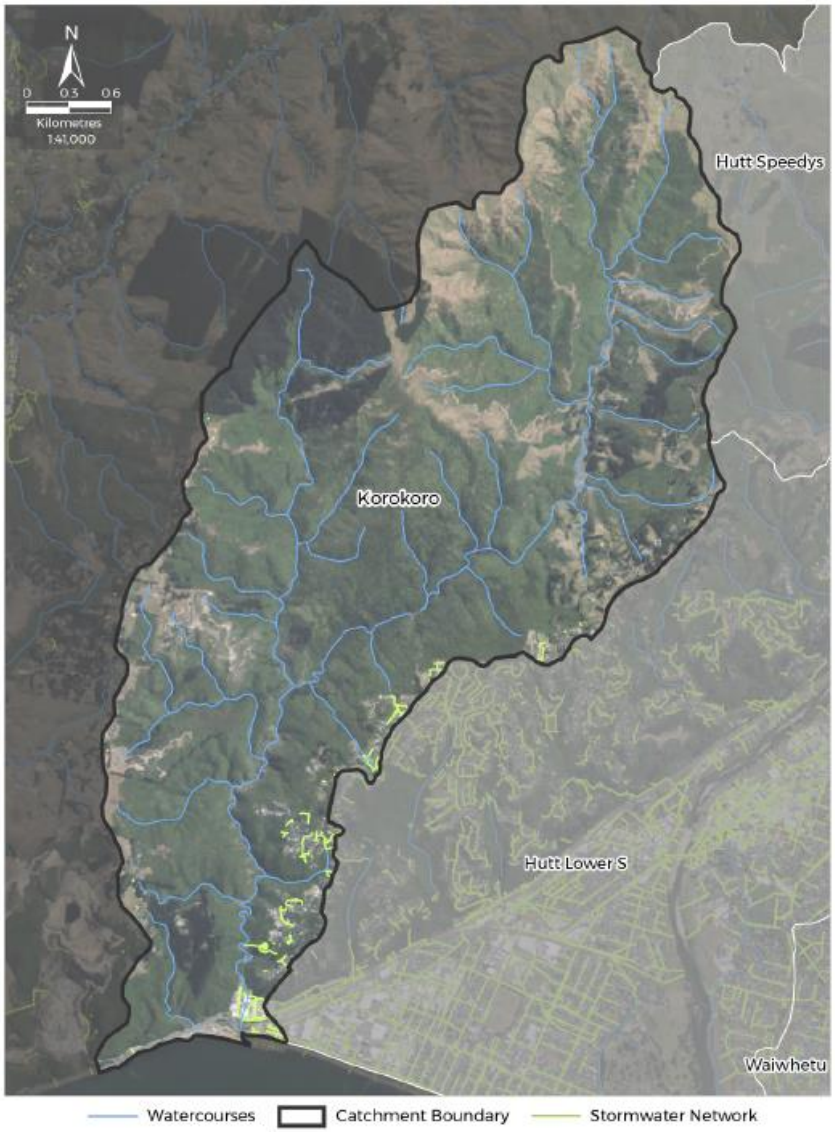
Priority ranking: **Medium to high priority**

Physical Consequences			Social Consequences		Contaminant Risk
Asset Management	Natural Environment	Land Use	Social Values	Cultural Values	
42.1% and 79.2% of the stormwater and wastewater infrastructure, respectfully, are in moderate to very poor condition.	Moderate modification of the natural environment.	SLUR sites account for 0.05% of the total land area respectfully.	Bathing sites are not monitored by GWRC. There is no data for public engagement.	No Data in this field.	Moderate risk.

Te Oranga Wai Kaupapa Classification: **Wai Mate – Dead water**

Management Options

Korokoro



Catchment Description

The Korokoro catchment is located to the west of Petone with the Korokoro Stream tributaries flowing into the Wellington Harbour. Steep hillslopes make up the topography of the catchment with broadleaved hardwood forest, exotic forest and high producing grassland being the main land use types. There are four contaminated land sites in the catchment that include a wastewater treatment plant. Areas along the bottom of the catchment, around State Highway 2 are susceptible to a 1% AEP flood event.

Modelled Priority Outcomes

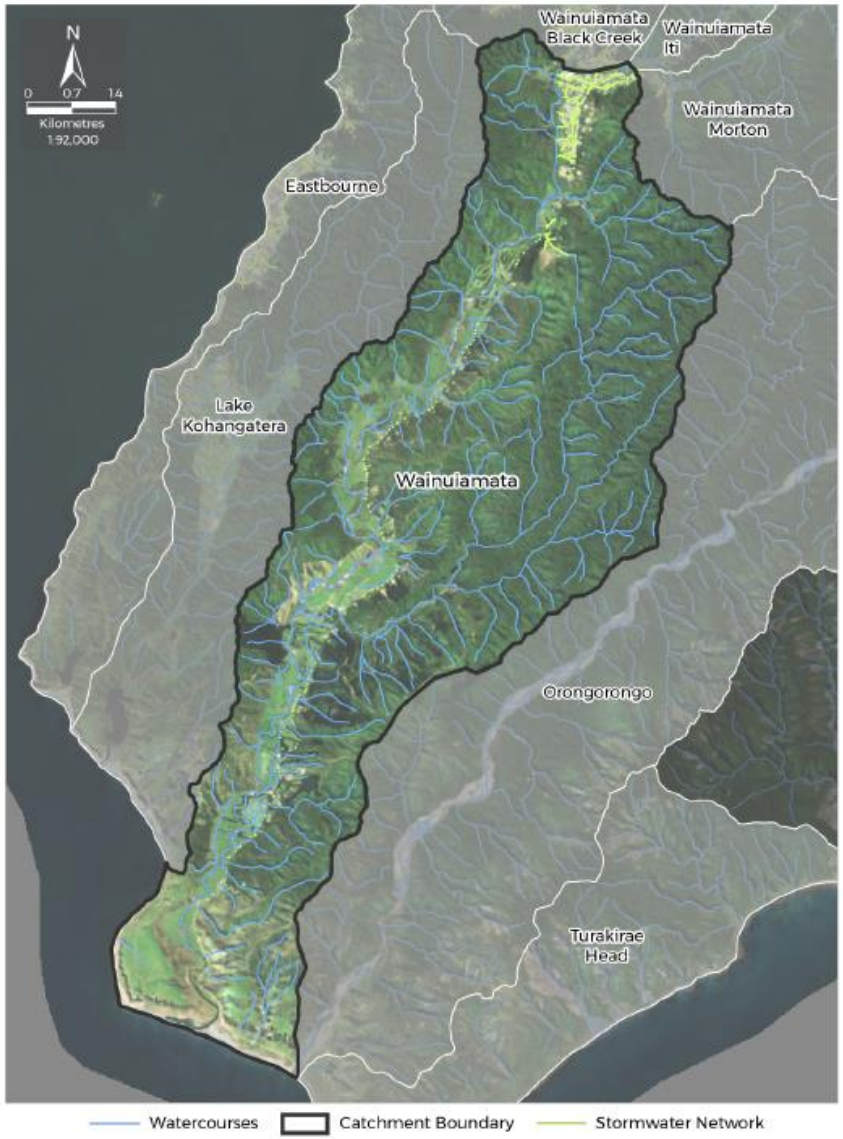
Priority ranking: **High priority**

Physical Consequences			Social Consequences		Contaminant Risk
Asset Management	Natural Environment	Land Use	Social Values	Cultural Values	
Over 60% of the stormwater and wastewater infrastructure are in moderate to very poor condition.	Low modification of the natural environment.	Roads account for 43.4% of the total land area. SLUR sites are below 1%.	Bathing sites are monitored by GWRC. There is no data for public engagement.	No Data in this field.	High risk

Te Oranga Wai Kaupapa Classification: **Wai Kautu – At risk**

Management Options

Hutt – Wainuiomata



Catchment Description

The Wainuiomata catchment is located on the peninsula to the east of the Wellington Harbour. The topography is varied with some flat low-lying land near the Wainuiomata River and some hilly areas, such as Mt Grace. Land use in this catchment is predominantly settled with a mixture of exotic and indigenous vegetation. There are four contaminated land sites, including a wastewater treatment plant. The flat land surrounding the Wainuiomata River is susceptible to a 0.1% AEP flood event.

Modelled Priority Outcomes

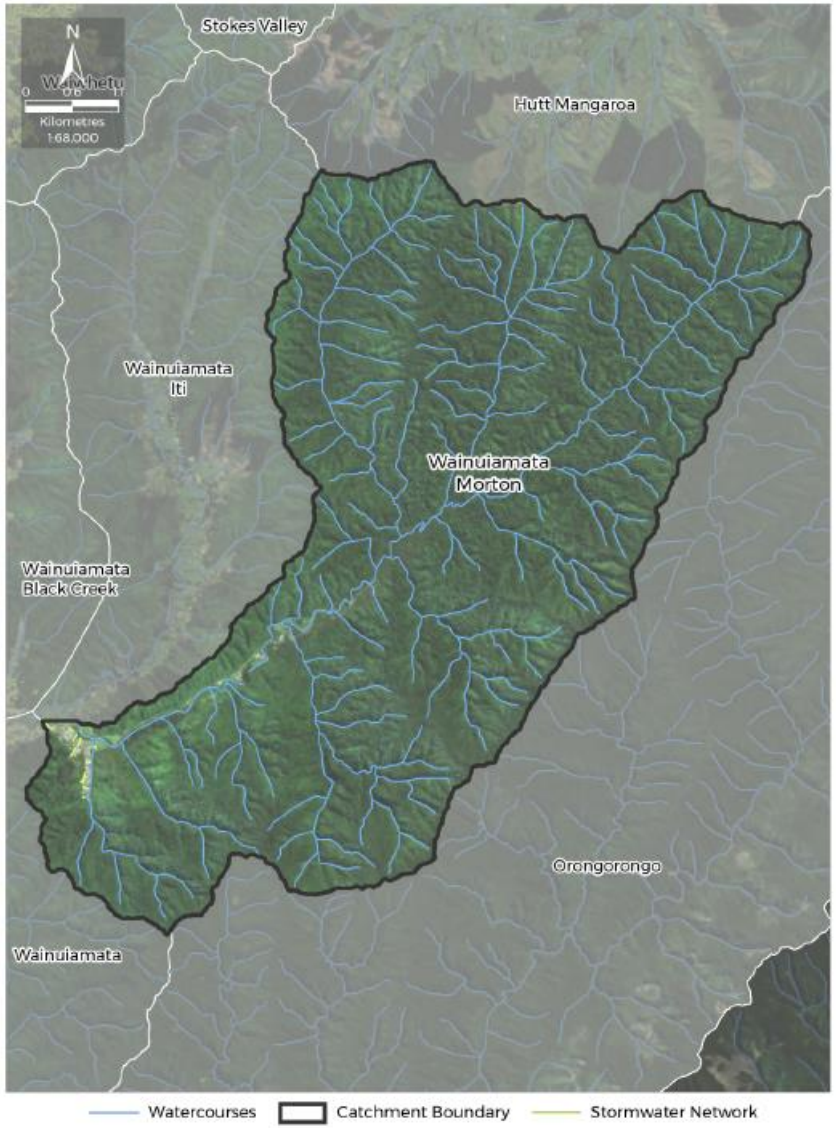
Priority ranking: **Medium priority**

Physical Consequences			Social Consequences		Contaminant Risk
Asset Management	Natural Environment	Land Use	Social Values	Cultural Values	
Only 8% of the stormwater network is in poor condition. However, 46.4% of the wastewater network is in poor condition.	Low modification of the natural environment.	SLUR sites account for 3.07% of the total land area.	Bathing sites are not monitored by GWRC. There is no data for public engagement.	No Data in this field.	Moderate risk.

Te Oranga Wai Kaupapa Classification: **Wai Kino – Dangerous polluted water.**

Management Options

Wainuiomata - Morton



Catchment Description

The Wainuiomata Stream flows through the centre of the catchment. The topography of the catchment is very hilly with steep slopes and ridges as well as many stream tributaries. Indigenous and exotic forest dominates the land use types and there are no contaminated land sites in the catchment. The area to the south east of the catchment is susceptible to a 0.1% AEP flood event from the Wainuiomata River.

Modelled Priority Outcomes

Priority ranking: **Low priority**

Physical Consequences			Social Consequences		Contaminant Risk
Asset Management	Natural Environment	Land Use	Social Values	Cultural Values	
There is no stormwater network but 100% of the wastewater network is in moderate to very poor condition.	Low modification of the natural environment.	There are no SLUR sites or gazetted roads.	Bathing sites are not monitored by GWRC. There is no data for public engagement.	No Data in this field.	Low risk

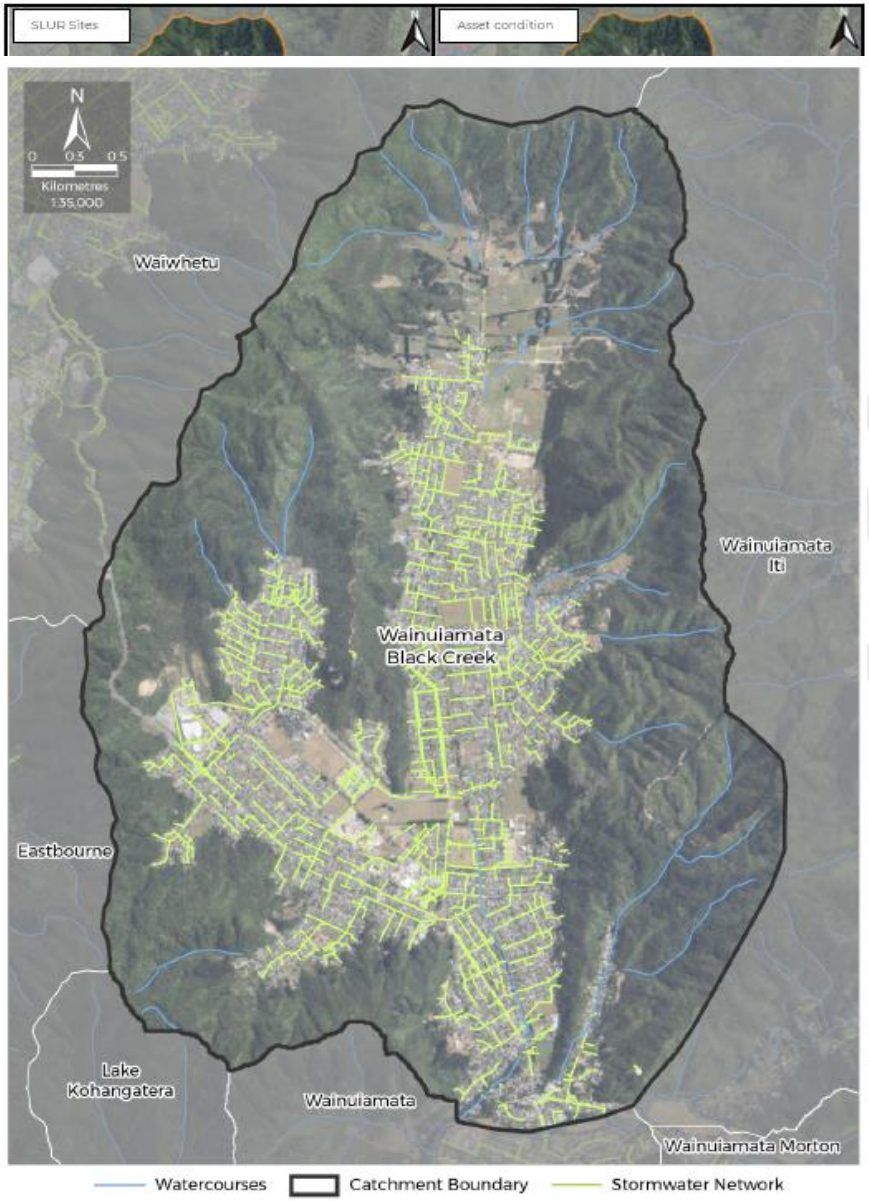
Te Oranga Wai Kaupapa Classification: **Wai Ora – Healthy water**

Management Options

Wainuiomata – Black Creek

Te Oranga Wai Kaupapa Classification: **Wai Mate – Dead water**

Risk ranking: **Medium**



Catchment Description

The topography is varied with low lying flat land surrounded by rolling hills. Land use on valley floor predominantly sub-urban settlement with central stream-side green space areas, hills are a mix of indigenous and exotic vegetation. North catchment branch is identified for urban growth.

Modelled Outputs

Physical Consequences			Social Consequences		Risk Ranking
Asset Management	Natural Environment	Land Use	Social Values	Cultural Values	
< 50% of SW and WW network is moderate to very poor. 10 known overflows.	Moderate modification of the natural environment.	15 SLUR sites 0.09% of total area.	Bathing sites not monitored by GWRC.	No Data in this field.	Medium

Issues Focus

- Wai Mate – Dead Water classification in Te Mahere Wai
- Wastewater network overflows
- Poor network condition (contamination risk)
- Urban environment impact on stormwater run-off
- Controls on development required to respond to growth pressures
- Straightened channel form in urban area

Management Options

- In-line treatment devices.
- Open channel naturalization opportunities.
- Development controls
- Education & Awareness Programme
- Compliance and repair/fix cross connections
- Network upgrades and renewals

Appendix E
Prioritisation Framework

A methodology for prioritising stormwater management in the Wellington region

Quality statement

Rev. no	Date	Description	Prepared by	Checked by	Reviewed by	Approved by
0	28/7/21	Initial draft for WWL review	Jess Grinter (Stantec)	Justine Bennett (GHD)	Francis Leniston, WWL	
1	05/5/22	Revised draft for general reference	Jess Grinter (Stantec)	Justine Bennett (GHD)		

This document may be referenced as follows:
Grinter, J. & Bennett, J. 2022 *A methodology for prioritising sub-catchments for stormwater management in the Wellington region*, report prepared for Wellington Water Limited by Stantec and GHD, 13 pp.

1. Summary

In 2019, Wellington Water commissioned the development of a Stormwater Management Strategy for the Wellington

City stormwater network catchment as required by the global stormwater consent (Stage 1, issued 2015) and Schedule N of the region's Natural Resources Plan. This was to be the first in a series of three strategies to cover the majority of the greater Wellington region's stormwater network managed by Wellington Water. All three strategies have since been developed over the subsequent three years (to 2022).

A key element of each Stormwater Management Strategy is the prioritisation of sub-catchments within the relevant network catchment (Wellington City, Porirua City, and Hutt City / Upper Hutt City) for future stormwater management, based on a range of aspects including catchment character and related risks to stormwater quality and quantity. The purpose of this exercise was to introduce an objective and robust tool to support decision-making with regards to stormwater management within the client councils (Wellington City Council, Porirua City Council, Hutt City Council, and Upper Hutt City Council) and Wellington Water.

An approach for prioritising sub-catchments for stormwater management was designed in order to meet the requirements of Schedule N, but also to provide an objective and robust tool for decision makers in each client council (Wellington City Council, Porirua City Council, Hutt City Council, and Upper Hutt City Council) and Wellington Water to utilise in the allocation of funding for stormwater network upgrades, water quality improvement projects, and other initiatives over the long term. The methodology for the development of the tool, described in this document, reflects an approach which is well-aligned with industry best practice for Multi-Criteria Analysis (MCA) processes. The tool was developed in consultation with Wellington Water and GWRC, with client councils in mind as primary users of the final application.

2. Contributors

The development of this methodology between March 2021 and April 2022 has been an extensive process, gathering feedback from a multitude of technical and practical perspectives, all of which has enabled the development of an appropriate and robust approach. The authors wish to thank the below-mentioned contributors for their time, patience, and valuable inputs throughout the process:

Geospatial data analysis / automation:

- Rory McPherson, Stantec
- Maddie Giles, Stantec
- David Ponting, Stantec

Key technical contributors:

- David Arseneau, GHD
- Emily Diack, GHD
- Wellington Water personnel including Fraser Clark, Paul Gardiner, Emily Greenberg, Mohammed Hassan, Nick Hewer-Hewitt, Francis Leniston, Katrina Murison, Nadia Nitsche, and Angela Penfold.
- Greater Wellington Regional Council (Jude Chittock, Rubie McLintock, Rachel Pawson, and Alastair Smaill)
- Connect Water team (Alistair Allan, Sheryl Paine, Alicia Taylor)

3. Introduction

The intent of this document is to provide a replicable methodology for the application of the prioritisation framework in catchments across the Greater Wellington region. It is intended as a tool for Wellington Water and its client councils to use to inform policy, funding, and asset management decisions in relation to the stormwater network and associated receiving environments. The tool is intended to provide an objective insight into complex issues, and in many ways, it simplifies those issues to allow for a more holistic, catchment-focused overview. It is designed to support wider processes and discussions regarding stormwater management, including those with external stakeholders such as mana whenua.

The tool does not account for peripheral or contextual factors such as local or national political issues and influence; community pressures; availability of funding; state of emergency situations (such as the aftermath of a large flood event), and additional inputs to the stormwater system which are managed through separate consenting and regulatory processes such as wastewater overflows and flood risk. 'Priority' may be determined through the consideration of a much wider range of factors by decision-makers. The prioritisation matrix is simply a tool to provide an objective starting point.

This framework was initially applied to the Wellington City, Porirua and Hutt valley/Wainuiomata stormwater network catchments. Unless otherwise indicated, catchment-scale information presented in this document is related to the Wellington City catchment (e.g. priority scoring, thresholds for criteria). This is intended as an illustrative example, and it is intended that the methodology will be marginally adapted to each of the other catchments in the region depending on available data and catchment characteristics. The underlying methods and assumptions applied shall be remain unchanged, and any peripheral variations to method to account for local context shall be captured in Stormwater Management Strategies developed for each of the three catchments.. It is intended that consistency between catchments will be maintained as far as practicable, to ensure that prioritisation outputs are comparable across the region.

The prioritisation framework is built upon previous work completed in support of the Stage 1 Global Stormwater Consent application (granted in 2018). Significant effort was invested in 2017 to prioritise sub-catchments across the entire Greater Wellington region, on the basis of the existing state of the aquatic environment and external pressures on the environment at that time (e.g. development, removal of vegetation, presence of other discharges). The level of quantitative data available to assess water quality in each sub-catchment was also assessed at that time, and gaps in knowledge were identified and then used to inform the development of a Stormwater Monitoring Plan. The SMP was finalised in February 2020, and monitoring began in June 2020. As a result, by July 2021 Wellington Water had collected over 12 months of water quality data for the sites specified in the SMP and the Stage 1 consent.

This monitoring information provides a more robust platform on which to base any assessment of stormwater quality than was previously available in 2017. Given that only one year of data is available, we have taken a cautious approach in using it to assess the current state of receiving water quality in each sub-catchment. The data will be applied only to validate the priority status scores (for ecological priority) assigned in 2017, for example to check whether there has been any noticeable change as indicated by the latest monitoring data. The data itself has not yet been directly

applied within the prioritisation matrix, but the option is available for it to be included in future once a larger dataset is available. In addition to the use of the monitoring data, an extensive review of available data from a wide range of other sources both internal to WWL and WCC and external has also been conducted.

4. Development of an agreed methodology for prioritisation

The prioritisation framework was developed iteratively, following the process illustrated in Figure 1 below. The process built upon the work already completed to support the Stage 1 stormwater consent application in 2017, and drew from similar methodologies such as those employed for Multi-Criteria Analysis processes (as mentioned below). A description is provided for each of the steps below.

The prioritisation approach developed was based on common industry practice using a typical MCA-style assessment, whereby a series of variables are scored according to applied judgements and scoring thresholds. Where necessary a weighting can be applied to allow the prioritisation to reflect the over-arching vision and objectives of a management strategy.

MCA type approaches are commonly used in business case development, assessment of alternatives and best practicable option (BPO) assessments, and in policy development and decision-making.

Figure 1 - Catchment prioritisation process

Step 1: Identify objectives

Given that the prioritisation framework needed to provide outcomes which would meet the requirements of Schedule N (for the SMS), it was important to identify the objectives of the overall SMS as a first step. This would then serve as a guide for the range of criteria to be considered.

Ultimately, for the Wellington City SMS, relevant objectives from the NRP were adopted as the objectives for the Strategy. Several alternatives were considered prior to this final decision, including:

- Three Waters Strategy
- WWL Statement of Intent 2020-23, particularly the organisation's service goals and outcomes
- WCC Long Term Plan 2015 – 2025
- Wellington Urban Growth Plan 2015

Given the focus of the SMS on meeting the requirements of Schedule N< it was decided that it was most appropriate for the SMS to be directly aligned with NRP objectives. The relevant objectives are outlined in detail in the SMS, but in summary they included (paraphrased):

- Maintenance or improvement of groundwater and surface water quality, and marine water quality within the Coastal Marine Area (**Objective 23**)
- Rivers, lakes, natural wetlands and coastal water are suitable for contact recreation and Māori customary use, including by maintaining water quality, or improving water quality (in significant contact freshwater bodies, sites with significant mana whenua values as defined in the NRP, and all other rivers, lakes and natural wetlands) to meet the secondary contact objectives stipulated in the NRP (**Objective 24)**
- Safeguarding biodiversity, aquatic ecosystem health and mahinga kai in freshwater bodies and the coastal marine area. This includes managing water quality, flows, water levels and aquatic and coastal habitats to maintain current condition (where NRP objectives (Tables 3.4, 3.5, 3.6 3.7 or 3.8 of the NRP) are already met), or to meaningfully improve the fresh water body or coastal marine area where those objectives are not already met. Restoration of aquatic ecosystem health and mahinga kai is encouraged. (**Objective 25**)

Once these objectives were identified, this enabled the identification of relevant criteria to prioritise catchments, and inform data requirements.

Step 2: Data inventory

An initial gap analysis was undertaken in 2019 to ascertain the types of data which were available to Wellington Water either through existing sources (e.g. GWRC web server connections; internal databases) or through new sources which would require some preparation/data processing to render the information useful for the prioritisation framework (e.g. publicly available data from external agencies such as Waka Kotahi – New Zealand Transport Agency).

Data sources were originally grouped according to three "wellbeings" (reflecting Wellington Water's service goals): environment, socio-cultural, and economic/services. Each individual source was assigned a variable name, and the scope defined (including primary source, temporal and spatial distribution of data points where relevant, and initial description of how the data would be applied). This process continued intermittently through 2020 as more information became available from various other parallel projects including the Stormwater Monitoring Programme and the initiation of Te Whanganui-a-Tara Whaitua Committee by GWRC.

During this stage, the spatial extent of the target catchments for analysis were also reviewed and where necessary adjusted to reflect contemporary conditions. The sub-catchments within the Wellington City stormwater network were previously delineated in 2015 (for the 2017 Stage 2 consent application). For consistency with the existing consent, those catchments were used as the basis for the SMS prioritisation framework. However, some aggregation and realignment was required to reflect the network with greater accuracy given information that had been obtained since 2015.

A Request for Information (RFI) was developed for Wellington Water, requesting internal data which were not available through public portals, or were related to internal reporting processes such as the Long Term Plan, and network infrastructure status. Wellington Water provided information that was readily available at the time, however some gaps remained. Where a gap was identified, a best-possible alternative (proxy dataset) was established.

As the data were obtained, each source was classified according to:

- Whether the data were available for digital use

- The source of the data (confirmed, with a link to online geodatabase/web service where data was presented geospatially)
- Whether data had been processed and was ready for incorporation into the prioritisation matrix and GIS platform
- Whether WWL input was required to obtain/check/finalise data
- Whether each dataset provided full coverage of the nine WCC sub-catchments
- Priority of the dataset – 'Required' (essential; highest priority), 'Assess' (available but needing further quality assurance check, and/or analysis to see if the data would be useful), or 'Optional' (nice to have; lowest priority)

Quality assurance

Once data was obtained and classified as above, it was then assessed according to the following criteria (where relevant, depending on data type):

- Creation date / date last updated and/or frequency of data maintenance; data more than 5 years old was carefully considered (whether it was still relevant or now obsolete given purpose of SMS)
- Primary or secondary source (e.g. water quality measurements directly from WWL, or aggregated at regional level by GWRC or MfE; published and peer reviewed source)
- Presence of any duplicate data entries or suspected data entry errors
- Spatial coverage – spatial boundaries used are consistent and match those required for the catchment characterisation (e.g. Korokoro/North Harbour catchment boundaries are quite erratic and seemed to vary from source to source). Data is spread evenly across all sub-catchments (not weighted towards some more than others).
- For data which were recorded in more than one source; results are consistent with other well-known/applied sources or local knowledge (e.g. SLUR sites from GWRC database match with known HAIL sites (from local knowledge))
- Incorporation of latest regulatory requirements/references (e.g. NPS-FM and/or NES-FW definitions for wetlands; pNRP)
- Checking whether any assumptions had been applied to create a dataset, which could bias/influence results of the prioritisation process.

Geographic Information Systems (GIS) integration

All data collated and verified through Step 2 above were loaded onto an online platform via ArcGIS Online, where they could be reviewed in layers over the sub-catchment boundaries. Where data were available via a web server (e.g. publicly available data from GWRC), a link to that server was established so that data used as part of the prioritisation process would be continually updated and 'live'. It is Wellington Water's intention that this repository is developed into an online tool to aid in communication and engagement both internally (to inform decision making) and externally with key stakeholders. It is anticipated that this tool will also negate the need for the use of 'static' maps in the SMS documents that would potentially become obsolete within short periods of time.

Step 3: Draft criteria

The best available data sources were used to inform the development of draft criteria for the prioritisation of subcatchments, on completion of Step 2 above. These datasets were used to assign scores for a set of criteria, typically each comprised of a single variable. Each criterion was analysed independently (i.e. there were no 'composite' criteria derived from multiple variables) to maintain as transparent and straightforward a process as possible.

The criteria were grouped using categories to organise the information and demonstrate the range of criteria used, covering multiple aspects for analysis. These categories also reflect typical 'best practice' approaches for MCA analysis of environmental options and issues. The criteria used to prioritise for stormwater management across the Wellington region are listed in Table 1 below (Section 4.4).

Step 4: Define scoring thresholds

Once the draft criteria were identified, it was necessary to examine the range of data values available for each criterion at a catchment scale. Appropriate thresholds were then defined to inform scoring, on the basis of the maximum range of data observed in the catchment. All criteria had five possible scores (from 1 to 5).

During multiple consultative discussions with Wellington Water personnel and technical advisors it became apparent that the task of defining thresholds could be highly subjective. As such, it was identified fairly early in the process that this task needed to be completed in as objective a way as possible, such as with the use of statistics as described below. Data availability sometimes varied between sub-catchments; therefore a percentile-based approach to defining thresholds was necessary to avoid over- or under-valuing criteria in catchments where the range of available data was greater, or severely limited.

Given the five possible scores for each criterion, five percentiles were used to define the thresholds for assigning scores.

In most cases, the 10th percentile data value became the threshold for the lowest score, 25th percentile for a score of 2, 50th percentile for score of 3, and so on, with a score of 5 being assigned where values fell within ~90th percentile of the dataset or higher. Table 1 below demonstrates the thresholds assigned for Wellington City catchment and their related percentiles (where relevant).

It was also determined that scoring on the basis of proportional metrics would be most appropriate, to avoid any bias towards catchments which were 'outliers' (e.g. very large inner city catchments with high population density, or conversely small coastal catchments with sparse population and predominantly rural land use). This bias can arise due to the variability in catchment characteristics such as catchment area; land use; degree of urbanisation; population; physical form and function, and others. For example, instead of scoring each catchment on the number of square metres of impervious surface, scores were assigned on the basis of the percentage of the total catchment with impervious surface.

Table 1 Criteria and scoring thresholds applied to prioritise sub-catchments for stormwater management in Wellington City

Criteria	Definition	Function	Scoring Method			Data source
			Input	Threshold(s)	Score	
Asset Management						
pipe_condition	Proportion of overall network that is graded as moderate to worse condition Both stormwater and wastewater network infrastructure is assessed	To assess the degree to which historic under-investment and poor asset condition contributes to increased opportunities for contaminants to enter in or become concentrated in the stormwater system Potential for overflows from wastewater to stormwater network via leaking wastewater pipes	% of the network that is within 5 years (Grade 4) to 10 years (Grade 3) of the expected 'end of life' given pipe materials and installation date	≥30% of pipes are Grade 3 or 4	5	Wellington Water asset condition database, with a grade assigned on the basis of years of pipe 'life' left (given recorded installation date and pipe material). This is a proxy for pipe condition grade, as formal grades have only been assigned to a limited proportion of the catchment. In most subcatchments, at least 80% of the network has installation date and pipe material data available.
				30 ≥ 20% of pipes are Grade 3 or 4	4	
				20 ≥ 15% of pipes are Grade 3 or 4	3	
				15 ≥ 9% of pipes are Grade 3 or 4	2	
				<9% of pipes are Grade 3 or 4	1	
growth	Predicted degree of growth and associated change in land use in future	Catchments with greater predicted growth (indicated by observed and predicted household numbers) will have a higher risk of reduced stormwater quality (if appropriate controls are not implemented,	The percentage change in total household numbers per catchment between 2018 (observed) and 2050 (predicted)	Forecast growth (2050 – 2018) > 44%	5	Population growth studies completed by Wellington Water in 2021
				forecast growth change 41% < Δ ≤ 44%	4	
				Forecast growth 34% < Δ ≤ 41%	3	

		or the right controls are not implemented well) and increased pressure on existing stormwater assets.		Forecast growth 24% < Δ ≤ 34%	2	
				Forecast growth ≤ 24%	1	
Natural environment (contaminant effects)						
Eco_priority	Catchments assigned highest priority for management under the	Based on the previous assessment variables - higher priority catchments are likely to require	Priority score assigned to the catchment in	'High'	5	Stage 1 global stormwater consent application, 2017 (AEE)
	global Stage 1 SW consent, based on environmental pressures and state assessed in 2017	more intervention and investment to manage the effects of stormwater discharges and poor discharge quality.	Stage 1 AEE (2017) for ecological priority	'Moderate'	3	
				'Low'	1	
%natural	Proportion of stormwater network which is comprised of open channel and natural channel	Catchments with a low proportion of open/natural channels are more degraded, therefore ongoing discharge of stormwater contaminants will exacerbate the degradation (objectives of NPS FW are at risk of not being met and RE resilience is lower)	Proportion (%) of stormwater network comprised of open and/or natural channel (and corresponding condition – extent of degradation)	<10% (Most degraded condition; Low natural value, very highly modified)	5	Length of natural watercourses denoted as Class 1, 2 or 3 in the NRP (GWRC geospatial data) Open channel as indicated in Wellington Water's stormwater infrastructure geospatial layer
				>10 ≤ 25% (More degraded; medium natural value, highly modified)	4	
				>25 ≤ 50% (degraded; medium natural value, moderately modified)	3	
				>50 ≤ 75% (less degraded; high natural value, low modification)	2	
				> 75% (least degraded; high natural value, very low modification)	1	
monitoring	Score assigned to each catchment to denote a need for increased monitoring (temporal and/or spatial coverage) in that catchment, as part of 2017 AEE and 2020 SMP.	Catchments with higher priority score were typically most lacking in monitoring data/knowledge of existing stormwater issues; therefore greater risk that there could be 'unidentified' stormwater quality issues in the catchment, or poor knowledge of other existing values.	Monitoring score (and associated priority for collecting more information)	≥26 (highest priority)	5	Stage 1 global stormwater consent application, 2017 (AEE) and Stormwater Monitoring Plan, 2020 (Table B1).
				≥22 < 26 (moderate priority)	3	
				<22 (lowest priority)	1	

Land use (contaminant generation)						
SLUR_sites	Proportion of total catchment area which has land cover or land use (including HAIL sites) that is known to contribute greater contaminant loads to stormwater (e.g. metals, hydrocarbons, sediment, persistent pollutants)	Catchments with high proportion of impervious area, SLUR site area, and/or high volume roads will be exposed to greater loads of contaminants through stormwater runoff, and therefore be at greater risk of poor stormwater quality	Proportion (%) of catchment area covered by sites with 'verified history of HAIL', or 'confirmed contamination' (as per GWRC database), and level of associated risk of contamination entering stormwater from those areas.	>25% (very high risk)	5	GWRC SLUR sites – geospatial database (only sites with 'verified history of HAIL' or 'confirmed contamination' were included.
				>10 ≤ 20% (high risk)	4	
				>5 ≤ 10% (moderate risk)	3	
				>2 ≤ 5% (lowmoderate risk)	2	
				<2% (lowest risk)	1	
impervious_surface			Proportion (%) of catchment area with impervious surfaces (degree of imperviousness)	>30% (high to completely impervious)	5	Two datasets combined: 1. Geospatial layer generated in 2016 using a predictive model (applying assumed proportions for different property types/land use) primarily covering large hardstand areas, driveways etc on private properties by excluding roof areas and roads. 2. Land Information New Zealand (LINZ) building roof areas and roads generated using LiDAR (Light Detecting and Ranging) imagery, 2021
				>20 ≤ 30% (highly impervious)	4	
				>10 ≤ 20% (moderately impervious)	3	
				>5 ≤ 10% (lowmoderate imperviousness)	2	
				<5% (low imperviousness)	1	
high_volume_roads			Proportion (%) of gazetted roads within the catchment classified as 'Arterial', 'Primary Collector' or 'High Volume' in ONRC database (km); and associated risk of contamination from roads	>50% (highest risk)	5	Waka Kotahi One Network Road Classification (ONRC) class – linear geospatial dataset (2022)
				>40 ≤ 50% (med-high risk)	4	
				>30 ≤ 40% (medium risk)	3	
				>25 ≤ 30% (low-med risk)	2	
				<25% (lowest risk)	1	

Social values						
bathing_rec	Presence of known contact recreation sites in the receiving environment(s) of a catchment	Catchments with known contact recreation sites are at greater risk of poor stormwater quality leading to a health risk for people engaging in recreation.	Presence or absence GWRC bathing monitoring sites located in the receiving environment	Bathing monitoring sites are present in catchment receiving environment	5	GWRC RWQE monitoring locations (from GIS web service)
				Bathing monitoring sites are absent from catchment receiving environment	1	
complaints	Frequency and nature of public complaints received in relation to stormwater quality/management issues in each catchment, in 2020/2021	Catchments with a greater number of major complaints will either have more ongoing issues (indicating an existing problem with stormwater management) and/or a more engaged community. Greater risk of reputational damage to Wellington Water and client councils, negative media coverage, risk to public health etc. Ongoing problems also indicate greater risk of further contamination/exacerbation of poor condition in catchment receiving environment.	Number of complaints relating to stormwater network, classified by Wellington Water as Priority P1 (Urgent – mains burst, or other risk) Or P2 (Non-urgent; large leak/other risk, large tap fully open)	>38 complaints	5	Wellington Water CRM info for 2020/21 (supplied by Wellington Wateron 14/7/21 and updated in April 2022 to include all 2021 data); scoring on the basis of stormwater related complaints and complaint priority.
				≤38 complaints	4	
				≤35 complaints	3	
				≤30 complaints	2	
				≤28 complaints	1	

Cultural values						
MW_value	Number of sites of significant value to mana whenua identified in the catchment (as part of SMP)	Catchments with more sites identified have greater perceived cultural value; these catchments would therefore be at greater potential risk of degradation of those values if stormwater management is not carried out effectively	Number of sites of significance to mana whenua identified within the catchment	>2 sites (highest mana whenua values)	5	Stormwater Monitoring Plan, 2020 – Tables 2-4 to 2-10. This information was not available for Karori catchment, so it has not been scored for this criterion.
				>0 ≤ 2 sites (low to moderate mana whenua values)	3	
				0 sites (mana whenua values not yet identified)	1	
Shellfish			Presence or absence of sites known to be used for shellfish gathering in the receiving environment of the catchment	Sites are present in the catchment	5	Shellfish survey, GWRC 2006
				Sites have not been identified in the catchment	1	

Step 5: Build prioritisation matrix

Scores assigned for each criterion were carried through to a 'dashboard' (the primary matrix) where they were then summed for each catchment. The catchments were then ranked from one to nine (1-9) on the basis of their total scores; with one (1) being the catchment at highest risk (and therefore requiring most attention for management) and nine (9) being the catchment at lowest risk.

The matrix was developed in a Microsoft Excel spreadsheet format, as it is a universal format that is widely accessible and fairly easy to use.

Step 6: Data optimisation

Several iterations of the prioritisation matrix were developed, primarily as the thresholds described in Section 4.4 were refined. This process continued over multiple months, and as a result, new or updated datasets subsequently became available. The understanding of the purpose and function of the Stormwater Management Strategies also evolved within the project team during this period, and additional projects to develop strategies for Porirua City and Hutt City / Upper Hutt City were also initiated, which further expanded the technical team and brought a more regional perspective to the work. In March 2022 it was identified that new or updated data were available for five of the 12 criteria. This became apparent after several gaps were identified, with inconsistencies between network catchments (for example, the dataset used to score for pipe condition had excellent spatial coverage in Upper Hutt City, but very poor coverage in Porirua City). Some optimisation was required to maintain consistency. The final criteria, source data and scoring thresholds are shown in Table 1 above. However, the main changes to establish those criteria included:

- The 'Growth' criterion was originally informed by a qualitative assessment of the status of each sub-catchment as described in the District Spatial Plan for Wellington City (and equivalent plans for the other three local authorities). This was highly subjective, although used the best approach available at the time. During 2021 Wellington Water initiated a study to model future population growth across the region, to 2050. The final outputs from that study became available in early 2022. This enabled the scoring for growth to be based on modelled estimates of household numbers at suburban scale, in 2018 and out to 2050. Scores were then assigned based on percent change in household numbers within each sub-catchment between 2018 and 2050.
- The 'Pipe Condition' criterion was originally based upon Wellington Water's asset condition grading scores, which are derived from a mixture of information about pipe installation date, materials, and CCTV inspections. However, as mentioned above, the portions of the stormwater network where condition grading had been completed were highly variable between catchments. This meant that in some cases, scoring could not be completed due to missing data. In Wellington City, only 23% of the stormwater network had been graded. To work around this

issue, catchments were instead scored on the remaining pipe 'life' (calculated based on expected life of pipe materials, and actual age of pipes as of 2022). Those pipes which had less time remaining to their expected 'end of life' presented a greater risk to the integrity of the stormwater network, and tis ability to convey stormwater.

- The 'Impervious Surface' criterion originally utilised a modelled dataset produced for Wellington City Council, depicting estimated impervious surfaces throughout Wellington City. However, the original model excluded building roof areas and roads. It was decided that better coverage could be achieved by combining this dataset (spatially) with new data available from Land Information New Zealand, which derives roof areas and road footprints from LiDAR.
- The 'High Volume Roads' and 'Complaints' source datasets were updated to include 2021 data.

Step 7: Sensitivity Analysis

The sensitivity of the prioritisation matrix was continuously checked and tested throughout the process described above (Steps 1-6). Much of the work to fine-tune the thresholds for scoring of criteria was initiated when thresholds appeared to be too coarse (i.e. all catchments scoring the same value) or too sensitive (over- or under-representing certain catchments). Each iteration of the matrix was checked to see whether scores matched with the technical team's understanding of the catchments in 'reality'; for example, if a catchment such as Owhiro Bay was known to have large areas of open space and a lower population, was this reflected in the final scores?

At various stages, the option of applying a weighting to some or all criteria was discussed. The over-representation of certain categories was of particular concern, and it was debated whether that issue should be remedied by applying a weighting. For example, there are three criteria for Asset Management, but only two for Social Values. However, when weighting was trialled (for example, applying a weighting to raise the scores for social values criteria, but not for asset management criteria), the final ranking of catchments did not noticeably change unless an 'extreme' weighting was applied. Given the purpose of this framework, the intended use of the matrix, and the 'coarseness' of some of the data (for example, regional scale trends rather than individual properties) it was eventually decided that weighting was not appropriate and would serve to further obfuscate a framework that was already fairly complex.

5. Concluding Statement

The development of this methodology and the prioritisation matrix itself has created many opportunities for discussion of the governance framework in which stormwater is managed across the Wellington region, and the roles of various entities in delivering outcomes for stormwater under the Natural Resources Plan, the NPS-FM and the RMA. It has brought to light issues such as the need for over-arching consenting strategies, particularly to achieve coordination between global stormwater and wastewater consents. It has also highlighted the influence of political, social and cultural contexts on decision-making for stormwater management and the allocation of funding and resources to certain catchments which may not actually present the highest risk to stormwater quality and receiving environments, at the cost of those catchments with far more serious issues.

These discussions have been valuable, and in some cases have led to the identification of further projects to be completed to supplement the stormwater management strategies. It is intended that the prioritisation matrix will continue to be refined over the next few years as more information is gathered and also with the evolution of Wellington Water's global stormwater consent from Stage 1 to Stage 2 and beyond.

Appendix F
Management Options

Introduction

There are many pathways to improving and minimising the effects of stormwater on our waterbodies within the Wellington Region. They range from:

- Minimising the effects / impacts of new development – Stopping the cycle of degradation.
- Targeted improvement activities across our existing stormwater networks.
- Working collaboratively with others to lift our overall relationship with water through education programmes.

We have listed and discussed the options in the three tables in this appendix. We expect that most, if not all, will be used at some point during our journey to wai ora. And that over the course of that journey new options will become available and will be incorporated, following good management practice.[60]

Good management practice evolves through time and results in continuous improvement as new information, technology and awareness of issues are developed and disseminated. Examples of good management practice guidelines for stormwater can be found on the Greater Wellington Regional Council's website.

Stormwater Management Options

"A paradigm shift in stormwater management moves from "to collect, convey, discharge" to a more integrated approach of "slow it down, spread it out, and soak it in."[61]

Wellington Water will use a range of approaches to manage stormwater quality. The management options outlined below identifies integrated approaches to manage the quality of water entering the stormwater network, which is then discharged to the receiving environment.

We will encourage our wider community to deliver integrated catchment solutions, that are in line with the principle of **ki utu ki tai**. As such, we will seek opportunities for encouraging that all developments and catchments apply the principle of the Treatment Train.

The treatment train is based on a logical sequence of stormwater flowing through a catchment, beginning with stormwater runoff controls at-source, followed by capture and treatment of overland flows, and finally the enhancement of receiving environments to enhance their stormwater management function.

Stormwater can be managed at a range of scales in the urban environment. Managing it at source is one of the most efficient ways of reducing harmful impacts on waterway.

The toolbox is made up of non-structural approaches through policy and planning, education and engagement and structural approaches through stormwater management assets consistent with WSD guidelines that provide the management of stormwater runoff and contaminants. The toolbox aims to provide a holistic solution that balances both structural and non-structural components for the benefit of both the environment and the community and is shown in Figure F 1.

[60] *Good management practice is defined as: Practices, procedures or tools that are effective at achieving the desired performance while contributing to the providing for desired environmental outcomes.*
[61] *Waikato Stormwater Management Guideline 2020*

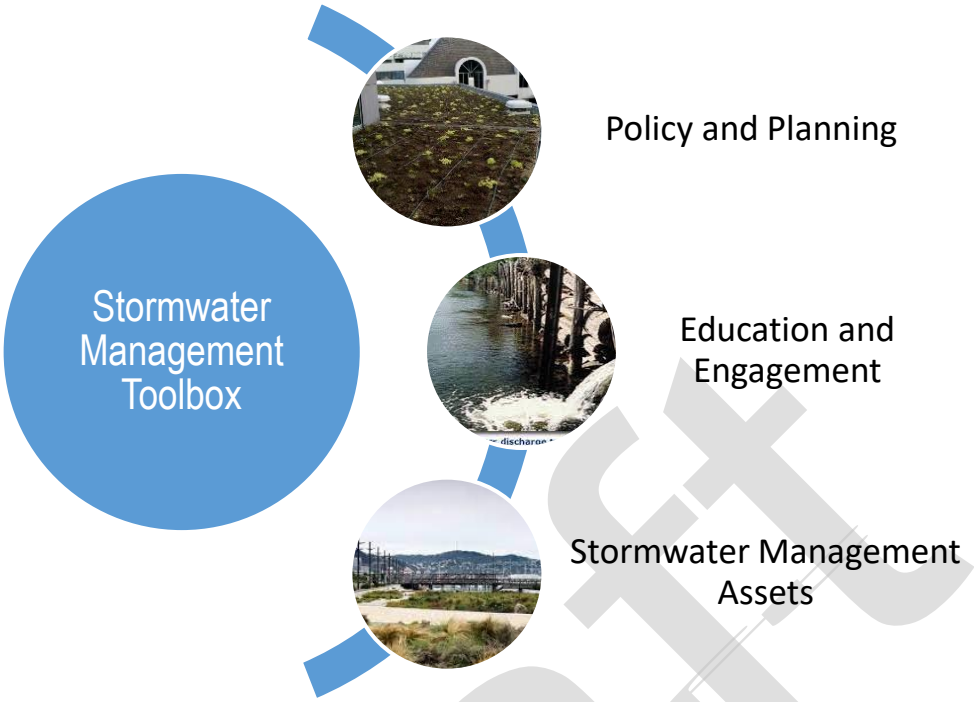


Figure F 1 Our approaches to influence better stormwater outcomes.

Water Sensitive Design

Water Sensitive Design (WSD) is a best practice approach for stormwater management to reduce run-off volume and contamination and has been successfully applied throughout the world and are becoming increasingly common practice here in Aotearoa New Zealand. It is achieved through integrating stormwater management with the ecology of a site; whilst also factoring in urban design and community values. WSD seeks to protect and enhance natural freshwater systems, sustainably manage water resources, and mimic natural processes to achieve enhance outcomes for ecosystems and our communities. WSD can also assist with hydraulic neutrality objectives by minimizing impervious areas and promoting infiltration and rainwater storage.

In 2014, Wellington City Council took the first step towards managing stormwater through WSD practices through the release of a guide for WSD of stormwater management in Wellington. This guideline introduced WSD concepts for a wide audience and outlined a high-level picture for WSD for Wellington City that can be applied at a range of scales from brownfield site specific developments through to new greenfield developments.

In 2019 Wellington Water produced a detailed design guideline for four types of treatment devices, wetlands, raingardens, swales and permeable pavements.

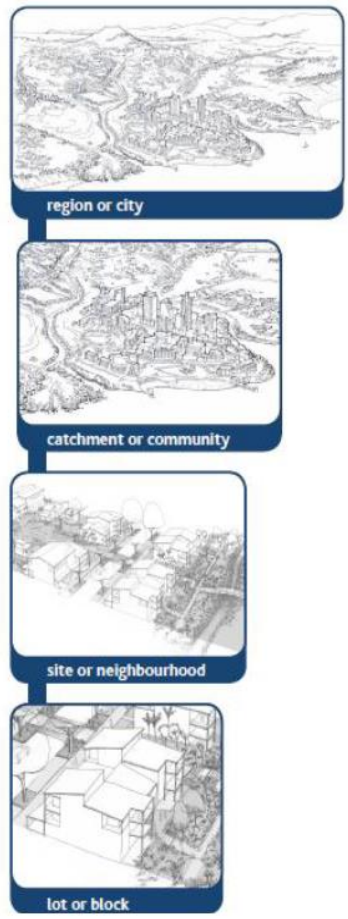


Figure F 2 Cascading WSD taken from GD04

The key principles of the WSD philosophy (GD04, 2015) are:

- Promote inter-disciplinary planning and design process
- Protect and enhance the values and functions of natural ecosystems
- Address stormwater effects as close to source as possible
- Mimic natural systems and processes for stormwater management

These principles are given life by using a combination of land-use planning controls and built infrastructure at varying scales across the region. Figure F 2 is borrowed from GD04 and depicts this idea of scale – cascading WSD from the region down to the individual lot scale.

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Preferred Option

As a starting point we have considered below in Table F 1 some common issues that we will have to manage and listed the preferred options below for addressing them in the early days of implementation.

Table F 1 Common issues that we will have to manage and preferred options for addressing these issues.

Stormwater from new impervious surfaces discharging into the network	Stormwater from new impervious surfaces from greenfield and brownfield development over 3000m²	Monitoring results identifying degraded water quality from contributing urban catchment
Follows Water Sensitive Design & Hydraulic Neutrality requirements / principles.	Development of a SCaMP*[62]	Launch a holistic catchment investigations programme
Treatment Train approach favouring source control	Follows Water Sensitive Design & Hydraulic Neutrality requirements / principles.	Identify key sources of contaminants of concern

[62] *If suitable, adopted SCaMP not already in place.*

Adheres to RSWS.	Treatment Train approach favouring source control	Review / undertake SCaMP
Identifies and shares resources to support on-going operation and maintenance.	Adheres to RSWS.	Model interventions and determine most effective approach
	Identifies and shares resources to support on-going operation and maintenance.	Invest in response: Policy response Structural or non-structural solution
		Ongoing Operation & Maintenance, and monitoring for change.

Combining Options

Many factors influence the design, implementation, maintenance, and cost of individual management options. Devices should be considered on a case-by-case basis against performance criteria which include catchment conditions, topography, soakage, and total site area through SCaMPs. A combination of devices, a treatment train, will be favoured to meet the two primary functions, attenuation and treatment.

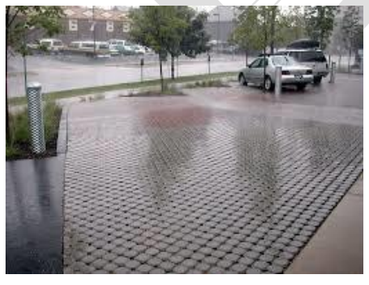
Approaches

Sustainable stormwater management requires stormwater devices that are well planned, designed, constructed, and maintained to reduce the impacts of stormwater, deliver multiple outcomes for the community, and protect waterways and harbours. Stormwater management should follow a treatment train approach by using the principles of WSD at the source and along its pathway to the receiving environments.

Structural Approaches

Table F 2 below illustrates the range of stormwater management assets that will be implemented across the urban areas covered by this SMS. The efficiency of these devices to manage flooding, scour and removal of contaminants from stormwater is dependent on the characteristics of the site where they are implemented such as, local topography and scale, as well as the specific design features of the management device.

Table F 2 Range of stormwater management assets that will be implemented across urban areas covered by this SMS.

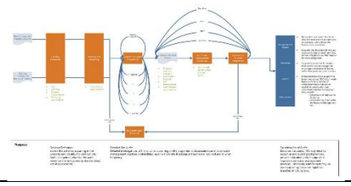
Stormwater Management Option		Type of Option & Applicability		Example of Implementation	Effectiveness to achieving Minimum Standards L=Low M=Medium H=High						Source Pathway Receptor	Location Suitability	Benefit	Drawback	Objectives Achieved?
					Nutrients		Erosion (TSS (Total Suspended Solids))	E. coli (Bacteria)	Heavy metals						
Option	Description	Option	Wellington Water Applicability		Nitrogen	Phosphorus			Zinc	Copper					
STORMWATER ASSET MANAGEMENT: Enhance natural freshwater systems, sustainably manage water resources, and mimic natural processes to achieve enhanced outcomes for ecosystems and our communities, through the combination of concrete and natural structures that involve minimal construction or earthworks, and planting vegetation to reduce or delay stormwater flow and or remove pollutants to increase the overall stormwater quality. With the goal to build maintain and improve these stormwater management assets through implementation of WSD.															
INFILTRATION SOAKAGE															
Vegetated Swales – Quality an/or Quantity	Vegetated swales can be mown grass or any vegetation types that is stable under stormwater flows. Convey and treat stormwater runoff.	Existing / New Assets (Projects)	Limited to WWL sites / projects. Influence through controlling access to network (Regional Standards)		H	M	H	M	M	M	Source and Pathway	Mid-catchment High and low-density areas. Group residential and commercial land use	Filter sediments, nutrients, and other contaminants before discharge to receiving environments	Could be limited by space between properties and road.	% of Plant cover and success and survival – design standard for minimum standard New vs retrofit. What is the acceptable % for retrofit of certain catchments
Filter Strips - Quality an/or Quantity	Filter strips are gently sloping, vegetated areas adjacent to impervious surfaces. ("Vegetative Filter Strips—A Best Management Practice for Controlling ...") They are intended to reduce impacts of sheet flow and velocity of stormwater and improve its water quality.	Existing / New Assets (Projects)	Limited to WWL sites / projects. Influence through controlling access to network (Regional Standards)		M	M	H	M	M	M	Source and Pathway	Mid-catchment High and low-density areas. Group residential and commercial land use	Integrated into existing or proposed landscape elements.	Limited by slope	A minimum standard could be, at a regional scale 60 % of urban catchment is treated in a swale
Pervious Pavement	A pervious pavement is designed to facilitate and maximise rainfall infiltration through the pavement for stormwater benefit. Beneath the paved surface is an aggregate material that acts as a temporary reservoir, allowing for run-off to slowly infiltrate into the ground.	Existing / New Assets (Projects)	Limited to WWL sites / projects. Influence through controlling access to network (Regional Standards)		L	L	H	L	H	M	Source	At source Individual residential and commercial land uses Small catchment areas with low traffic volumes such as residential streets, driveways, and small carparks.	Close to source management Filtration and sedimentation of contaminants	Not suitable on site with heavy commercial vehicles Regular inspection and maintenance	

Infiltration Trenches and Site Wide Infiltration	Trench containing gravels and provides treatment and disposal of stormwater. Some treatment is provided by gravel in the trench, but most treatment is provided by adjoining soil. Usually used in treatment train with filter strips.	Existing / New Assets (Projects)	Limited to WWL sites / projects. Influence through controlling access to network (Regional Standards)		L	M	H	L	H	H	Source and Pathway	Mid-catchment All land use types	Contributes to reducing runoff rates and volumes while supporting baseflow and groundwater recharge processes.	Risk of slope instability due to infiltration Risk of groundwater flooding due to infiltration. Limited by ground conditions and soils	Need roading to maintain. May need new targeted rate.
BIORETENTION															
Bioretention: Raingarden, tree pits, planter boxes - Quality	These practices use specific soils and plant materials to manage stormwater effects. Tree pits are essentially raingardens with a single tree rather than smaller foliage plants. Planter boxes are usually lined bioretention areas which receive point source runoff from rooftops or adjacent hard surfaces. ("Bioretention - Auckland Design Manual")	Existing / New Assets (Projects)	Limited to WWL sites / projects. Influence through controlling access to network (Regional Standards)		M	H	H	H	H	H	Source and Pathway	Mid-catchment Urban and high-density areas; often suitable for carparks and side street locations.	Treat stormwater through, sedimentation, filtration, infiltration, absorption, and biological processes. Soft engineering; adds amenity and ecological value to the landscape. Disperse device provide resilience against single device failure and supports integrated stormwater management.	Ongoing maintenance If private it relies on private property owner to undertake operation and maintenance	Experience is that private raingardens are not maintained or understood.
PROPRIETARY TREATMENT DEVICES															
Gross Pollutant Trap	Treats stormwater prior to filtration devices or discharging points into wetlands and ponds. Designed to capture large diameter sediments, plastic, litter, leaves and oils.	Existing / New Assets (Projects)	Limited to WWL sites / projects. Influence through controlling access to network (Regional Standards)		L	L	M	L	L	L	Source	Base catchment Group residential, Commercial, and Industrial land use areas. Small to medium catchment sizes.	Removes large non-biodegradable pollutants. Can be used stand alone or in a treatment train Pre-treatment to other options	Not suitable for removing fine sediment and dissolved pollutants Regular maintenance to clear system	

Sand Filters - Quality	Capture sediments, oils, and grease before solids before it is disposed to secure landfills.	Existing / New Assets (Projects)	Limited to WWL sites / projects. Influence through controlling access to network (Regional Standards)		M	M	H	M	H	H	Pathway	Mid-catchment High density residential, commercial, and industrial areas where the percentage of impervious surface is high and there are space restraints. Best suited to catchments less than 4 ha.	Can be easily added to existing structures Groundwater recharge		
Hydrocarbon Management / Oil and Water Separator	Designed to separate hydrocarbons, oil, and grease from stormwater. Best used in combination with non-structural controls such as oxidation and biological microbial decomposition mechanisms	Existing / New Assets (Projects)	Limited to WWL sites / projects. Influence through controlling access to network (Regional Standards)		L	L	L	L	L	L	Pathway	Mid-catchment Commercial and industrial areas	Can be located underground to minimise visual impact	Not efficient in removing nutrients, sediment, and heavy metals.	
STORAGE AND DETENTION SYSTEMS														
Wetlands	Mimics the treatment processes of natural wetlands for detention, fine filtration, and biological adsorption, to remove contaminants from stormwater runoff.	Existing / New Assets (Projects)	Limited to WWL sites / projects. Influence through controlling access to network (Regional Standards)		M	M	H	M	H	H	Pathway and Receptor	Base catchment Group residential, Commercial, and Industrial areas. Suitable for large and low-density catchment areas with sufficient open space	Attenuation of flood flows, water quality treatment, and supports aquatic plants and wildlife. Provides biodiversity and habitat opportunities. Increases amenity and aesthetics	Requires a large area to receive and treat stormwater so not suitable for small and high-density catchment areas	
Dry Detention Ponds (with extended detention)	Primarily used to store water during a particular storm event and slowly release the water over an extended period to alleviate peak flow	Existing / New Assets (Projects)	Limited to WWL sites / projects. Influence through controlling access to network (Regional Standards)		L	L	M	L	L	L	Pathway and Receptor	Base catchment Suitable for large low-density catchment areas with sufficient surface area. Group residential and Industrial	Helps to control volumes and flood risk in the downstream receiving environment.	Pre-treatment is needed to remove contaminants in the upstream network to assist with long-term operation and maintenance of these devices	

Wet Retention Ponds	Natural means to store stormwater. Pond that holds stormwater runoff permanently. Contains, and holds runoff allowing stormwater to build up on site.	Existing / New Assets (Projects)	Limited to WWL sites / projects. Influence through controlling access to network (Regional Standards)		L	M	H	M	N/A	N/A	Pathway and Receptor	Base catchment Suitable for large low-density catchment areas with sufficient surface area. Group residential and Industrial	Can cater to both quality and quantity management Can be used when groundwater is vulnerable High ecological, aesthetic and amenity benefits. Retention promotes pollutant removal through sedimentation and the opportunity for biological uptake mechanisms.	Not suitable for steep sides, due to requirement for high embankments Without proper maintenance, nutrients such as nitrogen and phosphorus that are typically found in stormwater runoff can accumulate in stormwater ponds and wetlands leading to degraded conditions such as low dissolved oxygen, algae blooms, unsightly conditions, and odours.	
CONVEYANCE SYSTEMS														
Riparian Buffers	Riparian buffers act as biological filters between catchments and receiving environments, intercepting a significant proportion of groundwater nutrients. Stormwater runoff is slowed and filtered, with direct uptake and transformation of contaminants by plants. Vegetation and humus layers attenuate significant volumes of water, promoting infiltration into the soil and releasing it over a longer time to contribute to stream base flows and to support riparian vegetation.	Existing / New Assets (Projects)	Limited to WWL sites / projects. Influence through controlling access to network (Regional Standards)		H	H	M	H	H	H	Pathway and Receptor	Mid to base of the catchment Areas where streams and rivers have no buffer between the stream and infrastructure.	Biological filter between catchments and the receiving environment Greater width of buffer the more benefits to stream health. However, effectiveness is influenced by slope, soil composition and drainage patterns etc.	Need the area and room between the stream and associated infrastructure.	

Living Streams	Constructed or retrofitted waterways that mimic the characteristics of natural streams. Usually come with riparian buffers that provides habitats for ecosystem health	Existing / New Assets (Projects)	Limited to WWL sites / projects. Influence key stakeholders and support Whaitua initiatives.		H	H	M	H	H	H	Pathway and Receptor	Mid-catchment Area with degraded natural streams or open drains with significant flows	Conveys runoff in highly urbanized areas and provide treatment. Healthy fringing and aquatic vegetation act as a biological filter. Organic and inorganic material can be filtered by living streams.		
Stream Daylighting	Process of restoring a stream which was once diverted to its original channel aboveground. These streams were channeled underground to accommodate for the development of an area. Obstructions that cover a river or creek are removed and the waterway is restored to its previous condition.	Existing / New Assets (Projects)	Limited to WWL sites / projects. Influence key stakeholders and support Whaitua initiatives.		M	M	M	L	L	L	Pathway and Receptor	Mid-catchment Highly urbanised areas with remaining open space	Increases the area available for water to pass through an area which increases storage capacity and reduces peak flows Enhance nutrient retention, improve channel habitation, and restore floodplains		
ASSET MANAGEMENT / OPERATIONAL & MAINTENANCE PROGRAMMES														
Asset Investigation Programme	Inclusive of cleaning, repairs, and condition assessment. All WWL Assets	Program / A.M / Operations	High								ALL				
Street Cleaning	Sweeping & Sump cleansing of paved assets.	Program / A.M / Operations	Limited. Influence Road Controlling Authorities								Source & Pathway				
Modelling & Mapping Programmes	Comprehensive programme of modelling and mapping flood risk, water quality & water quantity	Program / A.M / Operations	High								ALL				

Urban Watercourse Assessment programme	Baseline information on the existing condition of waterways in both urban and rural settings.	Program / A.M / Operations	High Support erosion & sediment			ALL				
Green Infrastructure Maintenance Programmes	Inspection and ongoing maintenance of G.I assets – Cyclical renewal of asset	Program / A.M / Operations	Limited. Influence Asset Owners.			ALL				Potential way to measure – 100% of the maintenance programme delivered (effectively)
Non-Residential Site Assessments	On site evaluation of Commercial & Industrial properties that have the potential to contribute to poor water quality in the stormwater discharges	Program / A.M / Operations	High. Controlled activity through Waste Permits		Need to look to high-risk sites and more frequently. Engagement survey approach to ensure a positive image of WWL. Potential way to measure success – 60% of all industrial sites are investigated annually.	Source				

*Note:
The above removal effectiveness of each device is only to be used for guidance. Many things influence stormwater pollutant removal devices, specific plant traits, filter media specification, stormwater device dimensions and appropriate regular maintenance, thus the removal rates will change depending on these factors. The level of contaminant removal will be subject to the provision of treatment system volume or surface areas relative to catchment run-off.

References:
Effectiveness of the removal of TSS, nitrogen, phosphorus, E.coli, zinc and cooper for proprietary treatment devices, bioretention devices, infiltration devices and detention, storage devices and conveyance systems listed above have been taken from the Waikato Stormwater Management Guideline, Stormwater Management Guidelines for the Bay of Plenty Region, Stormwater Management Devices in the Auckland Region (GD01) and Water Sensitive Design for Stormwater: Treatment Device Design Guideline (Wellington Water Document)

Non-structural Approaches

Non-structural stormwater management approaches are designed and implemented at the regulatory or community level to minimise contaminants from entering the stormwater network and to mitigate the effects of flooding and scour. The approaches are complimentary to structural approaches and involve shifting mindsets and behaviour through policy, planning, education, and engagement, such as awareness programs, government regulation and policy or economic incentives.

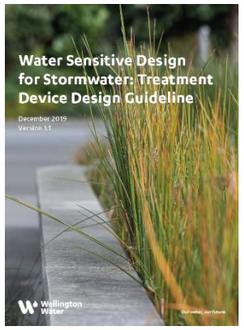
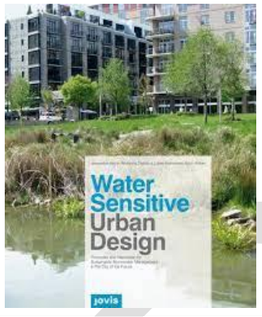
The identification of policy and planning initiatives enable good management practices for urban stormwater runoff through strategic planning, statutory controls, and regulatory actions. These are set in place before physical works begin therefore providing clear direction and guidance which can minimise contaminants in our stormwater. To ensure this, Wellington Water will work closely with regional and district councils to address stormwater management in new and existing urban areas. Table F 3 below illustrates the range of stormwater management related to policy and planning that can be implemented.

Education and engagement programs are a catalyst for behavioural change and a tool to raise awareness for stormwater management and reconnect communities with their waterways. Table F 4 below illustrates the range of education and engagement approaches that can be used as management options for stormwater quality.

Table F 3 Range of stormwater management related to policy and planning that can be implemented.

Stormwater Management Options		Type of Option & Applicability		Example of Implementation	Effectiveness to achieving Minimum Standards L=Low M=Medium H=High						Source Pathway	Location Suitability	Benefits	Drawbacks	Objectives Achieved?
					Nutrients				Heavy Metals						
Option	Description	Option	Wellington Water Applicability		Nitrogen	Phosphorus	Erosion (TSS)	E. coli (Bacteria)	Zinc	Copper					
STRATEGIC POLICY, PLANNING AND REGULATIONS: Identification of framework of requirements, policy, and initiatives to enable good management practices for urban stormwater runoff through strategic planning, statutory controls, education, and regulatory actions. Set in place before physical works begin therefore providing clear direction and guidance which can prevent, minimise, or remedy adverse effects.															
STORMWATER DESIGN GUIDELINES															
Green Roofs Policy	Green roofs are a layer of living plants growing on top of a roof. A green roof is not a collection of individual plants but an extension of a conventional roof that involves installing a layer of membranes, substrate, and plants.	Policy / Program	Low Influence District Plan		H	H	H	L	L	L	Source	At source Suitable for any type of catchment. Good option for high density urban areas where there is less space for larger treatment devices	Decrease urban temperature Low contaminant discharge potential and hence it is considered that runoff from these surfaces does not require water quality treatment. Noise insultation, enhance air quality, reduced the energy demand of buildings Provides biodiversity and habitat opportunities Mana whenua alignment.	Cost and supply to install Added structural design requirements. Potential fire risk if not designed properly. Building materials needed for roofs to be suitable to hold plants and soil matter etc.	Uncertainty around how we could require private developers to implement this due to perceived maintenance costs.
Roof Materials Policy	Painting galvanised iron roofs to prevent zinc entering stormwater, avoiding the use of copper roofing and guttering materials and those incorporating permanently exposed zinc coated surfaces	Policy / Program	Limited to WWL owned facilities. Influence District Plan		H	H	H	L	H	H	Source	At Source Residential, commercial, and industrial	Ideal in places where source control is likely to be a more appropriate option than providing treatment of stormwater practice Illuminates the source of heavy metals that	Cost to implement and source roof materials. Buildings will have to be retrofitted with roof linings that can hold new materials etc.	Not just roofs but all building materials Creates an opportunity to strengthen industry links What about existing roofs?

												usually come from corrugated iron roofs		
Rainwater Harvesting Policy	Rainwater tanks attenuate and re-use stormwater from rooftops of buildings and landscape areas. Provides a non-potable source of water. Can be placed partially underground or underneath eaves of buildings.	Policy / Program	Limited to WWL owned facilities. Influence District Plan		M	L	H	M	H	H	Pathway	At source Below ground in high density areas as limited space Above ground in areas with more available space such as rural properties	Removes contaminants from roofs. Meet some the developments water demand, delivering sustainability and climate resilience benefits Reduces pressure on existing Puna for water supply Reduced volume of runoff from a site.	Required periodic checking and maintenance Cost of the system, pump and the power required for the operation, especially if for private residential use.	Design guides can be changed more easily than the planning policy which often already addresses this. So could require treatment prior to discharge as part of an update to the design guide, integrating this into the DP however would require a schedule 1 process. This should also consider internal plumbing for toilets etc. This reduces potable water demand and enhances retention performance. There are also technologies that allow for centrally controlled rain tanks that can purge before rain events. potentially add measure that will incentivise retrofit of devices to areas that are not planned for redevelopment
CODE OF PRACTICE														
Risk assessment and environment management systems by	Risk assessments and environmental management systems can identify, characterise, and manage the associated	Policy / Program	High Programme level		It is challenging to manage stormwater at the catchment or region wide scale due to the range of pollutant sources and resource limitations. Risk assessments involves assessing the different sources of pollutants, prioritising them and allocating resources to manage them. For example, using a risk-based approach to prioritise catchments.						Source, Pathway, and receptor	Everywhere in the catchment All land use types.	Identifies key risk and concern areas within the region/ catchment		

local authorities	stormwater risks with each catchment.									
Develop stormwater management strategies at a “city scale”	Plans to guide decision-making on how stormwater quantity and quality is managed in a holistic and integrated matter in urban development, which is the over-arching purpose of this SMS.	Policy / Program	High Inform WWL activities		These strategies can then guide and inform the development of stormwater management plans which document the design proposed for a particular development area.	Source, Pathway, Receptor	Everywhere in the catchment All land use types.	Provides an integrated and holistic view towards stormwater management		
Stormwater Design Guidelines (For example: Water Sensitive Design for Stormwater: Treatment Device Design Guideline)	Communicates the requirements for the design of stormwater treatment devices in publicly owned assets and provides best practice guidance for the design of stormwater treatment devices where devices are to remain privately owned.	Guidelne	High Influence through controlling connection to network		Supports the use of good management practices through the release of standards, guidelines, and technical practice. Provides guidance for the concept, preliminary and detailed design phases pf a stormwater treatment system Ensures new treatment devices are functional, optimised, maintainable, safely designed, and mindful of community values.	Source, Pathway and Receptor	Everywhere in the catchment. All land use types.	Incorporates WSD principles In alignment with Whaitua Documents and mana whenua.		
Hydraulic Design	Takes into consideration, Safety during construction, maintenance and operation, Integration with other design elements, Integration with and around other services, Constructability, Maintenance requirements, Whole of life considerations.	Guideline	High Influence through controlling connection to network		Seeks to protect and enhance natural freshwater systems, sustainably manage water resources, and mimic natural processes to achieve enhanced outcomes for ecosystems and our communities. WSD (Water Sensitive Design) provides an approach which will contribute to achieving the vision and strategies of the Whaitua Documents and Resource Consent Conditions.	Source, Pathway and Receptor	Everywhere in the catchment All land use types.	Incorporates water sensitive and low impact design principles Utilises stormwater management areas for multiple uses.		
Servicing and infrastructur e standards	Servicing and infrastructure that is planned to service proposed development is to connect with the wider infrastructure network in an integrated, efficient, coordinated, and future proofed manner	Guideline	High Influence through controlling connection to networ		Standards within regional and district plans that for do not allow for use and development in areas where it is unable to be efficiently integrated within the existing infrastructure in an efficient and cost-effective manner.	Source, Pathway and	Everywhere in the catchment All land use types.			
OTHERS										
Target Rates through stormwater bylaws.	Setting target rates for operating devices and including them in SCaMPs (stormwater Sub-Catchment Management Plan). E.g., in Auckland, community elected to pay an additional	Policy / Program	Low Invfluence District Plan			Source, Pathway and Receptor	At Source Residential, industrial, and commercial	Helps mitigate a range of storm intensities and volumes Initiatives to decrease contamination of stormwater	Willingness of public to get behind – increase in costs may deter people	

	stormwater tariff to invest in water quality														
Copper-free or reduced copper brake pads	Metallic brake pads are commonplace throughout the world. Here in New Zealand most brake pads fitted to our vehicles contain copper and other heavy metals like mercury, lead, cadmium, and chromium. Low copper and copper-free friction materials used in brake pads can now outperform other friction materials and they do not compromise vehicle safety or performance. ("The hidden pollutant in our brake pads - Environment Canterbury") The cost of installing copper-free or reduced copper brake pads is only about $10-15 more expensive than traditional pads and they are easily available.	Policy / Program	Limited to WWL asset fleet procurement decisions. Influence National Policy and Direction.		N/A	N/A	N/A	N/A	H	H	Source	At source Suitable for all locations	Decrease in copper contaminants from vehicles Sustainable and resilient option	Supply demand. People not wanting to spend more	Electrification of the vehicle network (regenerative braking is much lower in contaminant generation)
Financial Levers, Incentives and Assistance	May involved but not limited to, rates rebates, grants and subsidies, targeted rating schemes, repayment schemes etc.	Policy / Program	Medium. Influence Funding regimes through negotiations with parent Councils.		Incentives based on 'polluter pays' and 'user pays' principles may be used to assist in implementing stormwater management controls. This should be decided upon through consultation with community groups to minimise resistance. Existing similar schemes include 'warm wellington' and the insultation grant schemes.						Source, Pathway and Receptor		Financial incentives or support may be useful in enabling privately owned infrastructure repairs replacement, or to incentivise uptake of new materials and technologies to replace dated infrastructure known to be prone to failure.		

Table F 4 Range of education and engagement approaches that can be used as management options for stormwater quality.

Stormwater Management Options				Benefits	Drawbacks	Objectives Achieved?
Option	Type	Wellington Water Applicability	Description			
EDUCATION AND ENGAGEMENT: Education and participation programs are a catalyst for behavioural change and a tool to raise awareness for stormwater management and reconnect communities with their waterways. Leads to community led initiatives and volunteer effort. Can be developed through Open Databanks, Public outreach, and educational campaigns, and Educational WSD.						
EDUCATION						
Short course or training on aspects of stormwater management	Program / Capability	Medium	For volunteer residents or 'champions' that focus on source controls that minimise stormwater pollution, particularly nutrients. Topics that can be covered include water conservation, plant selection, fertilizer use, irrigation practices, composting and shallow groundwater reuse.	Programs/courses can range from community level to regional scales. Holistic approach to promote best practice in stormwater management. Community become aware/champions in different topics such as water conservation, plant selection, fertiliser use, irrigation practices, composting and shallow groundwater use	Cost of courses Willingness of the public to participate	Are there enforcement options that can be attached to not following best behaviors? Like bylaw restrictions or does this fit in regulatory options?
Education campaign for residential property owners	Program / Public Outreach	Medium – Low	Awareness of potentially damaging household practices and opportunities such as stormwater capture. Aimed at informing to elicit a behaviour change and minimise pollution at source	Awareness of potentially damaging practices - with the aim of informing elicit behaviour change. Educational campaigns can encourage facilities to adopt environmental management and cleaner production techniques.	Willingness of the public and commercial and industrial premises to participate	
Education campaign for commercial or industrial premises, and educational facilities	Program / Public Outreach	Medium – High	Specific to industries that have a significant risk of contaminating stormwater because of their activities. Training and environmental accreditation programs are undertaken to encourage facilities to adopt environmental management and cleaner production techniques.	Awareness of potentially damaging practices - with the aim of informing elicit behaviour change. Awareness of industries to the significant risk of contaminating stormwater because of their activities. Educational campaigns can encourage facilities to adopt environmental management and cleaner production techniques.	Willingness of the public and commercial and industrial premises to participate	
Technical education on water sensitive urban design	Program / Capability	High	Capacity programs can range from community-level to regional scales. It is a holistic approach to promote good practice in stormwater management with communities, governments, and industry professionals.	Awareness of potentially damaging practices and origins of pollutants and contaminants. Awareness into WSD practices and how these could be incorporated at the individuals, residents, and commercial, industrial, and educational facilities.	Willingness of the public to participate	
COMMUNITY GROUPS						
Encourage citizen participation by the community in all aspects of stormwater management	Program / Public Outreach	Medium / High	It is important for residents to understand the nature of stormwater pollution and ways to manage stormwater effectively. Allocating budget to engage with communities can lead to residents positively contributing to future stormwater management approaches. A 'bottom-up' approach has proven more effective in changing the behaviour and perceptions of communities.	Community awareness of the origin of contaminants and pollutants leading to positive contributions in the future. Behaviour changes	Willingness of the public to participate	Enable and empower ownership and connection with water and environment

Identifying community groups or individuals to be champions for stormwater management	Program / Public Outreach	High	Community volunteers are valuable to ensuring stormwater management occurring at the local level. Community champions may assist in hosting community education programs to address stormwater management issues and represent the communities voice or opinions at council or local government meetings.	Community engagement and providing opportunities to build and transfer knowledge cultivates and grows institutional capacity and capabilities. Behaviour changes towards positive stormwater management.	Willingness of the public.	How do we empower these groups? Diversification of community group - from all areas (planning, infrastructure, engineering etc.) Need to consider the long-term viability. Is there a lack of collaboration within the group? Identification of skill gaps in the community groups.

Appendix G
Programmes of Work

Programmes of Work

Table G 1 Programme of Works implemented through this SMS

WORK PROGRAMME	PROJECT	DESCRIPTION	SHORT-TERM ACTIVITY 2024 - 2033	MED-TERM ACTIVITY 2034 - 2043	LONG-TERM ACTIVITY 2044 - 2053
Strategy and Planning	SP1 - Mana whenua relationships	Stormwater collaborative governance group is requirement under global consent and is associated with a secretariat role.	24 mtgs/yr	24 mtgs/yr	24 mtgs/yr
	SP2 - Working with others	Working with others in the stormwater space including council riparian programmes, mana whenua crews, Waka Kotahi, community groups, construction industry practices and standards. Integrate with Education & Outreach. We can't do it alone.	establish programme	ongoing coordination	ongoing coordination
	SP3 - Integrated green infrastructure management	Currently assets in the roads are operated and maintained by council roading departments and assets in reserves are operated and maintained by Parks departments. Can also include DP rules for rainwater reuse to reduce first flush events. WIP has recommendation to ensure adequate capitalisation and depreciation to provide for O&M.	Develop Service Level Agreements with all parties. Establish a programme of activity		
	SP3-1 - IGIM - Capex Delivery		Opex, Capital maintenance investment needs falling out of surveys/		

			investigations		
	SP4 - Policy through others	Advocating for Regional/District plan changes (e.g., rules requiring implementation of WSD) and Central govt legislation (ego ban on Cu brakes) to help implement stormwater management	as needed		
	SP5 - Securing funding and resourcing of SCaMPs and assets required	This can include targeted rates, development contributions, public-private partnerships, organisational structuring and other means to deliver the SCaMPs. Includes risk management but needs to acknowledge consent requirement associated with approved SMPs. This also includes Service Planning's role of securing investment through LTP process.	Modify investment planning templates Identification of funding needs & sources.	BAU	BAU
	SP6 - Planning for growth	Identify major developments (including infill/intensification) and new road works that offer opportunities for catchment-scale stormwater assets and development-funding assistance. Part of integrated catchment planning			
	SP7 - Leading by Example	Assessing and reducing the WWL "Stormwater footprint" from depot yards, building roof materials, fleet vehicle brake materials and car washing facilities, etc. Integrate this into Education and Outreach (demonstration projects). Review of all company documents including procurement, contracts, design gateways to reflect Te Mana o Te Wai and this SMS	Baselining of current sites/operations. Setting programme of improvement and innovation activities. Cross over to our education	ongoing	ongoing

			and communication		
	SP7-1 - LbE - Capex Delivery	Capital/Delivery of remedial activities (on depots, facilities, treatment plants etc)	Delivery of 6 site improvements	Delivery of 6 site improvements	Delivery of 6 site improvements
	SP8 - SW Discharge consent Compliance and SMS Update	The SMS will need to be reviewed every 6 years and prioritisation of sub-catchments for development of SCaMPs need to be redone. Compliance is currently in O&M. Compliance will include ensuring connections comply with universal responses related to Cu/Zn roofs, hydraulic neutrality, and gross pollutant traps as well as compliance documents to GW related to consent conditions.	1 review	2 reviews	2 reviews
	SP9 - Ensuring all company policies drive ICMP	Integration with WWNO programme, flood management programme, climate change, etc	Review policies		
	SP10 - Emergency works / Emergency Funding	Reactive works and planning to be ready to go if central govt becomes available (major event based) Space in Capital Programme to capture / chase additional funding to support delivery of the outcomes sought	Create a plan to maximise opportunities (being ready to go and call in extra $)		

Operation and Maintenance	OM1 - Enhanced Streams Works programme	Routine works in the beds of streams or weed suppression related to infrastructure maintenance needs to be integrated with identified need for habitat enhancements in the SMS and SCaMPs.	Develop integration & investigations programme Link to Training & Ed of operational teams	ongoing	ongoing
	OM1-1 - ESW - Capex Delivery	Capital works programme	5	10	10
	OM2 - Monitoring stormwater discharges	Condition of stormwater discharge consent. Opportunity to combine with working with mana whenua (Mātauranga Māori), working with others (citizen science), and monitoring for wastewater consents.	Revise monitoring plan and include mātauranga māori	ongoing	ongoing
	OM3 - Operations and maintenance of vested stormwater water quality devices		Identify all green infrastructure sites across council areas to derive a maintenance programme.	ongoing activities	ongoing activities

	OM3-1 – WQ Devices-Periodic-Capex Maintenance	Maintenance activities - Periodic work to keep on top of asset performance and condition. 5 - 10 yearly more involved capital maintenance	Periodic	Periodic	Periodic
	OM3-2 – WQ Devices-Cyclical Maintenance	Maintenance activities - Annual operational activities to keep on top of condition	Cyclic	Cyclic	Cyclic
	OM4 - Condition assessments Programme	Part of Renewal planning basis and Very High Criticality Planning	Develop a proactive works programme (aligned to VHCA)	BAU	BAU
	OM4-1 - CA- Capital Delivery Programme	Part of Renewal planning basis and Very High Criticality Planning	BAU - Assume 20 projects are delivered at cost of $500k each	BAU - Assume 20 projects are delivered at cost of $500k each	BAU - Assume 20 projects are delivered at cost of $500k each
	OM5 - Street sweeping	Currently this is funded and managed through council roading departments.	Review SLA with Council Departments and understand coverage, frequency. Undertake Investigation to enhance programme and share	With Council	With Council

			with Councils		
	OM6 - Compliance of private stormwater quantity and quality devices	Regular inspection or gathering of inspection/maintenance records on stormwater detention tanks and gross pollutant traps	Derive register & inspections programme Identify how to deliver.	ongoing activities	ongoing activities
	OM7 - High Risk Sites health checks	To be combined with Trade Waste inspections. There is a Porirua WIP recommendation 44 related to trade waste also.	Derive Audit programme	ongoing activities	ongoing activities
	OM8 - Cross Contamination Elimination Programme (see DC9)	Programme to identify/detect (Including the Knowing your pipe programme) and delivery of Capital solutions to enhance	Investigation & Decision to fund	ongoing activities	ongoing activities
	OM9 - Dry weather overflow programme	New programme focused on blockages based on smart manholes to be managed as part of the wastewater programme/consents - could result in lots of reactive work	Part of the WWNO Programme		
Modelling and Investigations	MI1 - Flood Management Programme	This is a new programme. Needs to be integrated with the SMS, growth programmes, etc.	Programme and dollars separate		
	MI2 - Regional Contaminant Load Model	Although led by GWRC, WWL has a collaborative role	Officer support and meetings	Officer support and meetings	Officer support and meetings

	MI3 - Site-specific contaminant load model	Wellington WIP recommends WWL develops tool by 2025 that can be used to assess a development - potential contribution of contaminants and hydrological impacts -	Determine approach to support Growth achieving ongoing AEH		
	MI4 - Aquatic Habitat Assessments	A baseline assessment of habitat (including Fish Passage) and scour	10 Assessments	10 Assessments	10 Assessments
Education, Outreach and Training	ED1 - Supply Chain staff training	Best practice and capturing innovation and new ideas, including mana whenua values and Kaupapa around water. D&C, O&M staff.			
	ED2 - Industry education	Integrated with High-Risk Site Health Audits. Also includes engagement with plumbers and drainlayers	Determine programme needs and support for other groups doing similar		
	ED3 - Community outreach	Integrated with other existing programmes through council, business community, community groups and mana whenua. Includes social media. Adopt a drain. Storm drain marking programme.	establish programme and budget		
	ED4 - Pilot / Demonstration projects	Contribute to appropriate pilot / demonstration projects to enhance industry capability and capacity			

	ED5 - Promote Knowledge Sharing	Industry workshops to share information and reduce gaps in stormwater management at industrial sites (identified with partners)	1 per annum	1 per annum	1 per annum
	ED6 - Stream signs / Stormwater 'Tourism'	Install signs at freshwater outlets into the harbour, including pipes, to indicate that they are streams and use art or other interactive ways to identify and communicate about piped and open streams.			
Design and Capital Projects	DC1 - Stormwater Sub-Catchment Management Plan (SCaMP) Programme	The SMS provides a means to prioritise, and the global discharge consent requires the development of sub-catchment scaled stormwater management plans. These will identify and cost needed stormwater quality assets such as raingardens and wetlands. 28 sub-catchments. NB this is in Capex because the Wastewater network overflow programme is in Capex	8 SCaMPs developed	8 SMPs developed	8 SMPs developed
	DC2 - Stormwater quality assets	Stormwater quality assets such as raingardens and wetlands identified as needed in each SCaMP. Spend starts at year 4 after investigation, design and procurement	1 wetland, 6 gross pollutant traps, 4 raingardens per SMP delivered	1 wetland, 6 gross pollutant traps, 4 raingardens per SMP delivered	1 wetland, 6 gross pollutant traps, 4 raingardens per SMP delivered
	DC3 - Restoring and/or daylighting natural channels.	New programmes: - identify and seek to daylight culverted watercourses - Identify and restore channels affected by stream scour	Desk based investigation to identify potential approaches to assessing potential erosion sites.	T.B.C	T.B.C

	DC4 - Innovative trials	Enabling technology and process innovations to be trialled into the network	Assume one trial in period	2 trials	2 trials
	DC5 - Design guide for WSD	Like Auckland's GD04 - to inform design of development and to inform choice of appropriate stormwater devices (which we already have WWL guidance for)	2 per cycle	2 per cycle	1 per cycle
	DC6 - Review RSWS - Stormwater	Update cycle for review of RSWS documentation to maintain consistency and be informed by best practice in stormwater	2 per cycle	2 per cycle	1 per cycle
	DC7 - Integrate stormwater management where relevant into all Wellington Water capital projects	This is like the Leading by Example programme (e.g., green roofs on WTPs) Influence the likes of Let's Get Wellington Moving programmes and support SW delivery	Identify capital delivery programme and review opportunities to implement 'best practice' SW quality Mgt approaches on WWL sites	Every project on WWL facilities capture SW runoff for quality treatment	All facilities (where appropriate) have best practice SW quality management
	DC8 - Wastewater Network Overflow Programme	Review of SMS and development of SCaMPs here also			
	DC9 - Cross Contamination Elimination Programme	Delivery of Capital solutions, especially if contamination to stormwater is from the public network, either due to a fault or cross-connection design (see OM8)	Part of the WWNO Programme	ongoing activities	ongoing activities
Asset and Data Management	ADM1 - Stormwater quality data management	Expand on pilot projects to provide public with monitoring results. (WQ & GI)			

		Support data needs for modelling, investigations, and education. Ensure all water quality data is linked. Also register of GI devices and as-builts. Tie in Opex programme so that ongoing activity is captured on asset in programme.			
	ADM2 - Data / Visualisation Programme	Investigation programme to support sharing with community. Include trial of 'SafeSwim' type programme.			

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