Wellington Water

He Rautaki Wai Āwhātanga | Stormwater Management Strategy

Our journey to wai ora

Our water, our future.

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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) sets out how the adverse effects of stormwater discharges on water quality is intended to be minimised. It captures how rainwater that falls on the urban area can be managed, so that it can contribute to better aquatic ecosystem health, enhance Māori customary uses and the recreational value of water, as well as enable growth across the Wellington region.

The SMS focuses on the management of discharges from the local authority stormwater network[1] which need resource consent from Greater Wellington Regional Council (GWRC). It is also specific to the management of stormwater network discharges from Porirua, Wellington, Hutt City, and Upper Hutt[2] which primarily drains the urban landscape.

The detailed focus on stormwater discharges in this SMS will be used to support the broader focus of integrated catchment management[3]. An integrated catchment management approach aims to improve water quality, reduce flooding and erosion and enhance the ecological health of the catchment. Integrated catchment management seeks to promote sustainable and resilient stormwater management practices.

In line with Schedule N of the Natural Resources Plan (NRP), the SMS covers the water quality elements of stormwater discharges and its part in supporting integrated catchment management delivery, but does not specifically address:

- a strategy for managing stormwater flooding for the purposes of protecting human health and property.
- untreated wastewater overflows resulting from heavy rainfall events.
- riparian and biodiversity restoration programmes
- recreation and access, or
- District and Regional Plan regulations for land use and subdivision.

For the SMS to be successful, the management of stormwater discharges will need to integrate seamlessly with all these other catchment-scale work programmes. This strategy is an important component of the application for a long-term (up to 35-year) Stage 2 Global Stormwater Consent.

Why manage stormwater for water quality?

Stormwater is generated when rainfall runs off the land. In our urban areas, the increased volume and velocity of runoff from rainfall that our waterways are naturally adapted to can cause scouring of waterways and sedimentation in harbours. On its journey across the urban landscape, stormwater collects litter and contaminants affecting water quality and ecosystem health. Our past management of stormwater has resulted in deterioration of the mauri of most urban waterways and harbours.

We need to shift the management of stormwater to use the principles of Te Mana o te Wai and ensure the health and well-being of the water is protected and human health needs are provided for. This means we will have to collaborate widely to support a transformational shift in how our cities are planned, designed, and constructed, including the urban stormwater networks. We will support Water Sensitive Design guidelines to protect and enhance natural freshwater systems, sustainably manage water resources, and mimic natural processes to achieve enhanced outcomes for ecosystems and our communities.

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[1] "Stormwater network" is defined in the Natural Resources Plan for the Wellington Region as - 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.

[2] 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.

[3] Integrated catchment management in relation to stormwater refers to a comprehensive 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.

Our journey to wai ora

The journey to wai ora signifies the long-term approach to achieving healthy water over the next 70 – 100 years. This is an intergenerational journey. For stormwater discharges from the local authority stormwater network, the SMS relies on a pathway of short-to-medium-to-long term steps. These specific periods enable us to continuously adapt our approach to achieve progressive improvement of our streams and harbours. The vision for the SMS is:

"Our region treasures its water. Our streams and harbours are healthy and suitable for contact recreation and Māori customary use. 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"

As reported in our Statement of Intent (2021 – 2024) [4], 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, mana whenua, city and district councils, GWRC and Wellington Water.

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 one part of an integrated water management approach.

Strategic direction

The objectives of this SMS respond to the Regional Policy Statement, the NRP and Whaitua documents. The three objectives that our work programmes are in place to deliver are:

- ***Aquatic Ecosystem Health –*** Biodiversity, aquatic ecosystem health and mahinga kai in freshwater bodies and the coastal marine area are safeguarded from the adverse effects of stormwater discharges.
- ***Māori Customary Uses and recreational contact -*** Rivers, lakes, natural wetlands and coastal water where stormwater is discharged are suitable for contact recreation and Māori customary use.
- ***Sustainable Growth*** – Stormwater networks support well-functioning urban environments***.***

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 Uta ki Tai /Mountains to the Sea–*** 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.

This SMS addresses each of the components shown in **Figure 0.1** :

[4] *Our Water, Our Future: Wellington Water Statement of Intent 2021-2024*

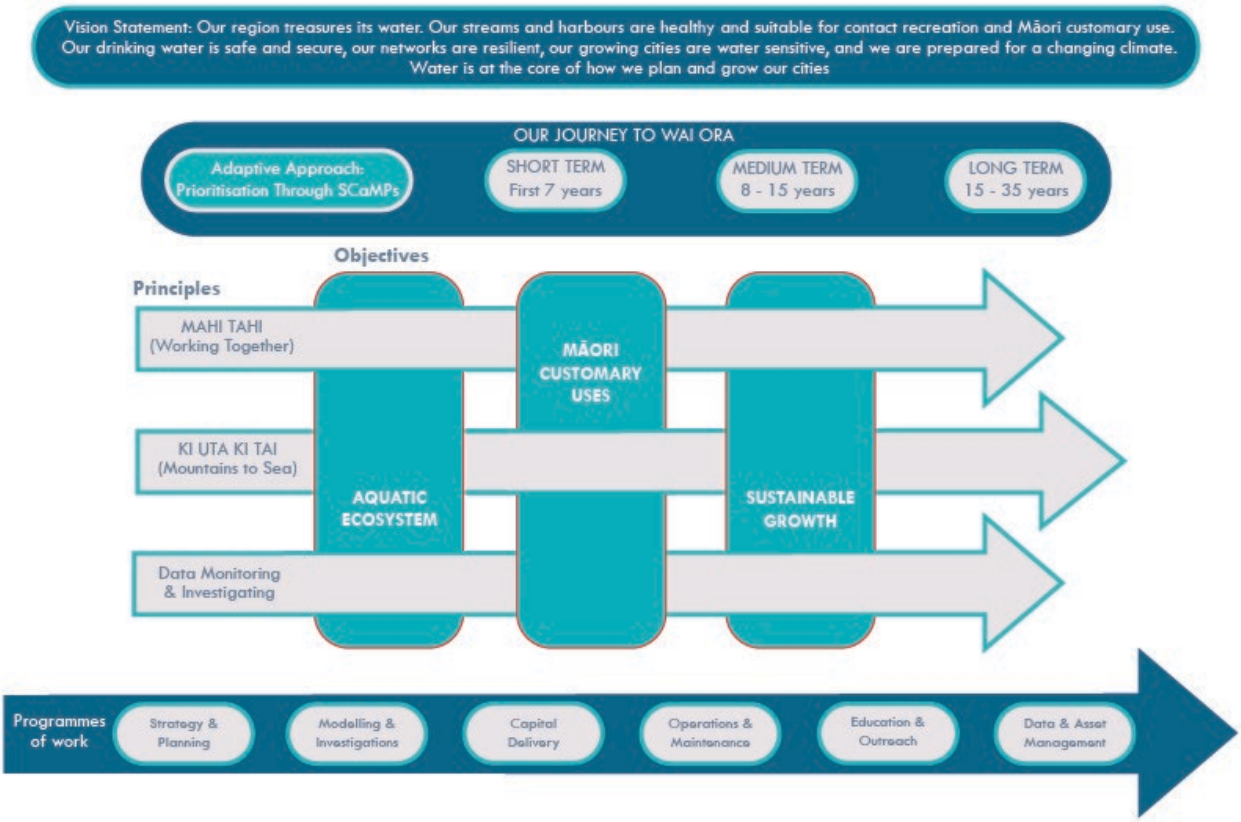

Figure 0.1 - Strategic Approach for the SMS

The Strategic Actions[5] that will implement the objectives and principles are described in two workstreams:

- ***Workstream 1: Universal Responses and Programmes for Water Quality Outcomes*** **–** The intent of Workstream 1 is to:
  - Maintain the current state of our waterways that can be adversely impacted by stormwater discharges.
  - Undertake activities to investigate, characterise and prioritise our catchments (through our five new programmes) for Workstream 2, below.
- ***Workstream 2: SCaMPs and Resulting Capital Improvements***– The intent of Workstream 2 is to:
  - Reduce the impacts of stormwater discharges on water bodies through the development and implementation of stormwater discharge Sub-Catchment Management Plans (SCaMPs)
  - Capital Delivery programme to design and construct stormwater water quality treatment devices identified in the SCaMPs.

The development of stormwater discharge SCaMPS is a key step towards achieving an integrated approach to catchment management. Although only one step to integrated management, SCaMPs support the broader goal of sustainable and integrated catchment management.

Over time, implementation of the SMS is expected to reduce the negative impacts of heavy metals (particularly copper and zinc), nutrients, *E. coli*, sediment, and gross pollutants as well as minimise localised scour erosion from the discharge of stormwater through the network on our waterways. Reducing the impacts of these contaminants will improve stream biodiversity, ecosystem health, mahinga kai, recreational activity and the provision for Māori customary uses.

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

Delivering the strategy

Wellington Water will progress towards the vision and objectives of this SMS through implementation of activities associated with Workstream 1 and 2. Reporting on our progress, as appropriate, will be managed through the Stage 2 Global Stormwater Consent.

There are four key components to the implementation of this SMS, as set out in **Figure 0. 2** below. In combination, these four components are anticipated to result in the successful delivery of this SMS and the requirements of the Stage 2 Global Stormwater Consent.

Figure 0. 2 Key components to the implementation of the Stormwater Management Strategy

Significant capital and operational investment would be required to implement the SMS. A Collaborative Committee, consistent with the principles of Te Mana o te Wai, will guide the implementation of this SMS.

Using the principle of adaptive management we can update management approaches during strategic reviews of this SMS, which will take place every six years.

Regulatory matters

Throughout the SMS, we identify how the strategy is in general accordance with Schedule N requirements of the NRP, primarily with the use of footnotes. Some of these requirements will only be fully met by the delivery of stormwater discharge SCaMPs, particularly in relation to specific strategic actions, management options and identification and management of localised effects.

As there are significant changes to the water industry proposed by the Government, it should be noted that each reference to “Wellington Water” in this document, within reason, includes any successor water entity that may be established in place of Wellington Water in the future.

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1 Introduction

This section describes the purpose and vision of this Stormwater Management Strategy (SMS).

1.1 Te Kaupapa Matua | Purpose

The SMS describes how contamination from discharges from the local authority stormwater networks in the Hutt Valley, Wellington and Porirua can be minimised to implement Te Mana o te Wai and to help achieve our long-term vision. This will be achieved, in part, by identifying priorities for progressive improvement, and timeframes to achieve this improvement[6]. The SMS also supports:

- An application for a Stage 2 Global Stormwater Consent.
- The delivery of integrated catchment management approach by providing urban stormwater quality-specific information and improvement actions, that can be combined with flood management, sustainable water use, wastewater management, urban planning, community led activities, biodiversity protection and climate change adaptation strategies and management plans.

1.2 Te Whakakitenga | Vision

The vision for this SMS is:

"Our region treasures its water. Our streams and harbours are healthy and suitable for contact recreation and Māori customary use. 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."

Our vision will guide us to reduce contamination from the local authorities' stormwater networks. The vision acknowledges that the management of stormwater discharges must be delivered together with the management of sustainable water use, flood protection, wastewater management, urban growth and climate adaptation.

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

When rainwater falls onto the ground, including modified land that is covered by impervious surfaces such as roofs, roads, driveways, and footpaths and is intercepted, it is called stormwater. Stormwater then runs over land either directly, or through the stormwater network through pipes and drains, mixing with the streams, rivers and groundwater to waterways, the open coast and harbours[7]. As a result of increased areas of hard surfaces, 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 aquatic ecosystems and our enjoyment of water bodies.

[6] *In accordance with Policy P86 in the NRP.*

[7] *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.*

The urban and roading stormwater network[8] was originally designed to support public health and economic outcomes through collecting and carrying rainwater away from buildings and roads.

Existing systems of management and the degraded water quality from stormwater discharges impacts on our relationships with water and restricts mana whenua from exercising mana whakahaere, kaitiakitanga, rangatiratanga and manaakitanga.

1.4 How does stormwater affect water quality?

Rainwater flowing over impervious surfaces is an effective pathway for contaminants to enter urban stormwater networks and to then enter watercourses, aquifers, or the marine environment. The most common sources of contaminants in stormwater are illustrated in **Figure 1.1** below. Some sources of wastewater contamination are also shown for completeness, despite not being addressed in the SMS.

Stormwater discharges can also alter the natural water cycle and hydrological balance of a catchment by increasing the amount of runoff during rainfall events, leading to flooding, erosion, and altered flow regimes in watercourses. This can impact both surface water and groundwater resources and affect the ecology of waterbodies.

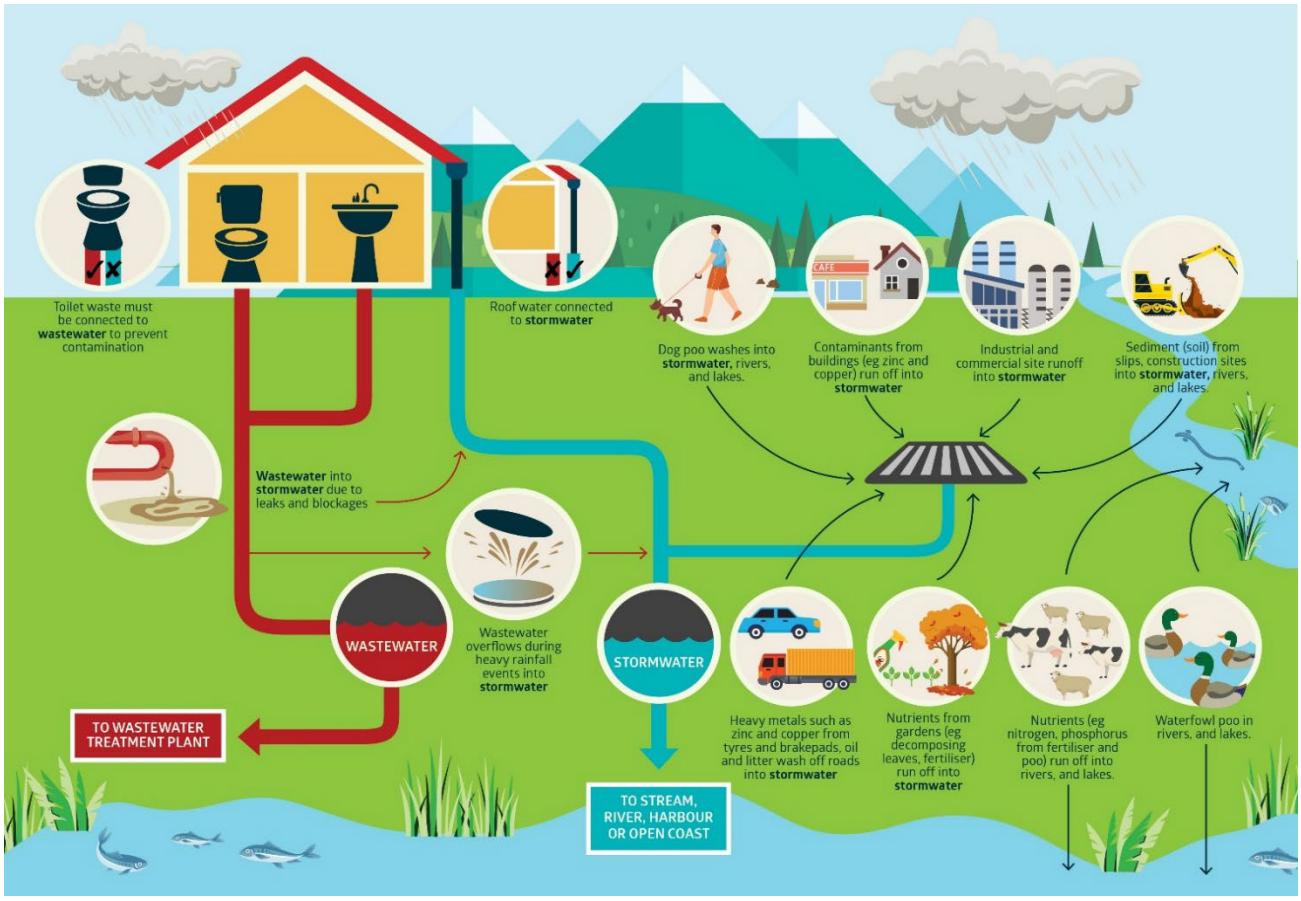


Figure 1.1 - Key sources of contamination

More detail on contaminant sources is provided in **Table 1.1**.

[8] *The NRP defines "Stormwater Network" as a system of structures and natural channels used for the collection, conveyance, treatment, and discharge of stormwater runoff. The stormwater network includes public and private pipes, channels, detention basins, and other infrastrcuture used for stormwater management. It also includes the natural watercourses and landforms that can act as conveyance pathways or treatment areas for stormwater.*

Table 1.1 - Common contaminant sources to stormwater.

Contaminant Source	Description
Roads, especially with heavy traffic	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 roading materials.
Brown / green field development	Conversion or redevelopment can result in stormwater picking up contaminants from urbanised surfaces and contaminants from previous activities on the site. Although earthworks can result in erosion and sedimentation, these discharges are managed separately[9] and are not specifically addressed in this SMS.
Industrial areas	Industrial areas can be hot spots for stormwater contamination. Storage yards, building materials and routine activities that pose a risk of spills that can contaminate surface runoff.
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.
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 contribute zinc to stormwater runoff. Copper is released from copper-cladding and copper drainpipes.
Domestic activities	Contaminants discharged directly to the stormwater network through activities such as car washing, spills, and house painting are not within the definition of stormwater and are not managed through this SMS. Surface runoff during rain events that pick up these contaminants as well as other contaminants such as fertilisers, weed killers and pesticides applied to lawns and other urban areas are included in the definition of stormwater and are addressed in this SMS.
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 to the stormwater system results in wastewater, including nutrients and pathogens being discharged into the network.
Wastewater overflows	Untreated wastewater can enter the stormwater network when the capacity of the pipes to deliver wastewater is exceeded by the inflow of rain during high rainfall events or the infiltration of groundwater or through leaks in the wastewater system. 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. These discharges are managed separately from this SMS (see Appendix C – Wastewater Network Overflow Programme).
Leaking Private and Public Wastewater Pipes	Aging and poor condition public and private wastewater pipes can leak through pipe failures or leaking joints and cracks. This wastewater can connect with groundwater or seep into public stormwater networks or waterways.

Urban stormwater runoff has contributed to a reduction in water quality in the region. This is reflected in impacts across the region on ecosystem health, recreational water quality and on Māori customary uses, , including:

[9] *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."*

- 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, the wāhi tapu, wāhi tupuna and wāhi maumahara / spiritual connection to the wai and 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 undertake cultural practices and sharing knowledge across the generations safely. This has lasting impacts on overall cultural and social wellbeing.

1.5 Our role in managing stormwater

Wellington Water manages the council-owned urban stormwater network[10] that collects, conveys, and discharges stormwater on behalf of our client councils. This management includes the following roles:

- Obtaining and complying with regional consents for stormwater network discharges (the subject of this SMS) (discussed below)
- Carrying out works in the beds of some urban streams and channels, such as clearing channels to improve flows and protecting banks from erosion
- Processing applications for new or modified connections to the network (to support new and modified buildings)
- 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, including monitoring of discharges
- Data management
- Asset management, including providing recommendations to councils for funding to achieve the above and the required levels of service.

The connections and engineering approval of extensions role requires assessment under the Local Government Act (LGA), Building Act and Resource Management Act (RMA), depending on the proposal and where appropriate[11].

These assessments are based on councils' provision of a primary level of service comprised of pipes, formed drainage channels and soakage systems designed and managed to carry rainwater away from buildings and properties. The work also includes for the provision of 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 is reliant on the provision of funding to undertake these activities on behalf of our client councils through the councils' Long Term Plan (LTP) processes. Wellington Water is involved in the LTP process by providing advice to the councils on the capital and operating expenditure anticipated to be needed to deliver on our role in managing the stormwater, water and wastewater networks and to meet customer expectations and regulatory requirements. The councils are ultimately responsible for determining how much of the recommended funding through the LTP is provided to Wellington Water.

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 provide improved water quality of stormwater discharges to the receiving waterbodies (streams, rivers, and coastal areas) (see Section 3 below). The SMS supports this role and supports the Stage 2 Global Stormwater Consent needed for the stormwater discharges from Porirua, Wellington, Hutt, and Upper Hutt City Councils (**Figure 1.2**)[12].

Wellington Water's role under Te Mana o te Wai is to work closely with our mana whenua partners, GWRC, Territorial Authorities, and other network providers to address stormwater management in new and existing urban areas. Our

[10] 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.
[11] Not all connections can be assessed under the RMA, depending on the rules in the Regional and District Plans.
[12] 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.

goal is to act as environmental stewards and support mana whenua as kaitiaki, seeking that stormwater management practices are sustainable, aligned with Te Mana o te Wai principles.

As there are significant changes to the water industry proposed by the Government, it should be noted that each reference to "Wellington Water" in this document includes any successor water entity that may be established to supersede Wellington Water in the future.

Figure 1.2 – Map showing the four council areas of Porirua, Wellington, Hutt, and Upper Hutt City Councils covered by this Stormwater Management Strategy

2 Regulatory Context

Resource consent is required under the RMA to discharge stormwater from the council-owned stormwater networks into water, or onto or into land where it may enter water[13]. the management of water must give effect to Te Mana o

[13] *Rule R53 of the NRP*

te Wai (NPS-FM, see section 2.2 below) and actively involve mana whenua. Furthermore, urban planning must facilitate growth in urban areas, while considering the impact of stormwater on the environment.

2.1 Natural Resources Plan for the Wellington Region

The requirements for the Stage 2 Global Stormwater Consent are specified in the Natural Resources Plan for the Wellington Region (NRP) which is the responsibility of 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 provisions in the NRP that are of most relevance to this SMS and the Stage 2 Global Stormwater Consent for stormwater discharges are shown in **Figure 2.1**[14].

In addition, as noted in Chapter 1.5 above, the management of the council-owned stormwater network must also be in accordance with the LGA. The LGA requires councils to meet the current and future needs of communities for good quality local infrastructure, including stormwater network services. This includes asset management responsibilities to plan for and report on what stormwater services will be provided, how much it will cost, and how stormwater assets will be managed.

As the Government is proposing significant changes for the provision of water services, , it should be noted that each reference to “Wellington Water” in this document, within reason, includes any successor water entity that may be established in place of Wellington Water in the future.

2.1.1 Whaitua Implementation Plans

Wellington Water acknowledges the extensive mahi completed by Whaitua Te Whanganui-a-Tara and Whaitua Te Awarua-o-Porirua. These committees, established by GWRC to inform the NRP, were tasked with recommending ways to maintain and improve the quality of our fresh water. Whaitua is the Māori word for space or catchment.

The Whanganui-a-Tara and Te Awarua-o-Porirua Whaitua committees led years of consultation, analysis, and information sourcing to issue the Whaitua Implementation Plans (WIPs) that contain recommendations for stormwater management in this region. Some of those recommendations will be incorporated into the NRP through future changes to the plan.

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

Figure 2.1 - Natural Resources Plan Regulatory Framework for this SMS. Objectives in the NRP are numbered starting with an "O" and Policies start with a "P".

2.2 Te Mana o te Wai[15]

Te Mana o te Wai recognises the vital importance of water and the special connection all New Zealanders have with freshwater. It distinguishes 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, through a hierarchy of obligations (shown in **Figure 2.2** below). Te Mana o te Wai ensures that mana whenua responsibilities and interests in water management are voiced, heard and acted upon. Through the role of Mana Whenua in the Collaborative Committee, this will give effect to the requirements of Te Mana o te Wai.

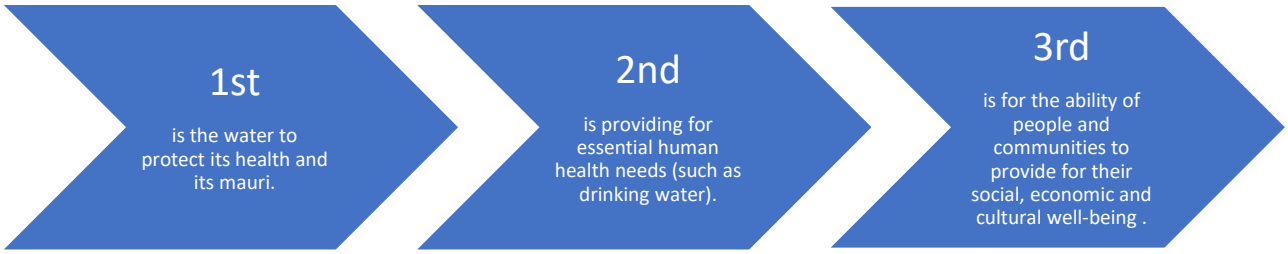


Figure 2.2 - The hierarchy of obligations (from NPS-FM, 2020)

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 is there to renew our relationship with wai/water.

Table 2.1 sets out the Te Mana o te Wai principles that support decision making for this SMS. 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 2.1 - 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.

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

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

- Ngāti Toa represented by Te Rūnanga o Toa Rangitira
- Taranaki Whānui ki te Ūpoko o te Ika a Maui represented by Port Nicholson Block Settlement Trust.

As reported in our Statement of Intent (2021 – 2024) [16], 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, mana whenua, district and city councils, GWRC and Wellington Water.

2.3 Compliance with the SMS

Implementing this SMS will include several aspects of compliance associated with the Stage 2 Global Stormwater Consent. We are continuing to develop our thinking in this space and will provide clarity in a later version of this SMS, prior to the hearing for the consent.

In general, this SMS is designed to result in new and expanded programmes of work associated with the management of the public stormwater network, which will require funding and investment by the asset owner to be obtained. This SMS itself cannot guarantee this funding. However, this SMS proposes a Collaborative Committee that will support securing appropriate funding (see Chapter 6).

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 2.3**.

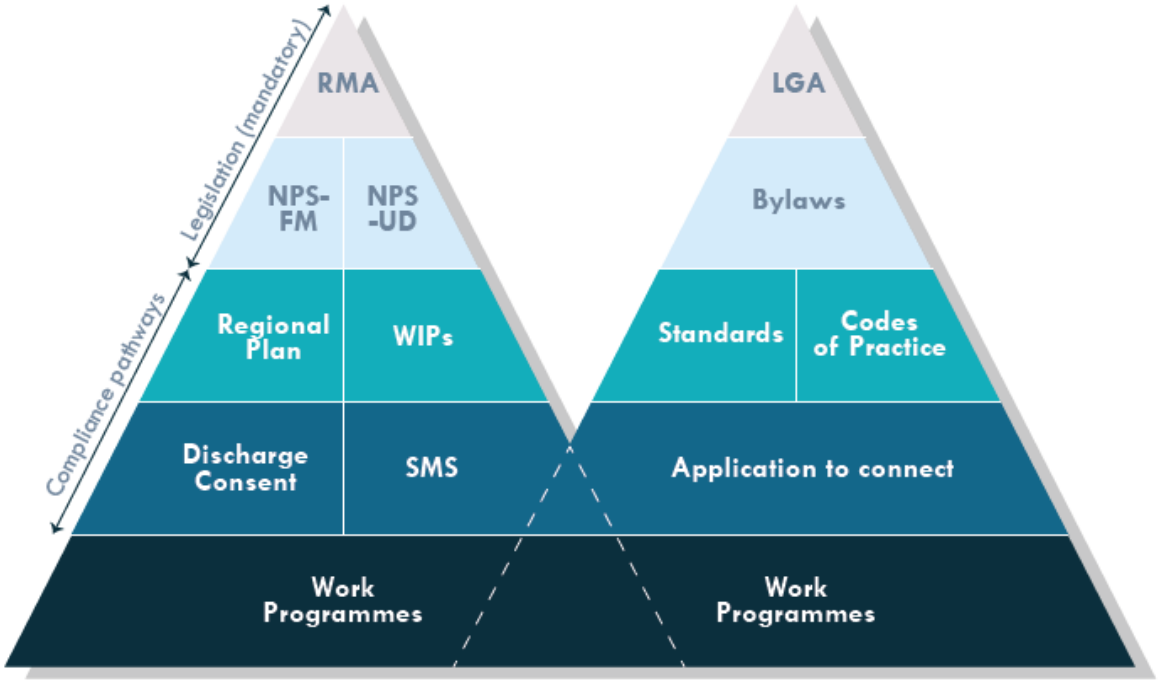


Figure 2.3 - Giving effect to this SMS under the RMA and LGA

[16] *Our Water, Our Future: Wellington Water Statement of Intent 2021-2024*

2.4 What's in and what's out

The SMS sets out stormwater management actions that, with appropriate funding, will be undertaken in playing our part in supporting the community improve the wellbeing of our streams, rivers, and harbours. it is proposed to focus specifically on the reduction of the contaminants within discharges from the stormwater network, such as:

- *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 Appendix C.
- Nutrients (which promote algal growth)
- Heavy metals (copper and zinc) (which are toxic to aquatic life), used as a proxy for hydrocarbons
- 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).

In keeping with an integrated catchment management approach, it also supports other activities to improve the state of our waterways.

Specifically, the following are excluded from the Stage 2 Global Stormwater Consent and from this SMS, as they are subject to their own regulatory processes, controls, and measures:

- Leachate from decommissioned and operational landfills
- Sediment generated through bulk earthworks and construction
- Flood management, other than 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 Appendix C), other than integrated investigations associated with stormwater discharges.

Although surface water and river flood management are not in the scope of the SMS, Wellington Water will be looking to apply an integrated approach, when appropriate, 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(s), although the SMS has several work programmes that are integrated with this important work. This SMS includes addressing private cross-connections through the Operations and Maintenance work programme.

3 Journey to wai ora

This whakataukī ('proverb') describes the journey to wai ora (healthy water) requires us to understand how 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.

Water quality needs to be improved but it will take time. It could be another 100 years before our waterways are restored to the levels sought by our communities. Mana whenua provide a guide for this, setting the framework for wai ora[17] by shifting our relationship from "managing water" to "healing water" and supporting the creation of a

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

pathway of short-to-medium term steps. Steps beyond these 100 years have been left for the next generation to determine, so they can reflect on their own aspirations.

3.1 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 150 years there has been a pattern of water quality degradation. An influx of non-Māori settlers challenged and changed land ownership and traditional water relationships, economic wellbeing, in the form of urban development, became the priority across the region. Our region's water quality was impacted by point discharges and runoff of stormwater from urban development. 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.

Brown R. K. (2009) identified how urban environments have transitioned over time and presented an aspirational view, referred to as the Water Sensitive City, for supporting the journey to wai ora, as illustrated in **Figure 3.1**.

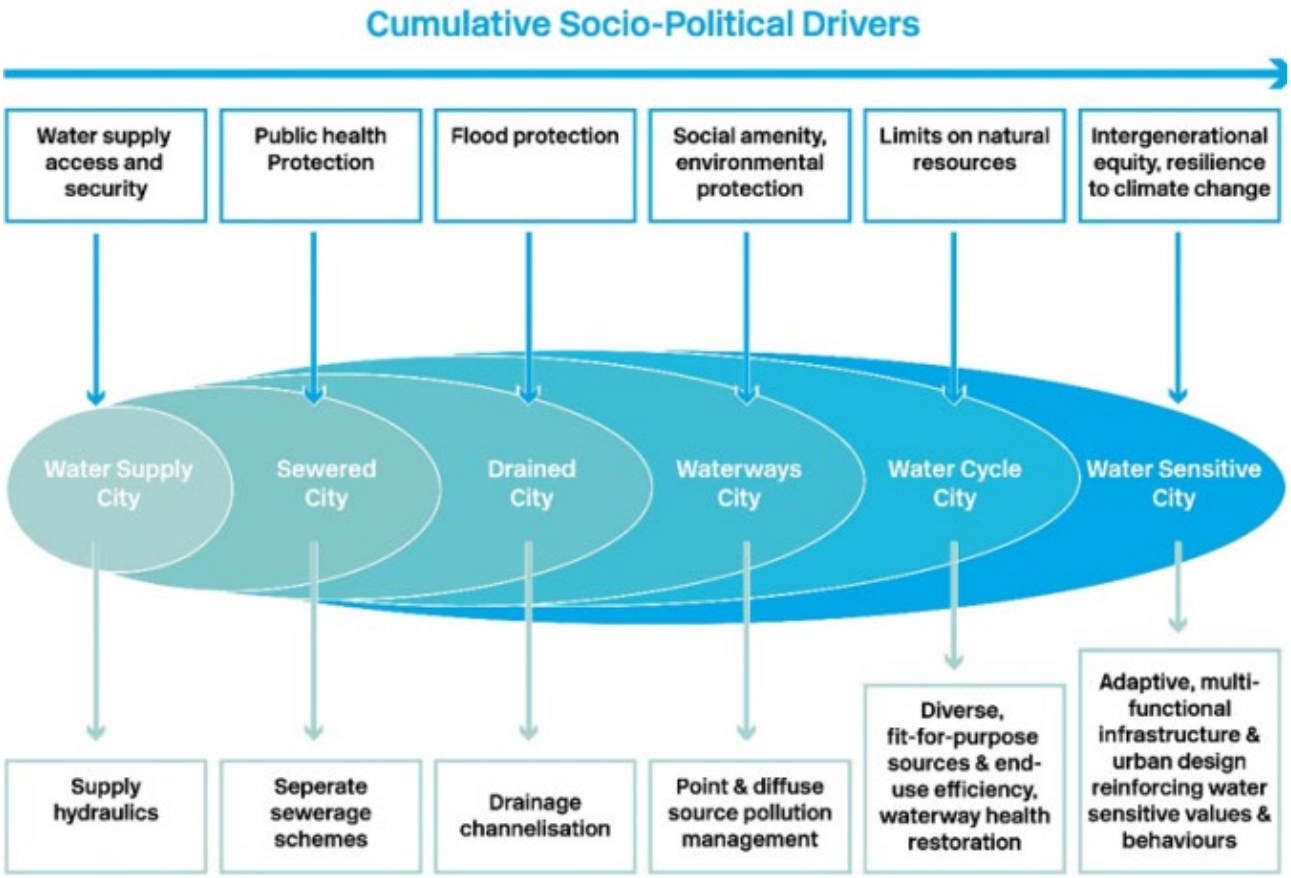


Figure 3.1 - Water Sensitive Cities framework: the urban water transition phases (Brown R.K., 2009)

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.

Throughout the mid-20th century, the awareness of environmental impacts on our waterbodies and the approaches to manage this was questioned. During this time, Wellington's urban settlements were still served by 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 in 2011[18]. 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.

The potential for producing **Water Sensitive Cities** and resilient communities through Water Sensitive Design (WSD), is aligned to the aspirations of Māori for water environments across Aotearoa New Zealand (Afoa, 2019). The four key principles of the WSD philosophy, as described in Auckland Council's technical guidance document GD04 (Lewis et al, 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.

3.2 Nāianei | At present

Some coastal areas, rivers, and streams are adversely affected by discharges from urban land use, stormwater, and wastewater overflows.

3.2.1 Global Stormwater Discharge Consents

Monitoring undertaken as a requirement of the short-term Stage 1 Global Stormwater Consent has improved our understanding of the water quality across the region and the impact of stormwater discharges. In general, monitoring[19] indicates most of our urban streams have poor water quality with regards to *E. coli*, copper, zinc, and nutrients.

The Assessment of Environmental Effects as part of the Stage 2 Global Stormwater Consent identifies, quantifies and evaluates the current impacts of stormwater discharges on the environment. It includes a description of the receiving waterbodies, assignment of values associated with the receiving waterbodies, a description the discharge of stormwater from local authority stormwater networks, and an assessment of current effects of stormwater discharges on the environment. This SMS represents our response to the adverse effects from stormwater discharges that are identified in the Assessment of Environmental Effects.

[18] *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.*
[19] *Stormwater Monitoring Plan Annual Report 2020-2021*

3.2.2 Our Catchments

This SMS supports stormwater management for water quality in three major catchments in the Wellington Region - Te Whanganui-a-Tara | Wellington Harbour[20] 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 on stormwater network discharges that drain the urban areas.

For the Stage 1 Global Stormwater Consent, 38 stormwater sub-catchments (three of these have no stormwater network) were identified based on the receiving waterbodies and the urban stormwater reticulation network, as shown in the online ArcGIS StoryMap and in Appendix D.

Detail of the existing condition and the likely future pressures in regard to urban land use that can affect the water quality of stormwater discharges[21] in each of the sub-catchments is provided in the online StoryMap. These characteristics have responded to the requirements of Schedule N of the NRP as listed in Appendix B.

It is important to note that some specific information on catchment characteristics, localised effects and stormwater quality management options will be produced as stormwater discharge SCaMPs following prioritisation of catchments, investigation, modelling, and consultation. Further details of stormwater discharge SCaMPs are included in Chapter 5.

Catchment v Sub-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 outlets 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 this SMS, a sub-catchment is a geographically defined management unit.

3.3 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.

Te Mahere Wai-o-Kahui Taiao 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.'* [22]

Ngāti Toa's vision for Te Awarua-o-Porirua Whaitua is captured in the Ngāti Toa Rangatira Whaitua Statement[23], '*That the mauri of Te Awarua-o-Porirua is restored, and its waters are healthy so that all those that live in the region,*

[20] 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.
[21] Addresses Schedule N(e).
[22] Te Kāhui Taiao. (2021). Te Mahere Wai o Te Kāhui Taiao. Wellington.
[23] Te Awarua-o-Porirua Whaitua Committee. (2019)Te Awarua-o-Porirua Whaitua Implementation Programme: Ngāti Toa Rangatira Statement

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 for the Wellington Region (Whanganui-a-Tara and Te Awarua-o-Porirua) describe the vision for stormwater management to be one that achieves a state of wai ora (healthy water) and restoration of the mauri of our waterways. This SMS aims to honour these visions by defining that this is where we are heading, our journey to wai ora.

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 3.1**. It has taken us over 100 years to degrade our waterways and it will take many years of collaboration before we see an obvious improvement. Wellington Water will work with mana whenua, our partners, stakeholders, and wider communities as we embark on our intergenerational journey towards healthy waterways and harbours over the next 70 to 100 years.

4 Objectives and Principles

This SMS identifies three objectives and three principles (**Figure 4.1**). These will guide the management of stormwater discharges for water quality over the life of the Stage 2 Global Stormwater Consent to help us measure our progress towards achieving the vision of this SMS.

4.1 Objectives

The three objectives[24] that will guide our decision making are described below.

4.1.1 Aquatic ecosystem health, biodiversity and mahinga kai

This objective is to ***"safeguard biodiversity, aquatic health and mahinga kai"***[25]. We will contribute to the protection and enhancement of aquatic ecosystems by reducing the impacts of stormwater discharged into the waterways, harbours and coastal environments. To support this objective the following will be incorporated into the implementation of this SMS:

- Improve the water quality of stormwater network discharges,
- Support the maintenance and restoration of fish passage at stormwater outlets, as appropriate,
- Support the principles of WSD for all new development, and
- Support the minimisation of stream modification and loss of natural streams.

4.1.2 Māori Customary Uses & Contact Recreation

Healthy waterways are important sources of wellbeing for communities. People want to be able to enjoy our beaches, rivers, streams, and the natural environment. Implementing the SMS will support waterbodies and harbours that are ***"suitable for contact recreation and Māori customary uses"***[26].

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 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). To support this objective the following will be incorporated into the implementation of this SMS:

- Prioritise the principles of Te Mana o te Wai,
- Work in genuine partnership and build capability and capacity with mana whenua, and
- Work across our stormwater and wastewater network programmes to reduce wastewater contamination of our waterbodies.

4.1.3 Sustainable Growth

This SMS supports **well-functioning urban environments**[27] while enhancing and protecting the mauri of our waterways and harbours. Implementing this SMS will support sustainable growth through the following actions:

- Plan, cost and deliver infrastructure assets to meet future stormwater requirements for the growing region, supporting the aspirations to deliver 'better growth' through the NPS-UD.

[24] *As required by Schedule N*
[25] *In alignment with Objective O19 of the NRP*
[26] *In alignment with Objective O18 of the NRP.*
[27] *In alignment with the NPS-UD*

- Provide clear guidance on catchment specific stormwater discharge requirements in new growth areas where sites are greater than 3,000m^2 (stormwater discharge 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 which is essential for promoting sustainable growth and development.
- Align with management approaches to reduce flood risks during implementation of WSD solutions.

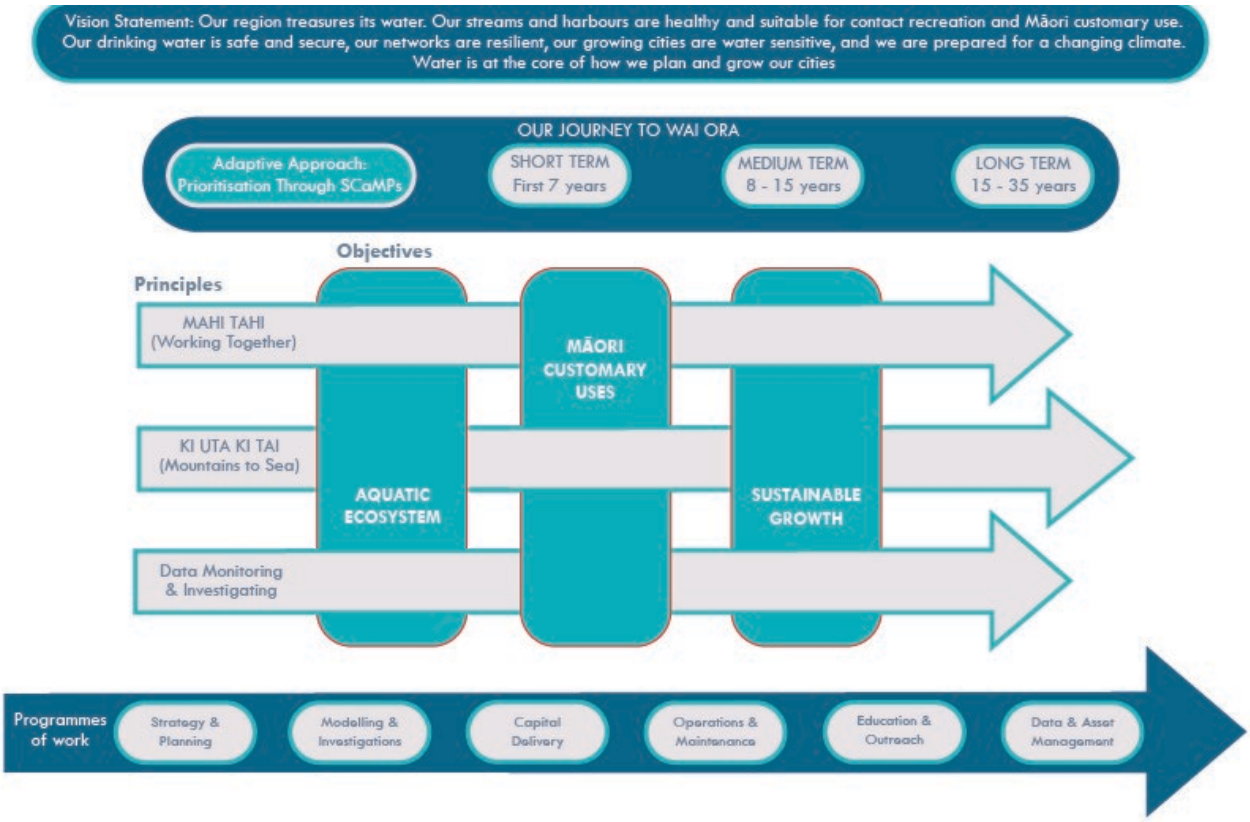


Figure 4.1 - Objectives and Principles of this SMS to guide us on our journey to wai ora and achieving our vision.

4.2 Principles

Three key principles will bind our work programme moving forward.

4.2.1 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 include 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 who manage building site sediment,
- GWRC 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 development 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 6).

4.2.2 Ki Uta ki Tai (Mountains to the Sea)

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.

This highlights the need to manage stormwater quality through an Integrated Catchment Management approach and to enable good outcomes (such as through the Water Sensitive Design) 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.

This SMS shares how integrated catchment management will be supported. The detailed focus on stormwater discharge quality, referenced in this SMS, is used to support the broader focus of integrated catchment management[28]. An integrated catchment management approach aims to improve water quality, reduce flooding and erosion and enhance the ecological health of the catchment. Integrated catchment management seeks to promote sustainable and resilient stormwater management practices.

4.2.3 Adaptive management informed through monitoring, investigations, and research

An adaptive management approach to implementation will help us respond to change and uncertainty. Reorienting the Water Industry to place greater priority on urban stormwater management, around aquatic ecosystem health and around 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 supporting partnerships with mana whenua, all levels of government, business, industry, academia, the voluntary sector, and others will enable us to:

- build collective capacity,

[28] *Integrated catchment management in relation to stormwater refers to a comprehensive 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.*

- understand barriers and opportunities, and
- learn from, and adjust, programmes as they are implemented.

This principle relies on monitoring, including mātauranga Māori, investigations, and research, which will:

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

However, it is difficult for monitoring to identify direct correlations between stormwater discharges and the health of the waterbodies. This is due to many reasons, such as:

- concentrations of contaminants in stormwater vary depending on when the sample is taken,
- water quality is also affected by rural runoff,
- people illegally discharging pollutants directly into storm drains (such as oil and paint tipping),
- complex interactions of ecological variables mean it is hard to identify a single cause and effect relationship include more than just water quality (such as sunlight, recruitment, and habitat quality).

Therefore, successful monitoring must be coupled with modelling and investigations.

To support progressive improvement over time, we will use an adaptive management approach to re-prioritise catchments for investigations and stormwater discharge SCaMP development, as shown in **Figure 4.2**. This will follow on from our prioritisation process discussed in Chapter 5.2.

It is anticipated that this review will occur on a six-yearly cycle.

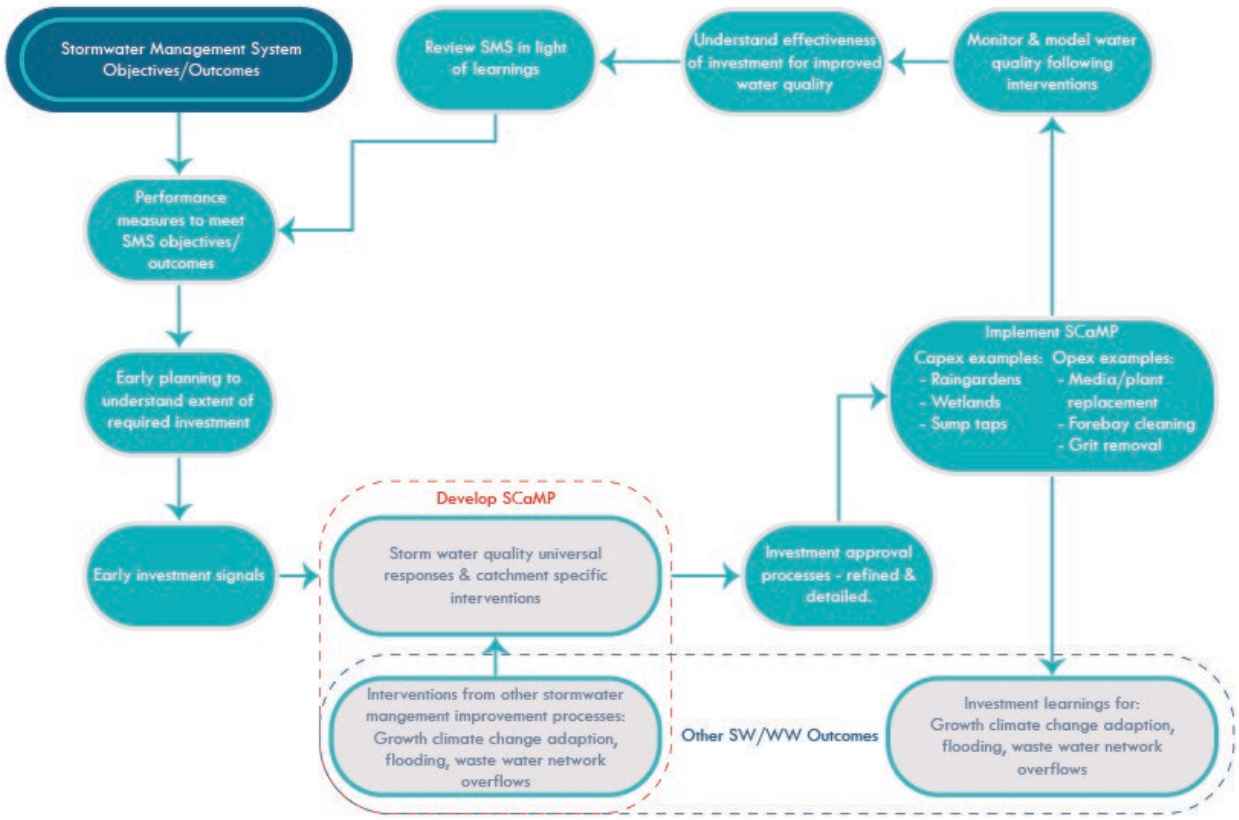


Figure 4.2 - Adaptive management is an important part of the investment, implementation, and review cycle.

5 Responses – Two Workstreams

The Objectives and Principles, discussed in Chapter 4, will guide implementation of two new targeted workstreams concurrently, as shown in **Table 5.1**. To overcome potential challenges and make the most of the opportunities, a combination of these workstreams are proposed to be used to improve stormwater network discharges in partnership with a wider integrated catchment management approach and community efforts to support better waterway outcomes.

Table 5.1 - Two workstreams of this SMS.

Workstream 1: Universal responses & programmes for Water Quality outcomes					
For new developments	*Site-specific SCaMPs for sites >3,000m²*	*No new exposed copper or zinc cladding*	*Gross pollutant traps*	*Hydraulic neutrality*	
Existing Networks Programmes	*Strategy and planning*	*Modelling & investigations*	*Operations and maintenance (*including monitoring and acute human health risk investigations)	*Education and outreach*	*Data and asset management*
Workstream 2: SCaMPs and resulting Capital Improvements					
Activities	*Prioritisation*	SCaMP Delivery	*Capital delivery of improvements*		

Through the Collaborative Committee as outlined in Chapter 6, we will work with mana whenua to reframe these identified work programmes on a regular basis. This will enable mana whenua to practice mana whakahaere and the next generation to become kaitiaki and help the community act in ways that care for water.

To support the delivery of progressive improvement over the length of the Stage 2 Global Stormwater Consent[29], the work programmes within Workstream 1 and Workstream 2 (Chapter 5.1 and 5.2) will be staged over the short-, medium- and long-term timeframes outlined in **Table 5.2** below.

Table 5.2 – Staging of the implementation of Workstream 1 and Workstream 2 over the short-, medium- and long-term.

Period	Years	
Short	**To 2030**	Includes requirements for new connections to the network under the Universal Responses, a revised focus on on-going activities and initiation and planning of new and expanded programmes to manage stormwater discharges, focused towards: • New connections to the stormwater network addressing water quality. • Establishing a Collaborative Committee for the water quality programme to support continued focus on delivery of improvements.

[29] *See Policy P86 in the NRP*

		• Ongoing activities that include continued monitoring, management of sites where there are acute adverse effects, and 'opportunistic' infrastructure improvements during routine maintenance, renewal, or upgrade works[30]. • Review and update of the Stormwater Monitoring Plan Development of new and expanded programmes, including additional targeted water quality modelling, investigations of waterways, audits of high-risk sites for stormwater contamination and the development of the first set of stormwater discharge SCaMPs.
Medium and Long	**2030 to 2058**	Includes design and delivery of stormwater treatment devices identified in the first stormwater discharge SCaMPs, development of the next set of stormwater discharge SCaMPs, and the on-going delivery and review of all implementation programmes associated with Workstream 1 and Workstream 2, as influenced through the Collaborative Committee.

The timing to achieve the various activities will depend on agreement on priorities and the availability of resources. Resourcing is fundamental to implementation. Some activities will be completed from existing resources or their realignment, while other actions are subject to future budget decisions. The Collaborative Committee (Chapter 6) will identify and drive the investment required to support these work programmes.

This will allow the Collaborative Committee, working with the wider community, to prioritise actions related to stormwater management. Effective stormwater planning and management will provide significant long-term cost savings while helping to achieve this SMS's three objectives of ***Aquatic Ecosystem Health***, ***Māori Customary Uses & Recreational Contact*** and ***Sustainable Growth***.

5.1 Workstream 1: Universal responses & programmes for water quality outcomes

The intent of Workstream 1 is to maintain the state of our waterways[31] and prevent further deterioration from the adverse impacts of stormwater discharges. Additionally, Workstream 1 undertakes programmes of activity to investigate, characterise and prioritise our catchments for Workstream 2 SCaMP delivery.

5.1.1 Universal responses for new development

In our supporting role, of approving new connections to the public stormwater network (see Chapter 2.3), we are seeking to prevent further degradation of our waterways through minimising sources of contamination and managing the effects of additional flow and volume from the public stormwater network.

We will require all new urban development not covered by a stormwater discharge SCaMP to deliver on a set of stormwater mitigations referred to as Universal Responses. Universal Responses (U.R) for new development and subdivisions will be required for approval to connect to the public stormwater network under the RMA, the LGA and through stormwater bylaws as outlined in Chapter 2.3 and through Figure 2.3.

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 would require all new developments and redevelopments on sites greater than 3,000 m[32] to have a stormwater discharge SCaMP (if they are not already covered by an approved sub-catchment scale SCaMP), focused on using WSD principles, as shown in **Figure 5.1** below. This illustrates how Workstream 1 includes stormwater mitigations specific to smaller developments in areas not covered by the requirements of an approved stormwater discharge SCaMP[33].

[30] *See Policy P83 in the NRP*
[31] *from Addressing Schedule N(h) in the NRP*
[32] *Consistent with the lower limits of Rule R49 of the NRP*
[33] *Addresses Schedule N(i) in the NRP.*

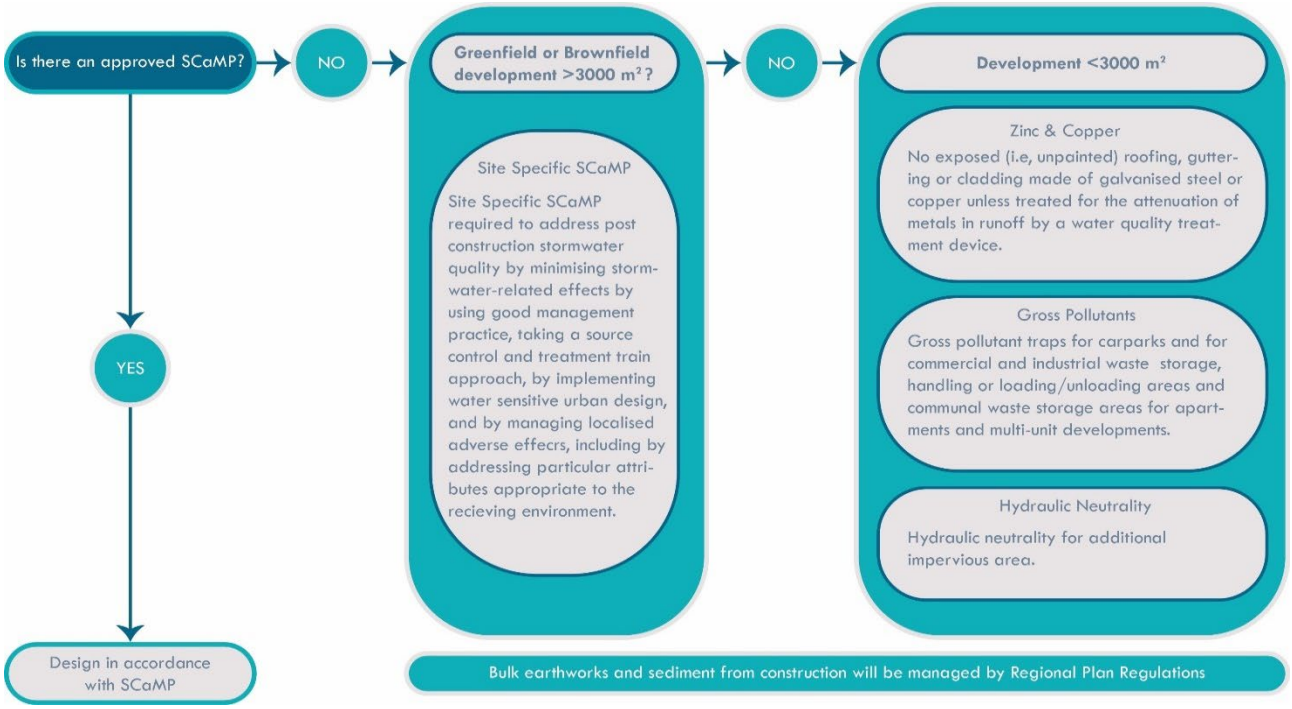


Figure 5.1 - Universal Responses required for new developments in areas not covered by an approved stormwater discharge SCaMP.

5.1.1.1 Site-specific stormwater discharge SCaMPs

Workstream 1 U.R's for developments (greenfield and brownfield) on sites of 3,000 m^2 (or greater) would require a site-specific SCaMP to be created. This intends to minimise the stormwater-related effects of development to the public and private stormwater network applying:

- good management practices,
- source control and treatment train approach, and
- water sensitive design[34].

Implementation of the stormwater discharge SCaMP activities and mitigations must be in place prior to the development discharging to the public stormwater network.

The SMS prioritises the need to reduce scour and streambank erosion resulting from the increased frequency of lower intensity flood events (e.g., the 2-year rainfall event[35]). These effects are a common outcome of increased imperviousness associated with urban development. Our approach to mitigate this will be through either:

- greenfield and brownfield stormwater discharge SCaMPs as part of the Universal Response,
- responding to the requirements identified within an existing sub-catchment stormwater discharge SCaMP developed through Workstream 2.

5.1.1.2 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

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

[35] *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.*

and stormwater flows that would increase risk to human health or safety, or increase the risk of inundation, erosion, or damage downstream[36].

Hydraulic neutrality to mitigate for peak flows is an existing requirement[37] for new developments and subdivisions and is included in the suite of Universal Responses. Hydraulic neutrality, as defined in the Regional Standard for Water Services (RSWS), focuses on capturing the additional peak stormwater that is generated during rain events and then slowly releasing it to reduce peak flooding in downstream areas. We recognise that further work is needed in this space to capture emerging good practice, and we have identified activities within Section 5.1.2.

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

Auckland Regionwide Stormwater Network Discharge Consent

Auckland's 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 use the council's consent provided they meet the NDC requirements and with council's approval.

Auckland's Schedule 4 Connection Requirements for their regionwide stormwater network discharge consent supports the use of "universal responses".

5.1.2 Programmes for water quality outcomes

To support the delivery of our commitments in line with the Schedule N requirements of the NRP, we have defined five programmes that we are seeking to continue, refine and enhance over the next 35 years. These would work in concert with Workstream 2 to prioritise, plan and deliver a series of capital improvements across the existing networks. These major proposed programmes are shown below in **Figure 5.2**.

These proposed programmes are scheduled to occur within short, medium, and long-term timeframes, as described above. In some instances, Workstream 2 requirements will supersede Workstream 1 outputs. Capital delivery under Workstream 2 includes the development of stormwater discharge SCaMPs which will require specific stormwater quality mitigations replacing Universal Responses in Workstream 1.

[36] *As referenced in Policy P84 of the NRP*
[37] *As identified in the Regional Standard for Water Services*

Figure 5.2 - The programmes of work to help achieve stormwater quality outcomes.

5.1.2.1 Strategy and Planning

A key requirement of this work programme is to support the Collaborative Committee to implement this SMS (see Chapter 6). This work programme is critical to setting up and managing activities that involve working with others (the principle of Mahi Tahi), a non-exhaustive list examples of which are shared in **Table 5.3**.

We need to be adaptive, flexible and open to changes in management approaches as new knowledge or information becomes available. This allows us to continually learn and improve our management approaches. It is based on the principle of continuous improvement and includes planning, implementation, monitoring, and evaluation and reporting, which will be run through the Collaborative Committee.

Evaluating this information and sharing the outcomes of the programme within Wellington Water with our partners and the community helps promote effective collaboration for collective action.

Table 5.3 - Programme of work – predominant activity – Strategy & Planning

Period	Years	Predominant Activities
Short	**To 2030**	Collaborative Committee – Set up and start the process for co-governance of this SMS and Water Quality enhancement programme – to build strong resilient relationships with mana whenua and key stakeholders.
		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 with others to identify and implement new policies and regulations and design guidance relating to stormwater management
		First update to SMS after 6 years.
		"Leading by example" by revising requirements for stormwater quality associated with fleet vehicles and depot yards
		Integrating SMS across other strategies within Wellington Water
Mid	**2030 - 2040**	Continuation and improvement of above activities
		Further updates to the SMS
Long	**To 2058**	Continuation and improvement of above activities
		Further updates to the SMS

5.1.2.2 Modelling and Investigations

One of our key priorities is to develop effective multi-benefit management solutions through comprehensive and focused modelling and investigations.

Conceptual models, such as contaminated load models are used to capture the relationships between values and threats and assess our assumptions about the improvements we expect from certain management activities. This helps us understand how our activities can contribute to improved discharges to support progressively improving the health of our waterways and public safety. This programme:

- Allows us to measure changes in the condition of waterways and the values they support.
- Informs us of the success of our interventions.
- Tests and further develops the assumptions underpinning our strategic approach.

Knowledge generated by modelling and investigations informs:

- Strategic planning, such as strategy development, works prioritisation and planning, and asset management systems.
- Delivery of actions and programs.

Activities associated with this work programme are shown in **Table 5.4**.

Table 5.4 – Programme of work – predominant activity – Modelling & Investigations

Period	Years	Predominant Activities
Short	**To 2030**	Modelling & Investigations – activities to support programme delivery (including Workstream 2), refining monitoring & investment programme.
		Review and refinement of the Stormwater Monitoring Plan
		Establish research partnerships to support development of trials and capture and test innovative solution developments.

		Develop programme of aquatic habitat and watercourse assessments, incorporating mātauranga Māori monitoring needs.
Mid	**2030 - 2040**	Ongoing modelling to support stormwater discharge SCaMPs – informed from prioritisation approach
		Continued programme of waterway investigations to support review requirements.
		Capture and report on outcomes and programme level evaluations
Long	**To 2058**	Ongoing modelling to support stormwater discharge SCaMPs – informed from prioritisation approach
		Continued programme of waterway investigations to support review requirements.
		Capture and report on outcomes and programme level evaluations

5.1.2.3 Operations and Maintenance

This enhanced work programme includes monitoring and supports new activities such as mātauranga Māori monitoring for stormwater discharges. This work programme also delivers the maintenance activities needed to keep existing water quality devices in working order. To ensure the monitoring and maintenance requirements are sustained, registers and databases must be expanded or established to capture works and inspections to meet Service Level Agreements with council roading and parks departments.

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. New capital assets delivered in Workstream 2 will require additional resourcing (funding and staff effort) that will be delivered through this work programme. This is designed to support and maintain the design level of performance expected from the new assets.

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.

Sites with Acute Human Health Risk

The Stage 1 Global Stormwater Consent has a strong focus on identifying and responding to sites where *E. coli* (in freshwater) or Enterococci (in coastal water) concentrations indicate wastewater and presents an acute risk to human health[38]. This SMS and the Stage 2 Global Stormwater Consent will continue to support existing work programmes ('Knowing Your Pipes' - cross-connections and 'Human Health Mitigation Projects' (HHMP)) that respond to these issues.

Many of these problems are the result of faults in the public and private wastewater networks (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. This SMS addresses sites with acute human health risks[39] 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:

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

- 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.

High-risk sites - health checks

The new programme of health checks, as part of Workstream 1, would be implemented for large carparks and industrial and commercial sites[40]. This proposed programme of works would be developed in collaboration with existing stormwater pollution prevention programmes carried out by GWRC and some of the local city councils. 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 unacceptable levels of contaminants into the stormwater network, 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))[41].

5.1.2.4 Education and Outreach

This new work programme supports the delivery of the SMS outcomes by addressing challenges faced by the water industry and communities across Aotearoa (and globally). This includes building the new required capability and capacity to deliver on the significant changes necessary to achieve the desired outcomes. The programme will 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 supply chains that can influence and deliver good outcomes in line with SMS objectives.
- Appropriate community outreach activities and an integrated education campaign. Targeted at increasing awareness and enhancing connection with residents and businesses about how they can reduce contaminants. Includes a focus on education for local streams, water quality and water usage for schools and the community.

Where possible, this programme will enhance existing council education and outreach programmes. Examples include targeted industrial pollution prevention programmes and community involvement in compliance and environmental monitoring programmes. Activities associated are shown in **Table 5.5**.

Table 5.5 – Programme of work – predominant activity – Education & Outreach

Period	Years	Predominant Activities
Short	**To 2030**	Development of capacity building and knowledge sharing needs across the programme.
		Collaborate with others to develop clear communication and education on sustainable stormwater management
		Staff & Supply Chain capability development – through industry wide workshops, research events and specific training portfolio development.

[40] *Addresses Schedule N(l) in the NRP.*
[41] *Addresses Schedule N(m) in the NRP.*

		Support a regional consideration of an awards system to keep focus on messaging and celebration of good practices, innovators, and community initiatives.
Mid	**2030 - 2040**	Ongoing roll out and refinement of education and outreach activities
		Continual focus into enhancing staff & supply chain capability development
Long	**To 2058**	Ongoing roll out and refinement of education and outreach activities
		Continual focus into enhancing staff & supply chain capability development

5.1.2.5 Data and Asset Management

Effective data management is vital to provide access to reliable information required for planning, communication, legislative reporting, auditing and tracking the effectiveness of the delivered on-ground works. A range of data associated with water assets and the state of urban waterways, derived from internal and external sources of information is managed.

Capturing this data at the appropriate spatial scale is important for access and ease of use of the information. 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 provide operational and monitoring data results to the public and with the Education and Outreach programmes.

To deliver enhanced stormwater quality over the next 30 years[42] Workstream 1 identifies significant new and expanded programmes of works. In addition, Workstream 2 will result in the development of new public assets through the stormwater discharge SCaMPs. These new assets will need to be captured within this programme.

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 5.3**.

[42] *30 years is the current long term investment cycle under the LTP*

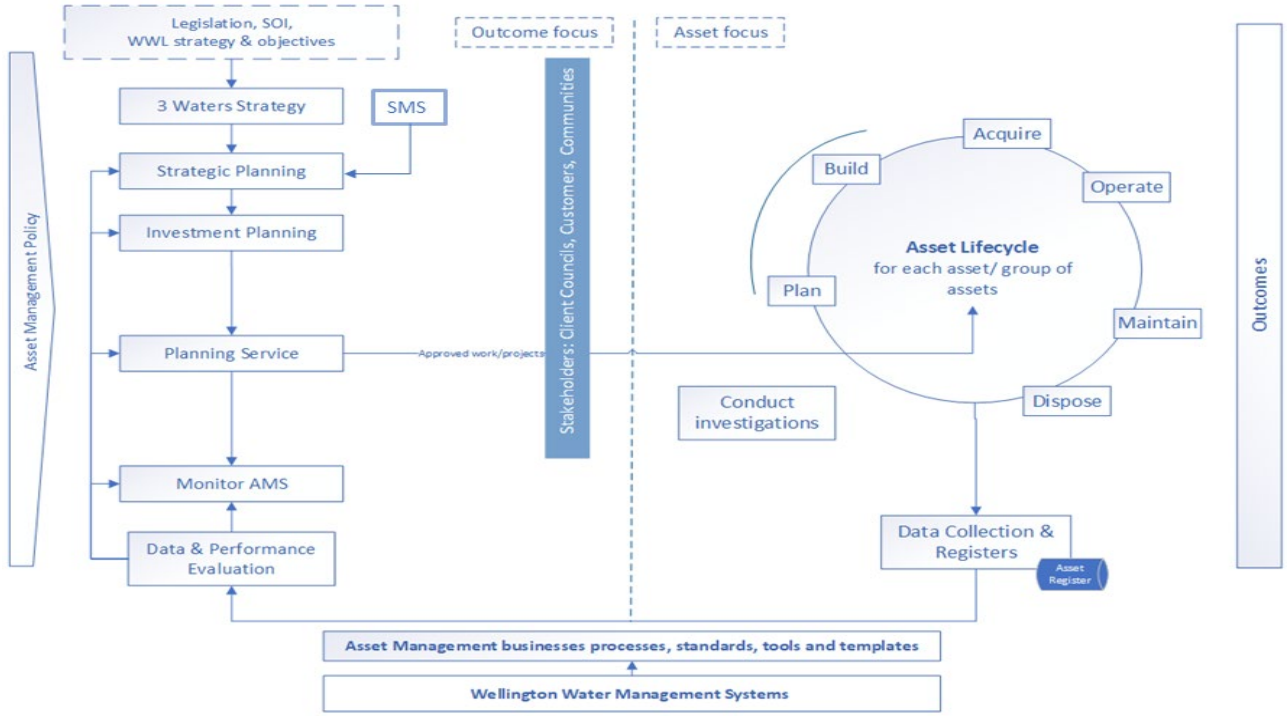


Figure 5.3 - Wellington Water's asset management framework and the role of the SMS in Investment Plan process.

Activities associated with the work programme are shown in **Table 5.6**.

Table 5.6 – Programme of work – predominant activity – Data & Asset Management

Period	Years	Predominant Activities
Short	**To 2030**	Develop and enhance monitoring information portals and activity tracking process to support wider Service Level Agreements with third parties and contractors.
		Identifying opportunities to align data and knowledge of waterway values to support multiple parties and determine other avenues of investment
		Review / collate data management process and define approach for sharing and visualisation
		Develop methodology for tracking outcomes and evaluation
		Continual scan of approaches to capture innovation and aligned programmes
Mid	2030-2040	Ongoing review of process to collate and share asset information
		Ongoing evaluation of our programmes to share information across the wider community
		Continual scan of approaches to capture innovation and aligned programmes
Long	To 2058	Ongoing review of process to collate and share asset information
		Ongoing evaluation of our programmes to share information across the wider community
		Continual scan of approaches to capture innovation and aligned programmes

5.2 Workstream 2: SCaMPs & resulting Capital Improvements

The intent of Workstream 2 is to reduce the impacts to receiving water bodies from stormwater discharges. The development of prioritised stormwater discharge SCaMPs and the resulting capital delivery programme is designed to support the design and construction of stormwater water quality treatment devices. This workstream:

- Delivers the SCaMPs (in the sequenced order identified through the Collaborative Committee).
- Delivers new assets that achieve multiple benefits for our community and assist to sustain mauri of our waterways, including seeking opportunities to restore our lost urban waterways.
- Enables innovative trials across the networks to support achieving the SMS objectives.

Stormwater discharge SCaMPs are sub-catchment scale management plans to minimise the stormwater-related effects of urban development. The contents of these documents will be identified and agreed to with the Collaborative Committee. The intent of these is to identify management activities and options that will support stormwater discharge improved water quality across a sub-catchment. These plans will share how through using good management practice, taking a source control and treatment train approach, by implementing WSD, and managing localised adverse effects, the planned activities will support the delivery of improvements to the receiving waterbodies[43].

Stormwater discharge SCaMPs will focus on identifying optimised sub-catchment-scale water quality solutions (such as wetlands and raingardens) based on monitoring, investigations, and modelling. Site-specific SCaMPs developed prior to these as a Universal Response under Workstream 1 will be incorporated into the larger sub-catchment SCaMP. This SMS, therefore, requires two types of stormwater discharge SCaMPs to be developed:

1. Developer-led site-specific SCaMPs for large developments and greenfield sites of 3,000m^2 or greater 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.

Stormwater discharge SCaMPs at the sub-catchment scale[44] will identify specific stormwater solutions that are needed in addition to any site-specific SCaMPs and the Universal Responses. Wellington Water may choose to develop its stormwater discharge SCaMPs at a geographic scale smaller than the sub-catchments. This will be done, in agreement with the Collaborative Committee, where sub-catchments are large and complex, where distinct smaller geographies can be identified and where tackling large complex sub-catchments as a whole risks delaying stormwater improvements.

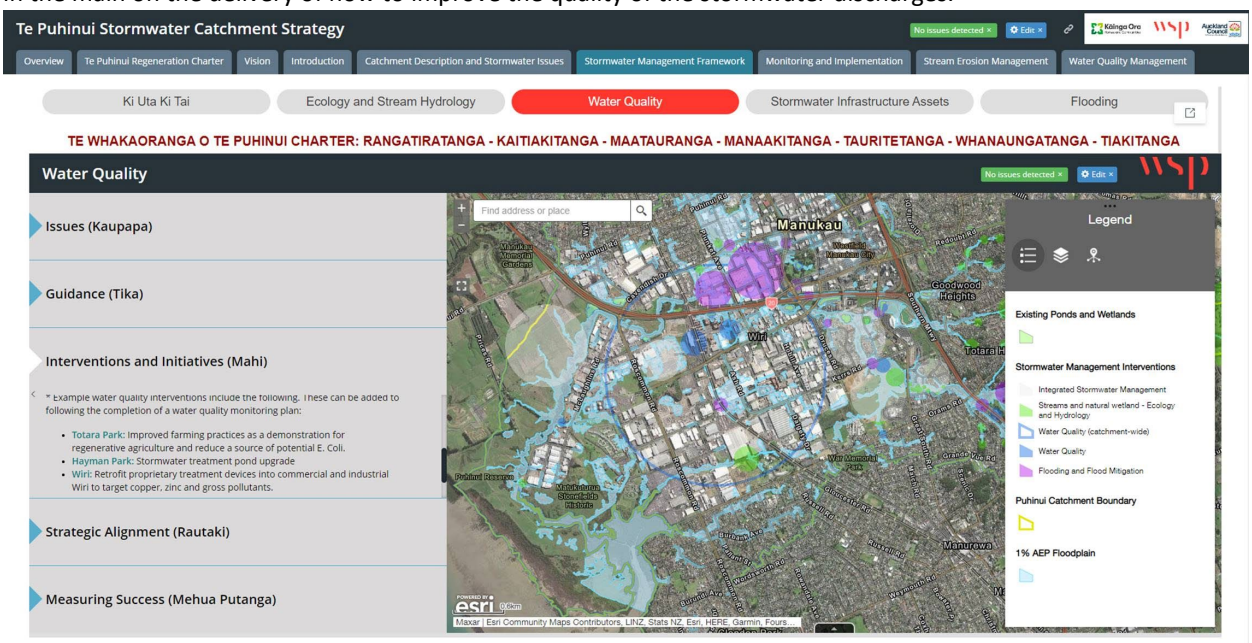
These solutions will likely include treatment train solutions that incorporate requirements for private devices or mitigations, as well as programmes of work and catchment-scale interventions such as publicly owned raingardens, swales and treatment wetlands to remove contaminants, and large-scale detention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

[43] *As referenced in Policy P83 of the NRP*
[44] *Although 38 sub-catchments are identified, sub-catchments are a management unit and can be at any scale.*

Example stormwater discharge SCaMP approach

This example shares the development of a "Stormwater Catchment Strategy" supporting Kainga Ora and Auckland Council to understand the risks to the waterways through the proposed Manukau Regeneration Programme. Following Auckland Council guidance, *"the primary objective is to achieve the best practicable option for the long-term management of stormwater from the development area. In addition to the requirements to consider the Stormwater Code of Practice and WSD principles, consideration should also be given to site specific constraints and circumstances as outlined in AUP Policy E1.3.10."*

The proposed stormwater discharge SCaMPs would enable this integrated approach to be taken but would focus in the main on the delivery of how to improve the quality of the stormwater discharges.



Example of how a stormwater discharge SCaMP might appear. Example shared is from a joint Kainga Ora and Auckland Council project delivering the Puhinui Catchment Stormwater Plan

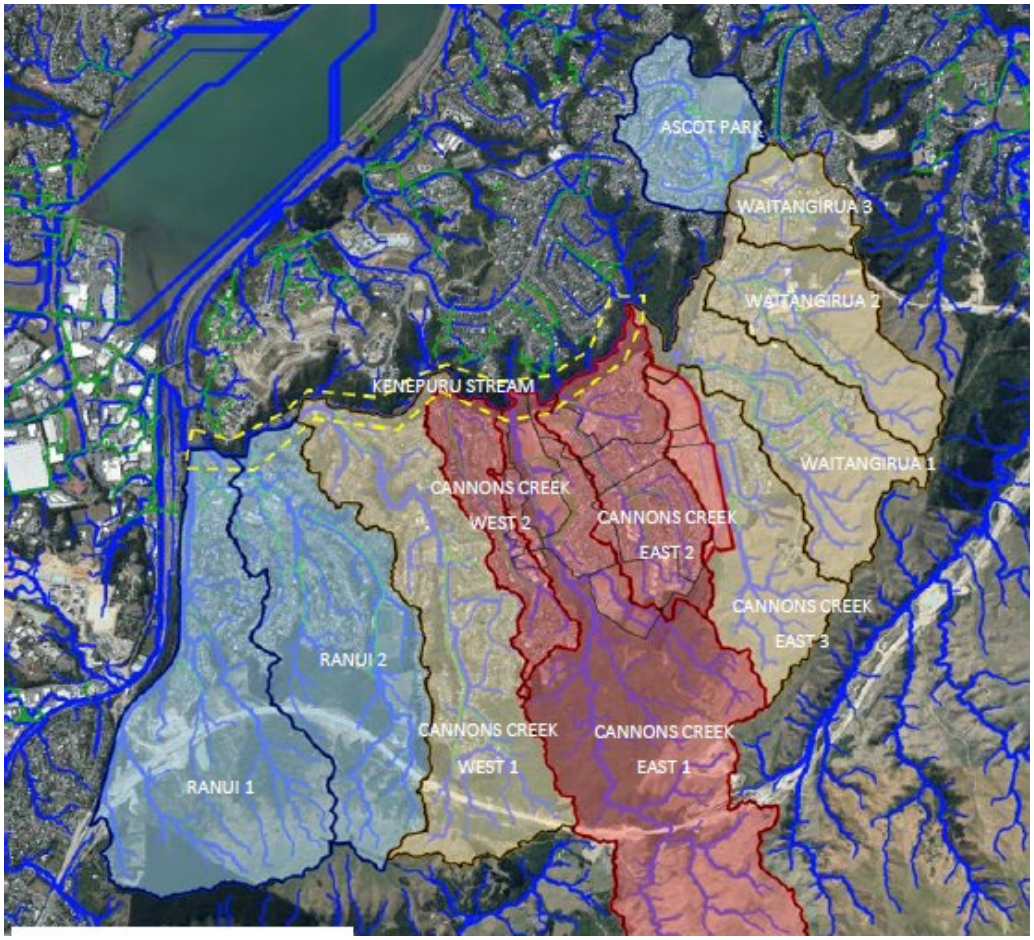
The development and planning of stormwater discharge SCaMPs will be carried out in an incremental manner that allows for future changes to be incorporated through the long-term programme.

The stormwater discharge SCaMPs proposed under Workstream 1 and Workstream 2 will identify site-specific and sub-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 stormwater discharge consent periods to support the journey to wai ora.

Sharing costs through regeneration investments or through other third-party funding sources represents an opportunity, instrumental to successful stormwater management. An example of site-specific stormwater discharge SCaMPs being developed for a large-scale brownfield redevelopment is shown below.

Site-specific SCaMP for Eastern Porirua Regeneration

This large-scale brownfield redevelopment is within a larger sub-catchment identified as Porirua Stream (see Appendix D of this SMS). Preliminary stormwater investigations being done by Te Aranga Alliance are considering management options specific to smaller sub-catchments that drain directly to Kenepuru Stream. This could result in up to eleven site-specific ScaMPs within the larger Porirua Stream sub-catchment.



Example of Eastern Porirua Regeneration Project

5.2.1.1 Prioritisation of Wellington Water-led stormwater discharge SCaMPs

Given that not everything, everywhere can be done at once, the prioritisation[45] of sub-catchments is a useful tool to guide the development of stormwater discharge SCaMPs. The development of a stormwater discharge SCaMP requires detailed information and evaluation of current conditions and pressures, including future pressures from projected growth or land development, as well as risks of significant adverse effects from specific stormwater discharges on the relevant waterbodies.

To support the delivery of SCaMPs to help achieve progressive improvement over the length of the Stage 2 Global Stormwater Consent, a prioritisation framework will be developed prior to the hearing of the Stage 2 Stormwater Discharge Consent. This framework will guide the development of stormwater discharge ScaMPs. The framework will be structured in a way to achieve the best outcomes and will be informed by the monitoring data gathered during the implementation of the Stage 1 Global Stormwater Consent.

[45] See *Schedule N (f), (l) and (m) in the NRP".*

Following the grant of the Stage 2 Global Stormwater Consent, subsequent prioritisation of the development of stormwater discharge SCaMPs to identify solutions needed, such as water quality treatment devices, will be overseen by the Collaborative Committee (see Chapter 6). It is anticipated this will occur on a six-yearly cycle and will be based on matters such as the following:

- **Regulatory Alignment** - with the NRP, Te Mana o te Wai, Stage 2 Global Stormwater Consent conditions, adverse effects based on monitoring, sites of significance, waterbodies identified as a priority for improvement[46], and waterbodies that fail to meet the national bottom lines for a relevant value (National Objectives Framework).
- **Efficiency** - incorporating affordability and integration with other work programmes (such as improvements to the wastewater network, flooding improvements, resilience projects or other environmental water quality programme work) and / or alternative sources of funding (i.e., 'opportunistic' growth or urban regeneration projects).

In addition, the principles of Ki Uta ki Tai and integrated catchment management can result in works being re-sequenced to get the 'best outcome for effort' by considering where results will be delivered from one set of works over another. Activities associated with Workstream 2 are shown in **Table 5.7**.

Table 5.7 – Programme of work – predominant activities – Workstream 2 (SCaMPs & Capital Delivery)

Period	Years	Predominant Activities
Short	**To 2030**	Working with the Collaborative Committee to refine the prioritisation framework for Stormwater Discharge SCaMPs
		Undertake initial set of stormwater discharge SCaMPs – informed from prioritisation framework
		Capital Delivery - Prioritised improvements to reduce the impacts of stormwater discharges – aligned with other ancillary programmes of work.
Mid	2030-2040	Undertake stormwater discharge SCaMPs – informed from prioritisation framework
		Capital Delivery - Prioritised improvements to reduce the impacts of stormwater discharges – aligned with other ancillary programmes of work.
Long	To 2058	Undertake stormwater discharge SCaMPs – informed from prioritisation framework
		Capital Delivery - Prioritised improvements to reduce the impacts of stormwater discharges – aligned with other ancillary programmes of work.

5.3 Scale of the programmes in Workstream 1 and 2

The proposed programmes could represent between $1 to $2 billion investment over the next 30 years. **Figure 5.4** shares the identified funding anticipated to enable implementation of the SMS on the journey to wai ora.

This SMS cannot guarantee funding and this is discussed in Chapter 7 Governance and Chapter 7.1 Challenges and Opportunities.

[46] *Under Schedule H2 of the NRP*

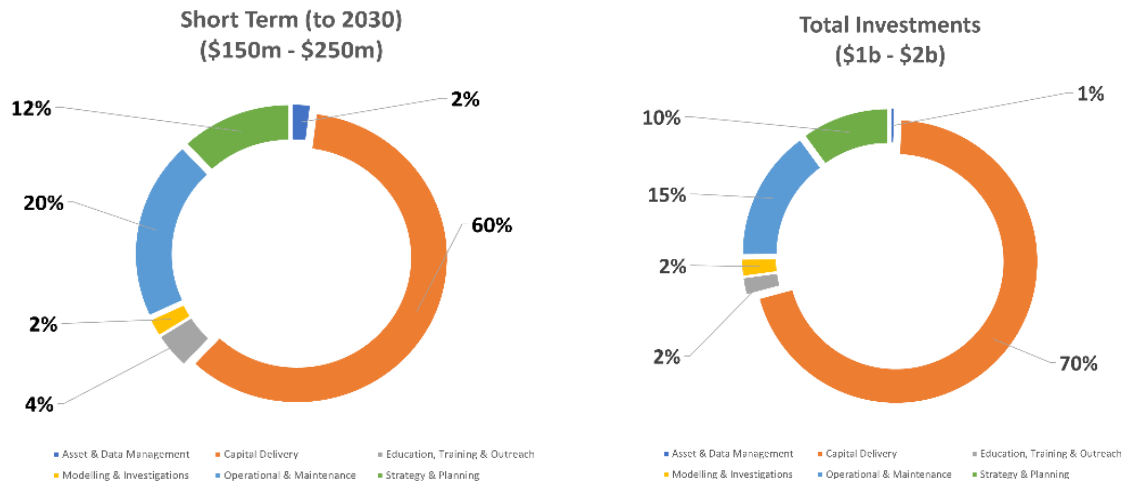


Figure 5.4 - Investment across the six work programmes for the short-term to 2030 (left) and overall, to 2054 (right).

6 Governance via a Collaborative Committee

This SMS is required to support the establishment of a Collaborative Committee to provide governance (outlined in Chapter 2). The Collaborative Committee would have the key oversight of implementation and is expected to operate for the duration of the Stage 2 Global Stormwater Consent. The Collaborative Committee would:

- Give effect to the requirements of Te Mana o te Wai, particularly mana whakahaere
- Support the investment needed to deliver the objectives of this SMS
- Lead the implementation of this strategy by setting clear expectations and direction.

To achieve these outcomes, the development and implementation of the collaborative committee will rely on four guidelines that align with the principles of this SMS, as shown in **Table 6.1**, below:

Table 6.1 - Guidelines for developing and implementing the governance structure.

Collaborative Committee Governance Guidelines	SMS Principle*
Give effect to Te Mana o te Wai • Enables the six principles of Te Mana o te Wat to support the decision making for this SMS; Mana whakahaere, kaitiakitanga, manaakitanga, governance, stewardship, and care and respect • Decision-making follows the hierarchy of obligations (**Figure 2.2**).	Mahi Tahi / Working Together
Recommend investment to support the objectives of the SMS • Ties into Asset Investment Plan processes (see **Figure 5.3**) Realises that funding is needed to achieve water quality outcomes and as management of stormwater discharges is only one piece of the puzzle, it requires others to play their part.	Mahi Tahi / Working Together
Deliver prioritisation across the network • Recognises that not everything can be delivered at once, requiring a framework for decision making to be developed.	Ki Uta ki Tai / Integrated Catchment Management
Apply transparent and robust decision making • Ensures the decisions are evidence-based, consider multiple perspectives and lead to more sustainable outcomes	Adaptive Management

* = SMS Principles are described in Chapter 4.2 of this document.

As a critical component necessary for Te Mana o te Wai, the membership of the Collaborative Committee would be 50% mana whenua and 50% asset owners (Porirua, Wellington, Hutt and Upper Hutt city councils) and consent holder (Wellington Water). The membership is designed to reflect mana whakahaere and the councils' role as asset owners responsible for governance of, and investment in, the networks.

The Collaborative Committee would enable mana whenua to support the implementation of the principles of Te Mana o te Wai (see Chapter 2.22.2), honouring mana whenua as signatories to Te Tiriti o Waitangi and their role as kaitiaki with responsibilities and obligations to their whakapapa and their environment.

The Collaborative Committee would be supported by Wellington Water staff and mana whenua representatives as desired[47]. There would be two observers, GWRC as the environmental regulator, and Regional Public Health. Wellington Water will act as secretariat.

The Collaborative Committee would oversee:

- reviews of the SMS, on a six yearly cycle
- reviews of the prioritisation of sub-catchments and the delivery of the stormwater discharge SCaMPs with other ongoing network discharge consent requirements, such as the Wet Weather Network Overflow consents (WWNO)
- implementation of this SMS
- preparation of the stormwater discharge SCaMPs
- preparation of the mātauranga Māori Monitoring Plan
- reviews of the Annual Report, including information about the effectiveness of this SMS and the stormwater discharge SCaMPs in progressively reducing adverse effects of stormwater discharges
- preparation, updating, and implementation of the community engagement plan.

7 Delivering this SMS

Implementation of this SMS would require significant changes in current programmes. Using the Governance approach presented in Chapter 6 :

- Investment plans to implement the identified programmes of works for each of the councils over the short-, medium- and long-term are proposed to be developed.
- On the journey to wai ora, we intend to use an adaptive approach to manage stormwater discharges. We propose to do this by using the best information available to inform the delivery of our implementation program, as supported by the key principle of monitoring including mātauranga Māori, investigations, and research.

7.1 Challenges and Opportunities

Managing stormwater discharges to minimise the adverse effects on the wellbeing of streams, rivers and harbours presents challenges as well as opportunities. The challenge and opportunities faced in the delivery of this SMS, the Stage 2 Global Stormwater Consent, and the activities required, are described in the **Table 7.1** below.

[47] Anticipated to include input from a mātauranga Māori expert, or other party agreed to by Te Rūnanga o Toa Rangatira and Taranaki Whānui, into updates of the SMS and preparation of SCaMPs.

Table 7.1 - Challenges for Wellington Water in the implementation of this SMS and achieving NRP Objectives.

CHALLENEGE	OPPORTUNITY	ACTION
Managing stormwater for water quality is a relatively new way of assessing, designing and providing stormwater services.	This new focus will result in progressive improvement of streams, rivers, and coastal areas.	The SMS describes a strategic approach to managing stormwater for water quality that relies on three objectives, three principles and strategic actions comprised of two comprehensive workstreams.
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.	The SMS highlights the role that new development has in managing stormwater to protect water quality – through proposed Workstream 1. Workstream 2 captures the delivery of SCaMPs and the consequential network improvements needed to progressively improve water quality in the sub-catchment.
Current organisational roles and responsibilities for stormwater have limited ability to control the urban environment inputs to the stormwater system.	SCaMPs will provide a necessary piece of the puzzle to deliver Integrated Catchment Management plans which will also need to be supported by plans specific to urban development, riparian management, roading, etc. 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.	The SMS identifies the role that Wellington Water can play in supporting the overall delivery of Integrated Catchment Management plans and Mahi Tahi, working together, with other organisations and funding regimes. This SMS identifies how Wellington Water can shift the approach to reducing the impacts of stormwater discharges on the environment, but requires all parties to lift their game accordingly to support a societal shift to how we interact with our water environments.
Wellington Water's enforcement role and powers are limited.	Rules and regulations and responsibilities can be revised.	The SMS identifies how Wellington Water wish to influence central and local government to support achieving the outcomes - through the proposed Strategy & Planning programme (Workstream 1). The Collaborative Committee will keep a watching brief on the items that are unknown currently, such as changes to local government or water service delivery. Should these not deliver intended outcomes then revise the SMS during 6-yearly reviews.
Capability and Capacity Constraints	Opportunity to implement a competency framework with career progression targeting capability and capacity building aligned with the needs of this SMS.	The SMS includes new and expanded work programmes that will require additional resourcing in relation to physical investments in assets but more importantly through committed programmes of work through both workstreams.

CHALLENEGE	OPPORTUNITY	ACTION
	Opportunity to engage and encourage diversity into workforce through targeted educational programmes and mātauranga Māori outreach / employment programmes.	The SMS identifies the critical need to support capacity and capability improvements through the proposed Education & Outreach programme identifies the need for training and education activities.
Operating and Maintenance 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.	The SMS partially recognises this challenge and seeks to provide additional funding to support, influence, engage and develop appropriate assets based on whole of life cycle costing process and design appropriate guidance through the proposed Strategy & Planning programmes. The SMS identifies the need for increasing operational awareness for ongoing budgets to support this additional mahi.
Stormwater treatment devices located in roads and reserves require interdepartmental management agreements	Supports the principle of Mahi Tahi and better outcomes – chance to redesign system over time to follow treatment train in public open spaces.	The SMS partially supports this opportunity through the proposed Strategy & Planning programme and its role in developing partnerships to agree appropriate levels of service agreements with relevant authorities/organisations.
The community is unaware of ecosystem functions of stormwater networks	Better awareness will enable people to be guardians and kaitiaki	The SMS identifies the critical need to support community level understanding of our waterways through the proposed Education & Outreach programme and undertaking this work would partially deliver the opportunity alongside a societal shift in our relationship with our water environments.
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. Future legislative changes may provide a way to give effect to this SMS.	The SMS partially enables Wellington Water to influence better outcomes to support achieving the outcomes - through the proposed Strategy & Planning programme (Workstream 1). The Collaborative Committee will keep a watching brief on the items that are unknown currently, such as changes to local government or water service delivery. Should these not deliver intended outcomes then revise the SMS during 6-yearly reviews
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.	The SMS shares how Wellington Water want to influence the industry to support achieving the outcomes - through the proposed Strategy & Planning and Education & Outreach programmes (Workstream 1). The Collaborative Committee will keep a watching brief on the items that are unknown currently, such as changes to local government or water service delivery. Should

CHALLENEGE	OPPORTUNITY	ACTION
		these not deliver intended outcomes then revise the SMS during 6-yearly reviews
Affordability of a new programme of investment that is uncertain in relation to the certainty of achieving the delivery of the required Objectives / Outcomes	Prioritisation of the works 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.	The SMS partially enables this opportunity to be realised through the proposed Collaborative Committee providing the opportunity to sequence and prioritise the programme of works delivery to match affordability and other community aspirations.

7.2 Our Future for Stormwater Management

This SMS describes a journey to wai ora that will help achieve a vision of the future described as, "*Our region treasures its water. Our streams and harbours are healthy and suitable for contact recreation and Māori customary use. 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*." It is an ambitious vision that will require us to work together (Mahi Tahi), take a Ki Uti ki Tai (mountain to sea) approach and to use adaptive management to learn from our successes and failures.

This SMS is a strategy that focuses specifically on the management of discharges from the stormwater networks owned by Porirua, Wellington, Hutt and Upper Hutt city councils. The SMS also acknowledges that to be successful the implementation of this strategy must be integrated with the management of sustainable water use, flood protection, wastewater management, urban growth and climate adaptation. By working together to implement innovative solutions, promote community engagement and education, and invest in stormwater infrastructure, we can help achieve the vision in this SMS.

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Wellington Water

Tāhuhu korero

Appendices - Technical and background information

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 (litter).
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 waterbodies .
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 Consent	Resource consent from Greater Wellington Regional Council for Wellington Water to discharge stormwater from the local authority 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.
Raingarden	A vegetated filtration system designed to provide enhance water treatment through combined physical and biological processes, also call bioretention devices.
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 Management Plan (SCaMP)	Plan for managing stormwater discharges from the local authority urban network 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/Local 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 (Appeals Version Final 2022) - 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 Greater 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 P85 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

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 **Table C-1** 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.

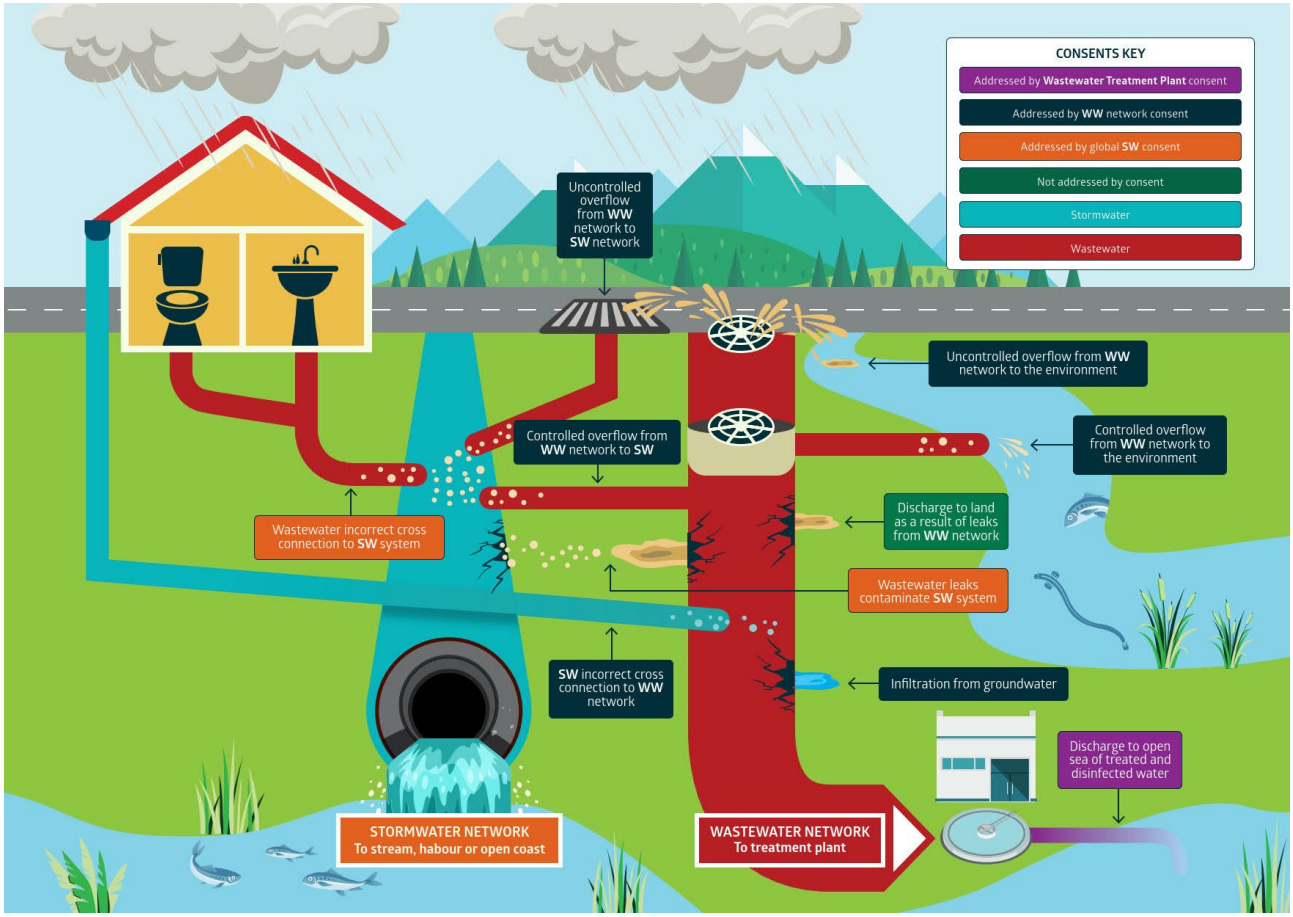


Figure C 1 Integrated approach between wastewater management and stormwater management. Untreated wastewater can discharge to the environment when wastewater pipes are overwhelmed with rainwater and when wastewater is connected to stormwater.

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 (WWNO), which will be subject to specific conditions of the WWNO consent.

Appendix D Catchment Characteristics

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 Consent and one-page summaries of each sub-catchment.

This appendix supplements the ArcGIS online StoryMap that provides more detail.

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.

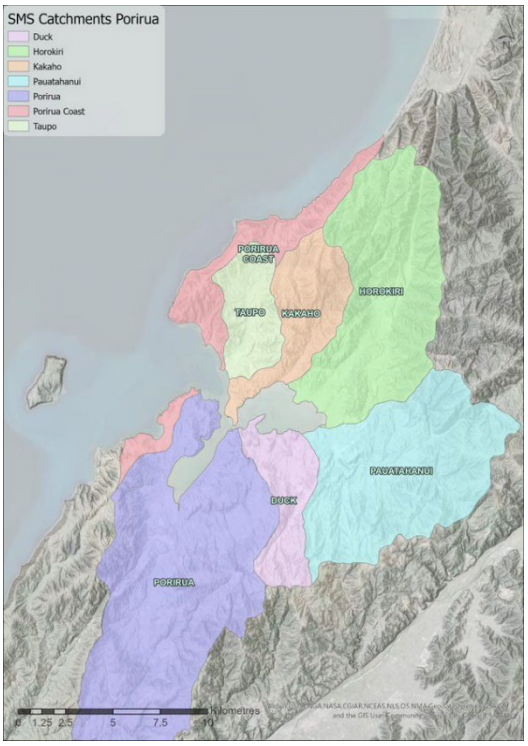


Figure D 1 Map showing the Stormwater network Porirua

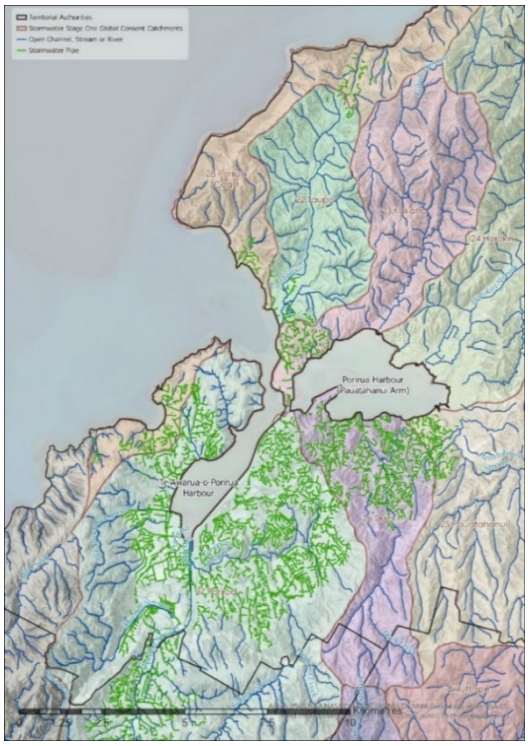


Figure D 2 Map showing the Stormwater in network in Porirua

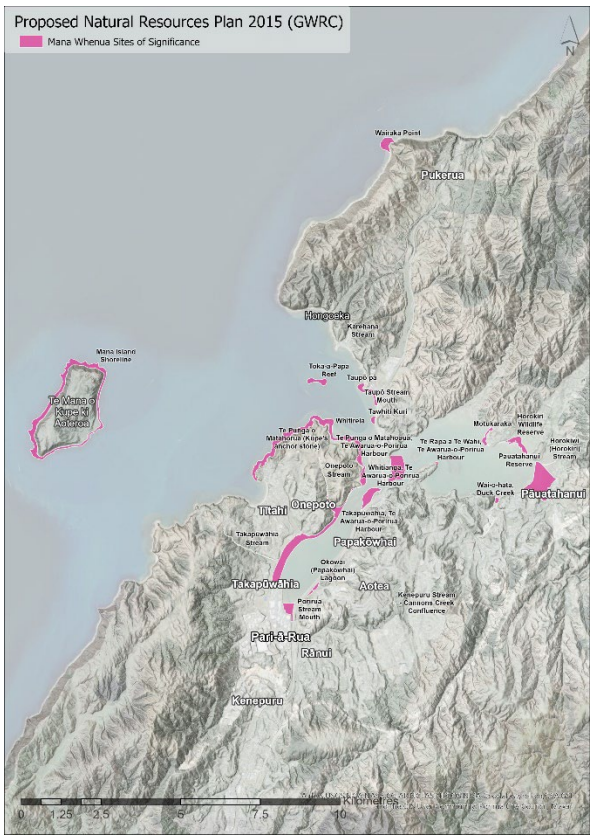


Figure D 3 Map showing the outstanding water bodies, Ngā Taonga Nui-a-Kiwa and aquatic sites with significant Mana Whenua values identified (Sch A-C of NRP).

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 [1] from the Stage 1 Global Stormwater Consent shown in **Figure D-4** and **Table D-1** indicate poor water quality in regards to *E.coli*, enterococci, copper, zinc and nutrients.

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

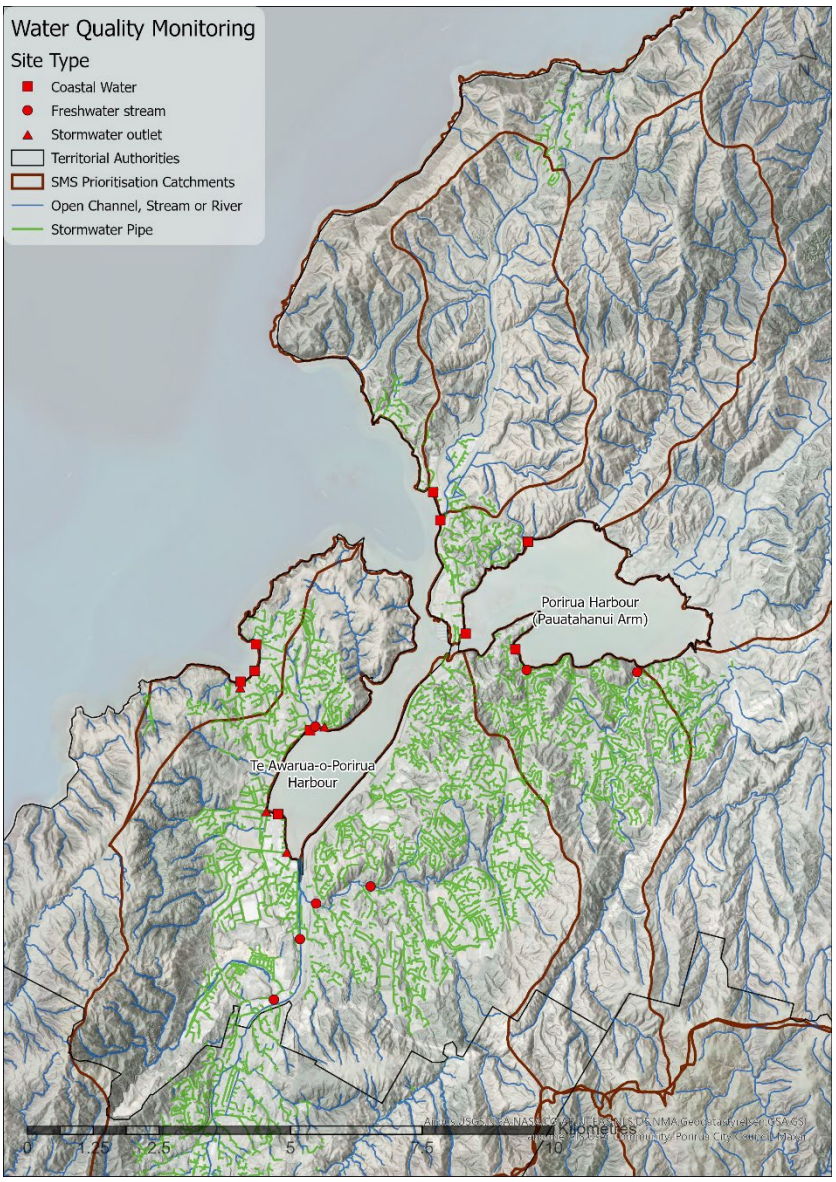


Figure D-4 - Monitoring locations for the Stage 1 Global Stormwater Consent in Te Awarua-o-Porirua Whaitua.

Table D-1 - Overview of receiving environment water quality across the Porirua catchments, based on monitoring data collected for the Stage 1 Global Stormwater 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
Enterococci (coastal water recreation, NRP 018-95%ile <540)	Not met (Onepoto)	Met (at 1 of 2 sites)	Not met (at 1 of 1 sites)	NM	Met (at 2 of 3 sites Titahi Bay) 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

Water Quality parameter	Porirua	Kakaho	Duck	Taupo Stream	Porirua Coast
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 Paekākāriki Hill in the north, to Churton Park and Newlands in the south.

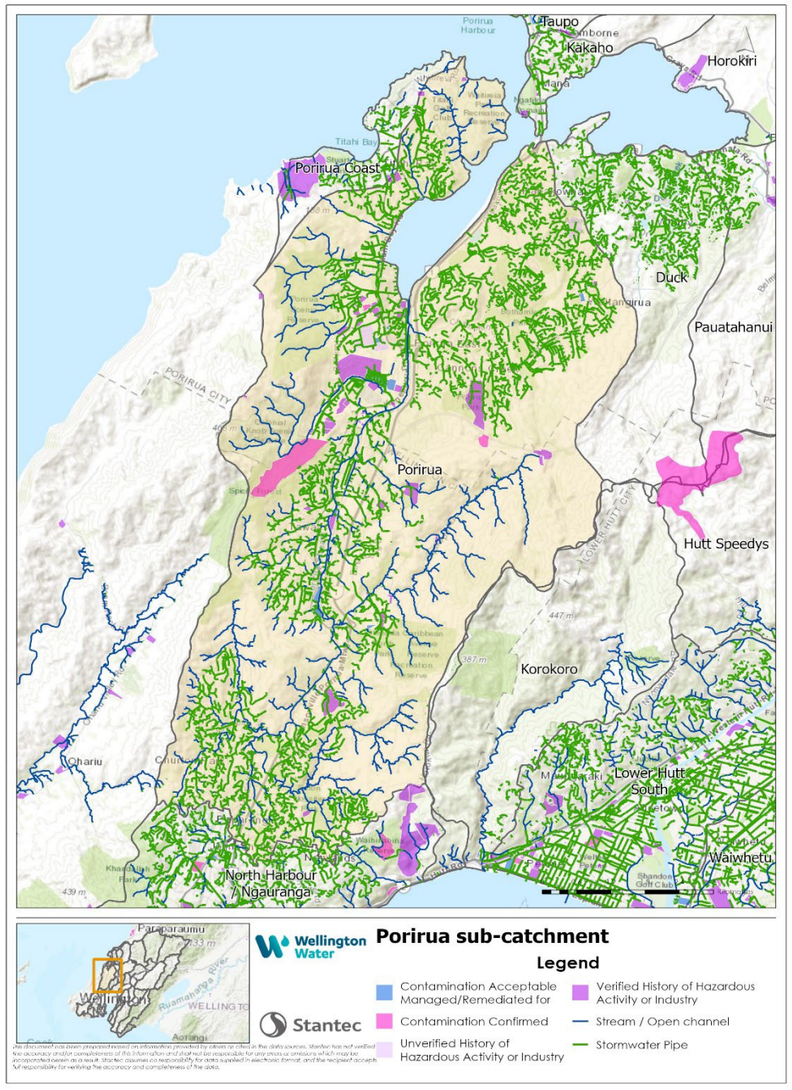
Te Kukuwai o Toa - Elsdon Park Stormwater improvement

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

Porirua



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, Whitireia Stream, 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.
- The Te Awarua-o-Porirua Whaitua Implementation Programme identifies three streams Hukarito Urukahika, Mahinawa Stream are particularly significant to Ngāti Toa Rangatira given the streams proximity to Takapuwahia and Hongoeka marae.

Sub-catchment information

Total catchment Area (km^2)	SW Network area (km^2)	SW Network Area (%)	Impervious Surface Area (%)	SW Network length (km)	Number of stormwater outlets
66.5	28.5	43%	19%	385.2	610

Predominant existing land use

Land use proportions (%)[1]		Hazardous Activities and Industries within catchment [2]	
Rural	24	**SLUR sites**	Detailed maps outlining location of SLURS sites in Section 4 of the Assessment of Effects on the Environment 2023.
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		

Wetlands (Schedule A)

5 wetlands within Porirua catchment: Romesdale Lagoon (0.68 ha), Papakowhai Bush (0.79 ha), Papakowhai Lagoon (0.09 ha), Te Onepoto Wetland (0.51 ha), and Te Awarua o Porirua Harbour (Onepoto Arm) – Tidal Flats (1.5 ha).

Existing Monitoring

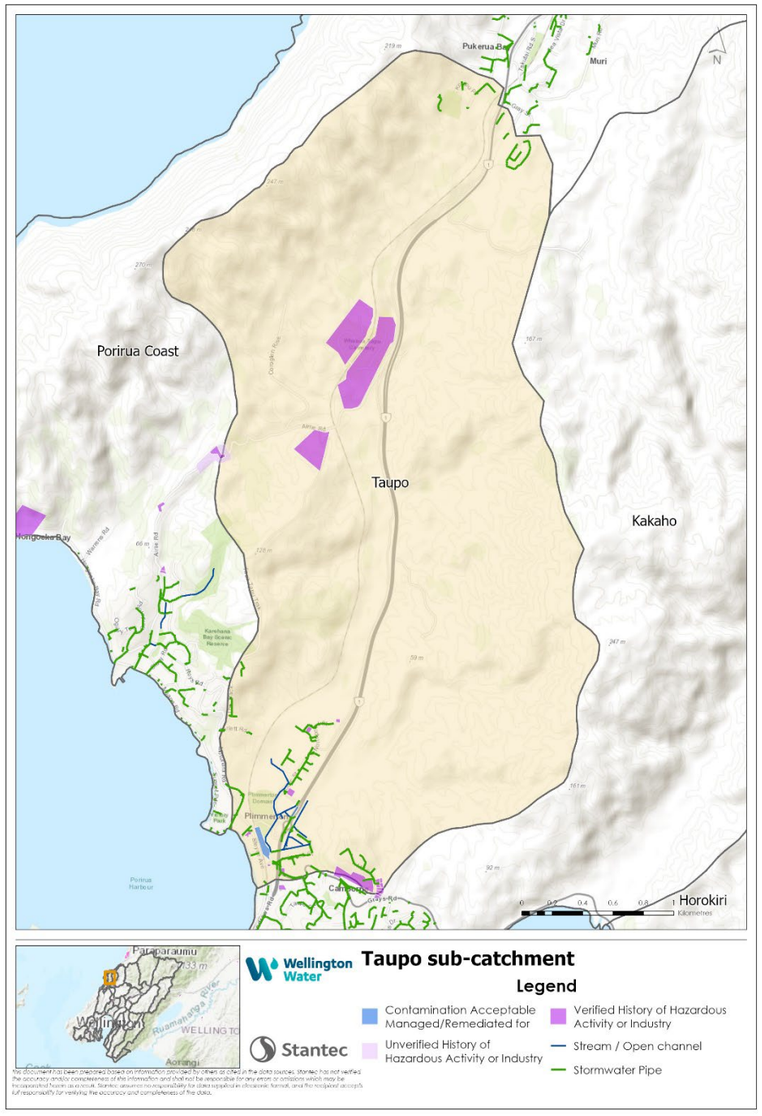
22 monitoring sites (10 freshwater sites, 2 coastal sites, 2 RWQE Sites, 5 stormwater outlet sites and 3 stream/marine sediment sites). More detail on monitoring locations can be found in the ArcGIS Online StoryMap.

Section 4 of the Assessment of Effects on the Environment 2023 outlines the current state of the environment for this catchment.

1 Three highest land use proportions displayed as % of total area

Stormwater Catchment

Taupō



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 and Te Awa me te Kukuwai o Taupō (Taupō swamp and stream) are listed as Ngā Taonga Nui a Kiwa in Schedule B of the NRP
- Taupō pā is and Taupō Stream Mouth are identified in Schedule C of the NRP as sites of significance to Mana Whenua.
- Taupō Stream is identified in Schedule F1 (watercourse with significant indigenous ecosystem value) of the NRP.

Sub-catchment information

Total catchment Area (km^2)	SW Network area (km^2)	SW Network Area (%)	Impervious Surface Area (%)	SW Network length (km)	Number of stormwater outlets
10.6	0.6	6%	9%	5.5	22

Predominant existing land use

Land use proportions (%)[1]		Hazardous Activities and Industries within catchment [2]	
Rural lifestyle	24	**SLUR sites**	Detailed maps outlining location of SLURS sites in Section 4 of the Assessment of Effects on the Environment 2023
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		

Wetlands (Schedule A)

3 wetlands within the Taupō catchment. Muri Road Wetland (2.1 ha), Plimmerton Swamp East (3.3 ha) Taupō Swamp Complex (31.1 ha)

Existing Monitoring

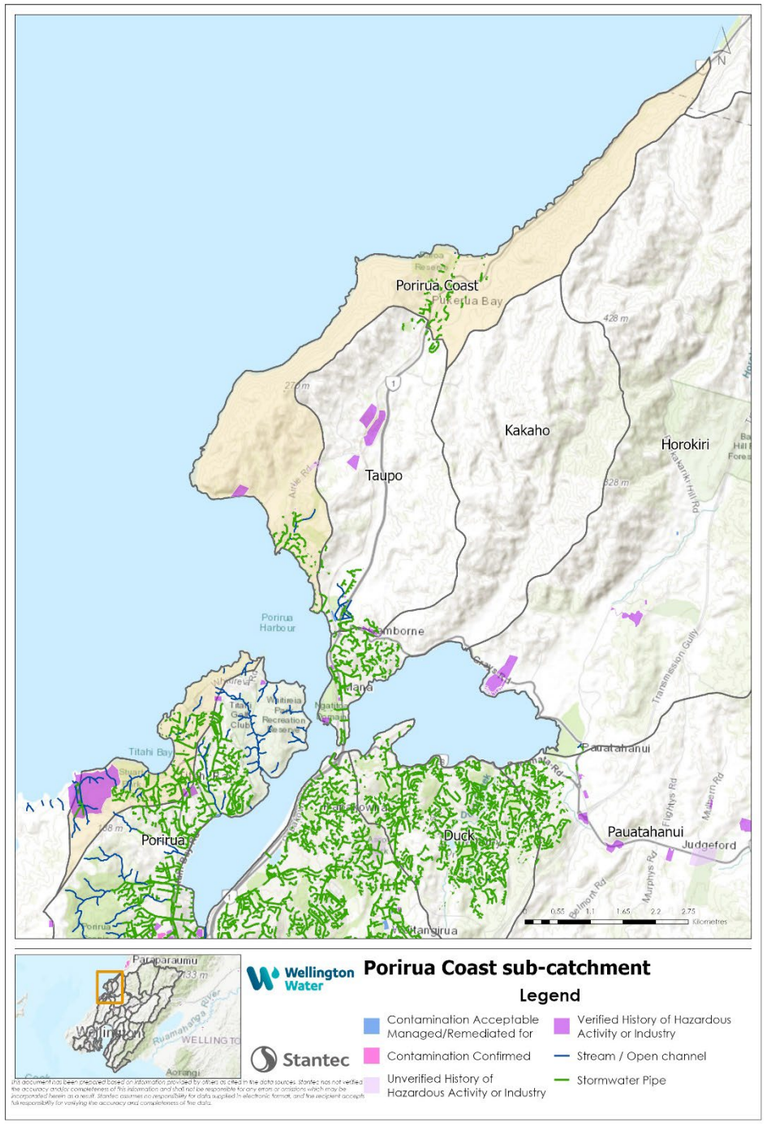
3 monitoring sites (1 coastal site, 1 RWQE site and 1 stream/marine sediment site). More detail on monitoring locations can be found in the ArcGIS Online StoryMap.

Section 4 of the Assessment of Effects on the Environment 2023 outlines the current state of the environment for this catchment.

1 Three highest land use proportions displayed as % of total area

Stormwater Catchment

Porirua Coast



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
- Whitieria, Toka-a-Papa Reef, Tawhiti Kuri, Taupō Pā, Wairaka Point and Mana Island Shoreline are identified in Schedule C of the NRP as sites of significance to Mana Whenua.
- Tītahi Bay at South Beach Access Road is identified in Schedule H2 (Contact recreation and Māori customary use) of the NRP.

Sub-catchment information

Total catchment Area (km^2)	SW Network area (km^2)	SW Network Area (%)	Impervious Surface Area (%)	SW Network length (km)	Number of stormwater outlets
14.4	2.1	15%	10%	22.1	59

Predominant existing land use

Land use proportions (%)[1]		Hazardous Activities and Industries within catchment [2]	
General Rural	42	**SLUR sites**	Detailed maps outlining location of SLURS sites in Section 4 of the Assessment of Effects on the Environment 2023
Māori purpose	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		

Wetlands (Schedule A)

1 wetland within the Porirua Coast catchment: Muri Road Wetland (2.0 ha)

Existing Monitoring

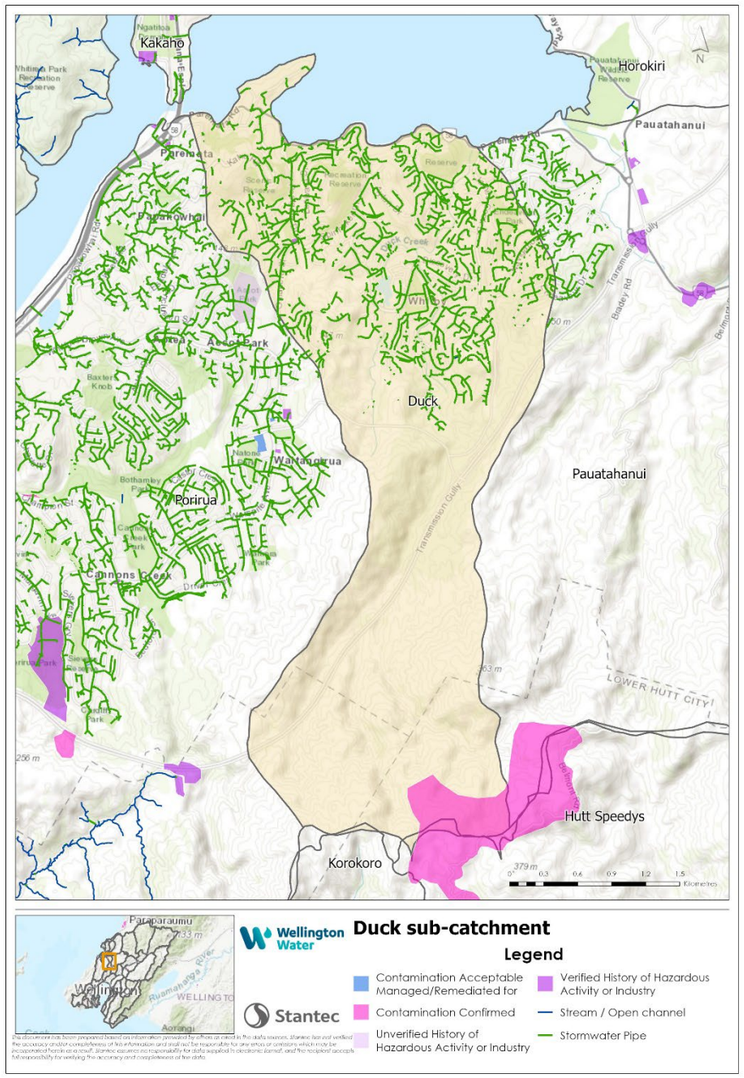
4 monitoring sites (3 coastal sites, and 1 stormwater outlet site). More detail on monitoring locations can be found in the ArcGIS Online StoryMap.

Section 4 of the Assessment of Effects on the Environment 2023 outlines the current state of the environment for this catchment.

1 Three highest land use proportions displayed as % of total area

Stormwater Catchment

Duck



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

Sub-catchment information

Total catchment Area (km^2)	SW Network area (km^2)	SW Network Area (%)	Impervious Surface Area (%)	SW Network length (km)	Number of stormwater outlets
12.0	4.6	39%	15%	72.9	176

Predominant existing land use

Land use proportions (%)[1]		Hazardous Activities and Industries within catchment [2]	
General Residential	43	**SLUR sites**	Detailed maps outlining location of SLURS sites in Section 4 of the Assessment of Effects on the Environment 2023
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		

Wetlands (Schedule A)

2 wetlands within Duck catchment: Pauatahanui Inlet Tidal Flats (466.8 ha), and Duck Creek Saltmarsh (1 ha)

Existing Monitoring

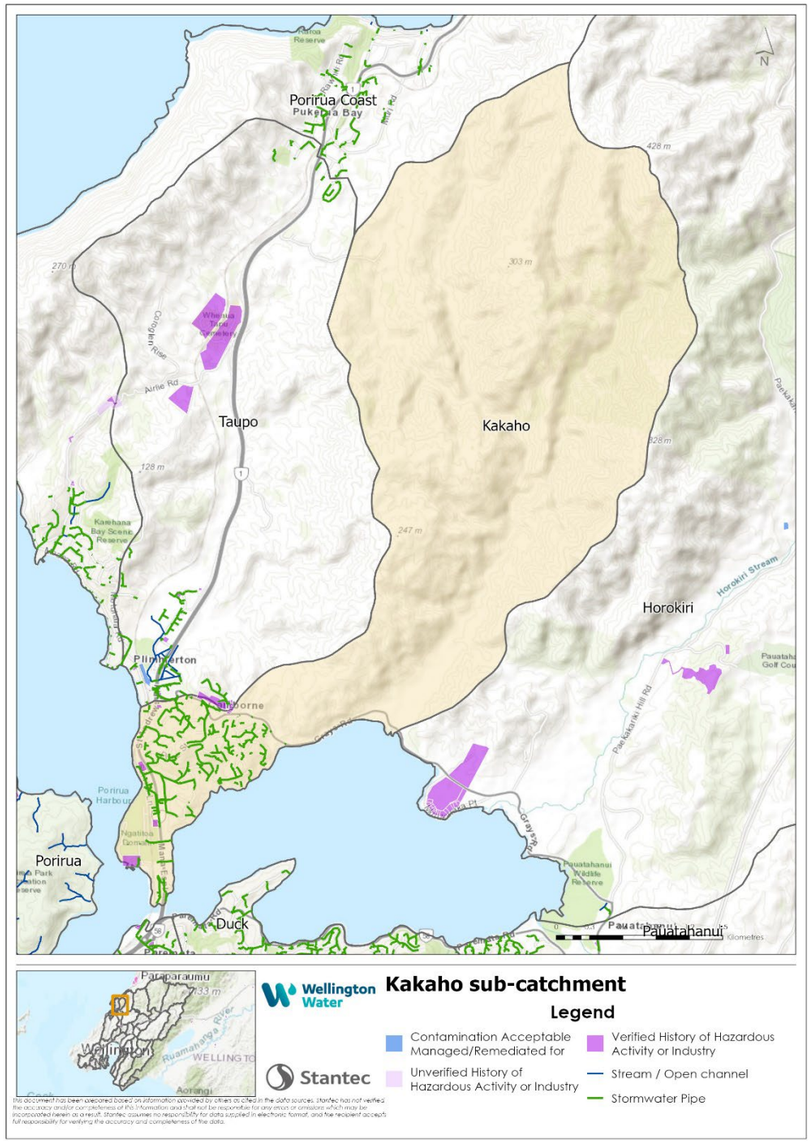
5 monitoring sites (2 freshwater sites, 1 coastal site and 2 stream/marine sediment sites). More detail on monitoring locations can be found in the ArcGIS Online StoryMap.

Section 4 of the Assessment of Effects on the Environment 2023 outlines the current state of the environment for this catchment.

1 Three highest land use proportions displayed as % of total area

Stormwater Catchment

Kakaho



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

Sub-catchment information

Total catchment Area (km^2)	SW Network area (km^2)	SW Network Area (%)	Impervious Surface Area (%)	SW Network length (km)	Number of stormwater outlets
14.8	0.9	6%	3%	14.2	28

Predominant existing land use

Land use proportions (%)[1]		Hazardous Activities and Industries within catchment [2]	
General Rural	49	**SLUR sites**	Detailed maps outlining location of SLURS sites in Section 4 of the Assessment of Effects on the Environment 2023
Rural Lifestyle	32	**Predominant HAIL activities**	• Vehicle refuelling, servicing, and repair (all located in the lower portion of the catchment
General Residential	5		

Wetlands (Schedule A)

3 wetlands within Kakaho catchment: Pauatahanui Inlet Tidal Flats (466.8 ha), Kakaho Saltmarsh (1.94 ha), and Camborne Scarp Wetland (0.2 ha)

Existing Monitoring

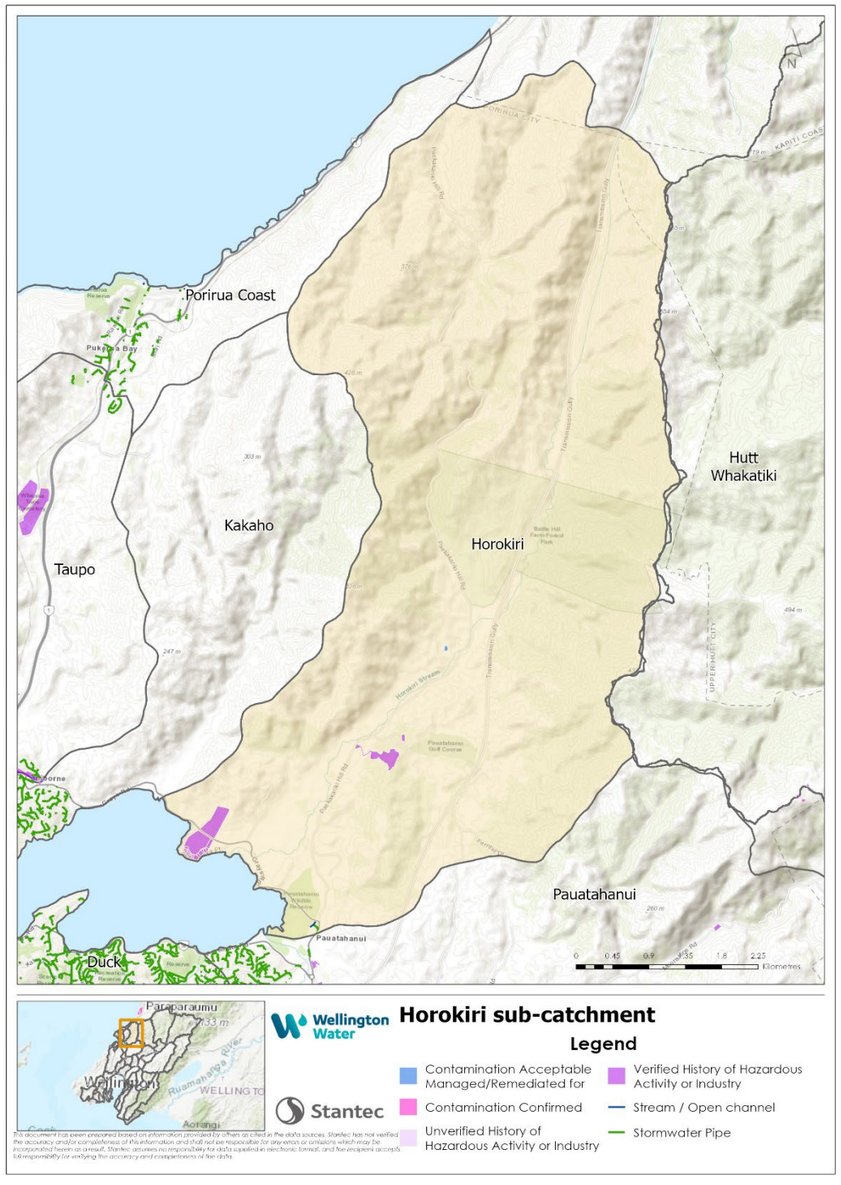
4 monitoring sites (3 coastal sites and 1 stream/marine sediment site). More detail on monitoring locations can be found in the ArcGIS Online StoryMap.

Section 4 of the Assessment of Effects on the Environment 2023 outlines the current state of the environment for this catchment.

1 Three highest land use proportions displayed as % of total area

Stormwater Catchment

Horokiri



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.
- Horokiri Wildlife Reserve is identified in Schedule C of the NRP as sites of significance to Mana Whenua.
- Te Awarua-o-Porirua is listed as Ngā Taonga Nui a Kiwa in Schedule B of the NRP

Sub-catchment information

Total catchment Area (km^2)	SW Network area (km^2)	SW Network Area (%)	Impervious Surface Area (%)	SW Network length (km)	Number of stormwater outlets
41.0	0.0	0%	2%	0	0

Predominant existing land use

Land use proportions (%)[1]		Hazardous Activities and Industries within catchment [2]	
General Rural	63	**SLUR sites**	Detailed maps outlining location of SLURS sites in Section 4 of the Assessment of Effects on the Environment 2023
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		

Wetlands (Schedule A)

6 wetlands within Horokiri catchment. Swampy Gully (Battle Hill (1.4 ha), Kakaho Saltmarsh (1.9 ha), Motukaraka Saltmarsh/Ration Point (0.46 ha), Horokiri Saltmarsh (6.2 ha), Pauatahanui Inlet Saltmarsh (37.1 ha), and Pauatahanui Inlet Tidal Flats (466.8 ha)

Existing Monitoring

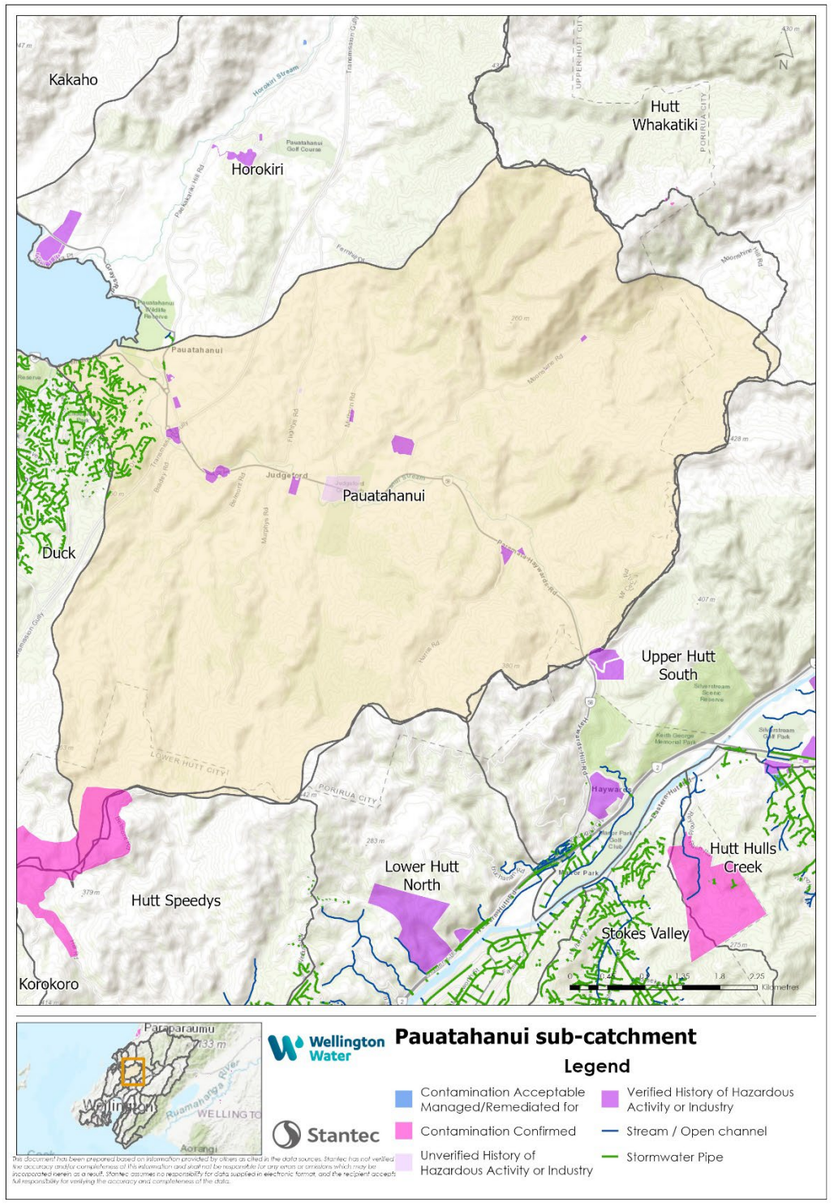
No established monitoring locations in this catchment.

Section 4 of the Assessment of Effects on the Environment 2023 outlines the current state of the environment for this catchment.

1 Three highest land use proportions displayed as % of total area

Stormwater Catchment

Pauatahanui



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

Sub-catchment information

Total catchment Area (km^2)	SW Network area (km^2)	SW Network Area (%)	Impervious Surface Area (%)	SW Network length (km)	Number of stormwater outlets
41.5	0.9	2.3%	4%	13.3	35

Predominant existing land use

Land use proportions (%)[1]		Hazardous Activities and Industries within catchment [2]	
General Rural	70	**SLUR sites**	Detailed maps outlining location of SLURS sites in Section 4 of the Assessment of Effects on the Environment 2023
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		

Wetlands (Schedule A)

2 wetlands within Pauatahanui catchment: Pauatahanui Inlet Saltmarsh (37.1 ha), and Pauatahanui Inlet Tidal Flats (466.8 ha)

Existing Monitoring

No established monitoring locations in this catchment.

Section 4 of the Assessment of Effects on the Environment 2023 outlines the current state of the environment for this catchment.

1 Three highest land use proportions displayed as % of total area

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 7**.

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.

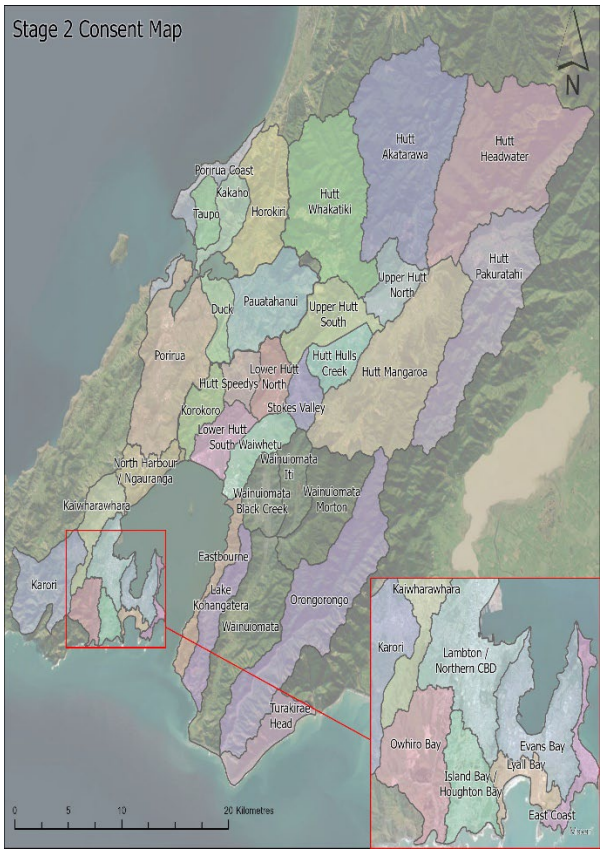


Figure D 5 Map showing the Wellington City catchments.

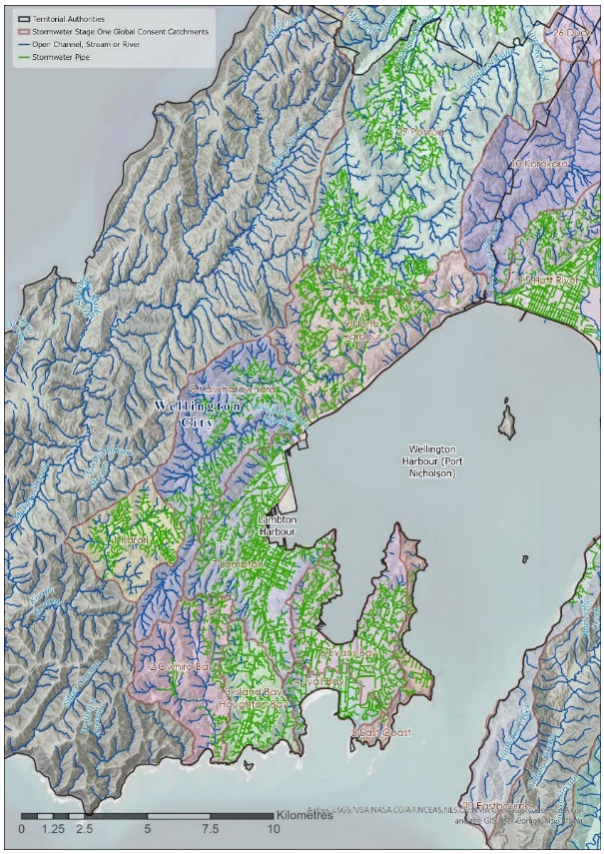


Figure D 6 Map showing the stormwater network in Wellington City.

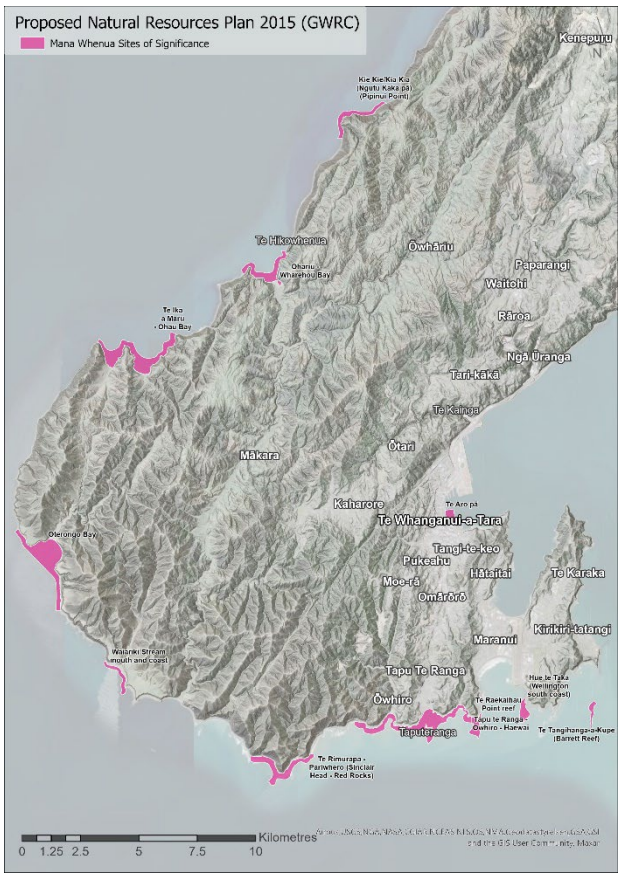


Figure D 7 Map showing the outstanding water bodies, Ngā Taonga Nui-a-Kīwa and aquatic sites with significant mana whenua values identified (Sch A-C of NRP).

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 [2] from the Stage 1 Global Stormwater Consent shown in **Figure D 8** and **Table D-2** 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[3].

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

[3] *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*

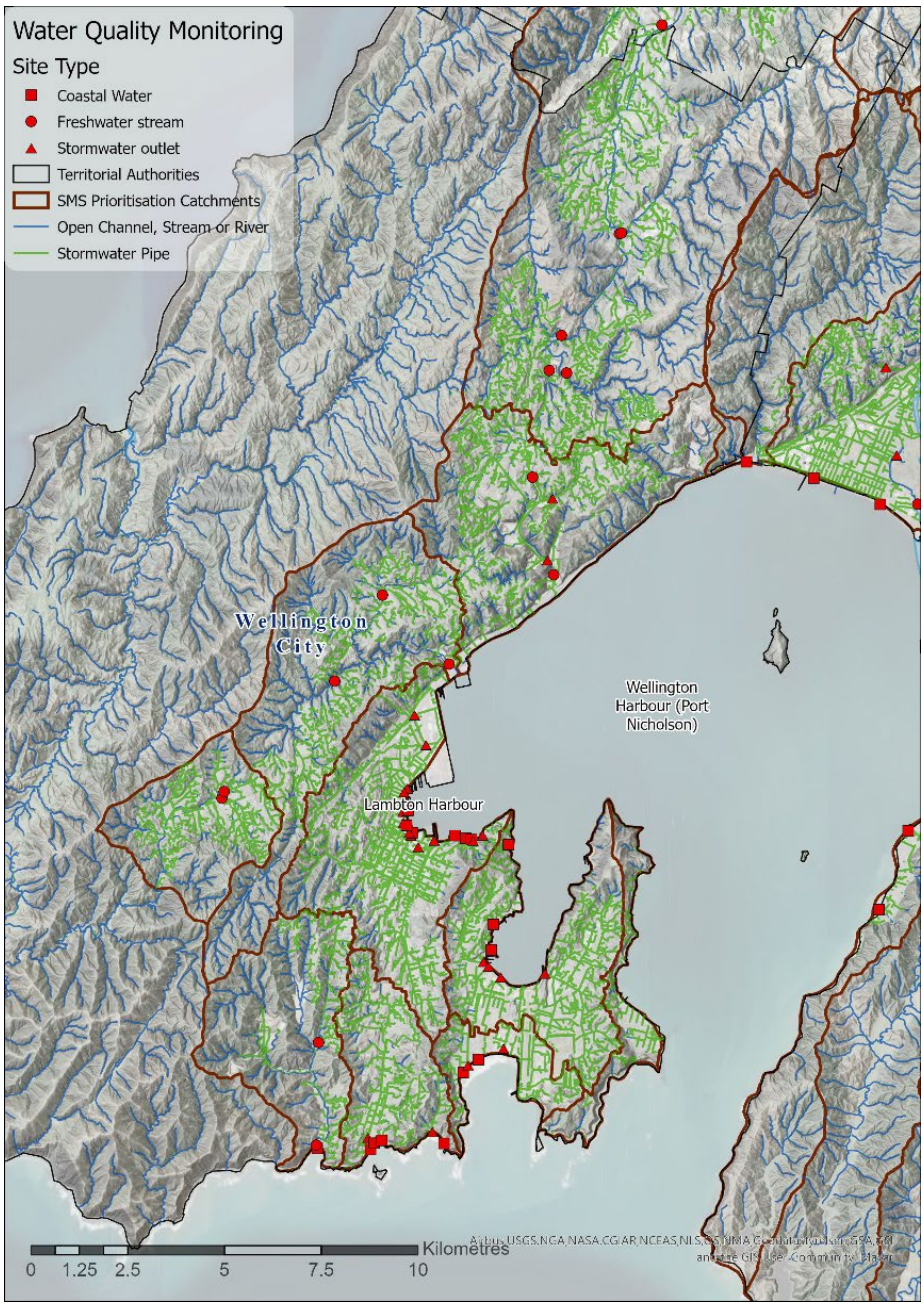


Figure D 8 Monitoring locations for the Stage 1 Global Stormwater Consent in the Wellington City catchments.

Table D-2 Overview of receiving environment water quality across the Wellington catchments, based on monitoring data collected for the Stage 1 Global Stormwater 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	NM	Not met	Met	Met	Met (at Wairepo Lagoon and Oriental Bay	NM	NM

Water Quality parameter	Karori	Owhiro	Wellington south coast	Evans Bay	Lambton CBD	Kaiwhara-whara	Waitohu
recreation, NRP 018-95%ile <540)					Not met (Waterfront at Shed 6 and Taranaki Diving Platform)		
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?

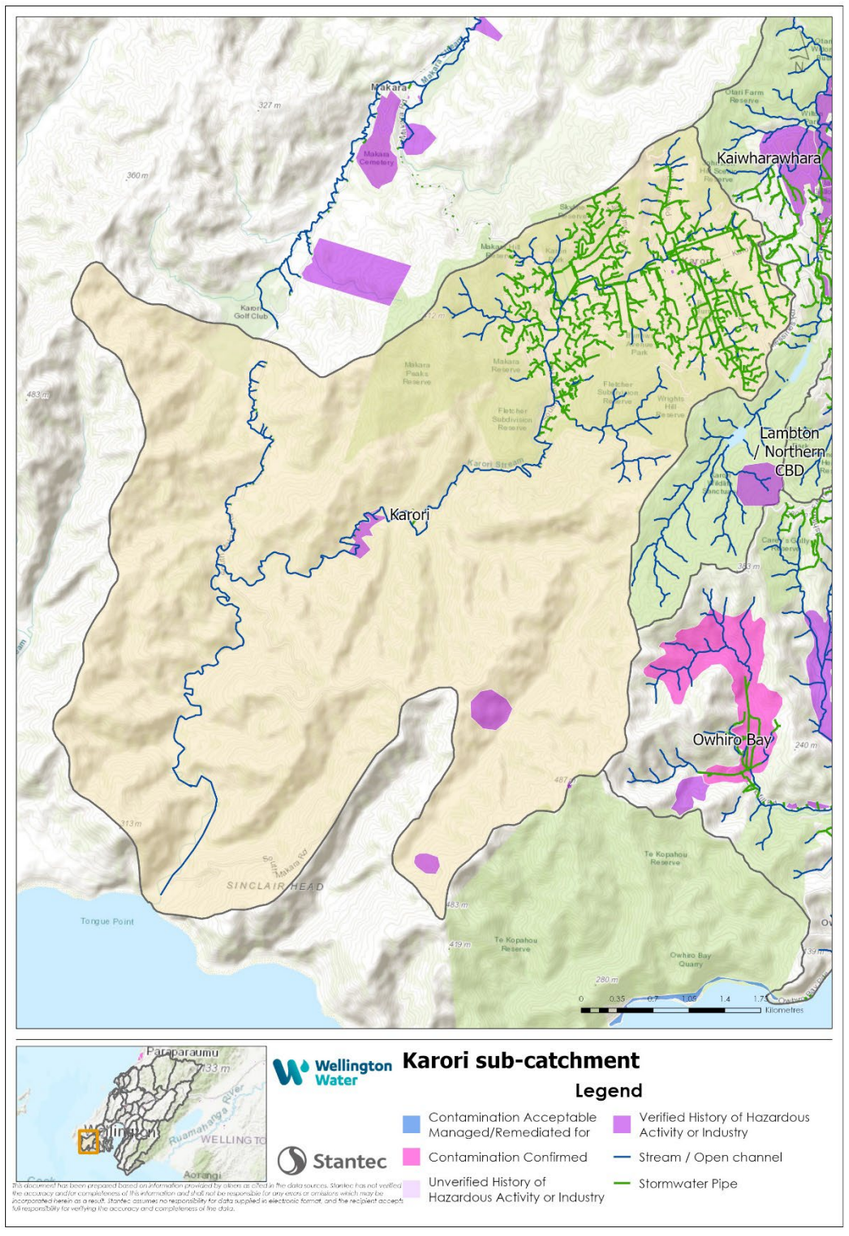
The case study of the Waitangi Park Wetland below is an early example of water sensitive design within the Wellington urban area. It is an internationally recognised response to urban stormwater management in Wellington City.

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

Karori



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 on 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).
- The urbanised area of Karori is predominantly residential, but with significant commercial and community infrastructure.

Sub-catchment information

Total catchment Area (km^2)	SW Network area (km^2)	SW Network Area (%)	Impervious Surface Area (%)	SW Network length (km)	Number of stormwater outlets
31.0	3.1	10	5	58.5	125

Predominant existing land use

Land use proportions (%)[1]		Hazardous Activities and Industries within catchment	
Outer Residential:	44	**SLUR sites**	Detailed maps outlining location of SLURS sites in Section 4 of the Assessment of Effects on the Environment 2023
Conservation:	34	**Predominant HAIL activities**	• Western Treatment plant and septic tank present in this catchment • Two shooting ranges are in the catchment.
Open Space B:	9		

Wetlands (Schedule A)

No Schedule A wetlands present in catchment

Existing Monitoring

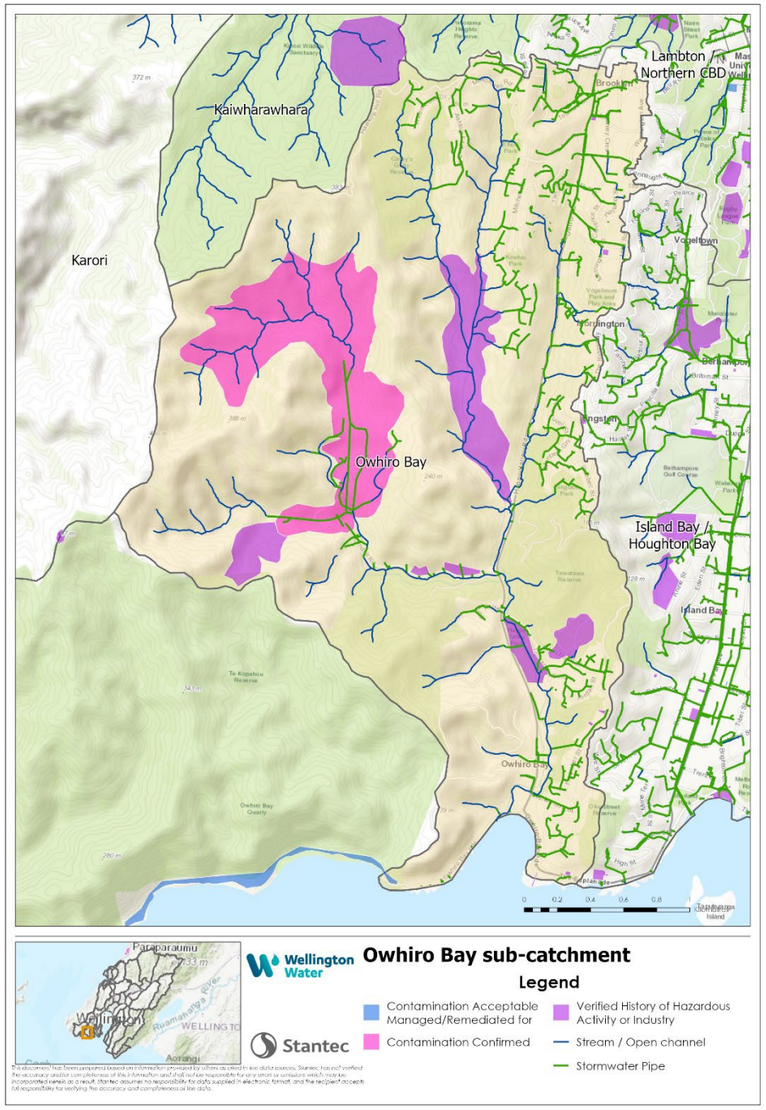
4 monitoring sites (2 freshwater sites, 1 RWQE site, 1 stream/ marine sediment site). More detail on monitoring locations can be found in the ArcGIS Online StoryMap.

Section 4 of the Assessment of Effects on the Environment 2023 outlines the current state of the environment for this catchment.

1 Three highest land use proportions displayed as % of total area

Stormwater Catchment

Owhiro Bay



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.
-

Sub-catchment information

Total catchment Area (km^2)	SW Network area (km^2)	SW Network Area (%)	Impervious Surface Area (%)	SW Network length (km)	Number of stormwater outlets
9.7	2.1	21	6	30.9	81

Predominant existing land use

Land use proportions (%)[1]		Hazardous Activities and Industries within catchment	
Gorse Scrubland	85	**SLUR sites**	Detailed maps outlining location of SLURS sites in Section 4 of the Assessment of Effects on the Environment 2023
Urban	7	**Predominant HAIL activities**	• Multiple landfills are present in this catchment • Clean fill storage of construction waste
Pastoral	4		

Wetlands (Schedule A)

No Schedule A wetlands present in catchment

Existing Monitoring

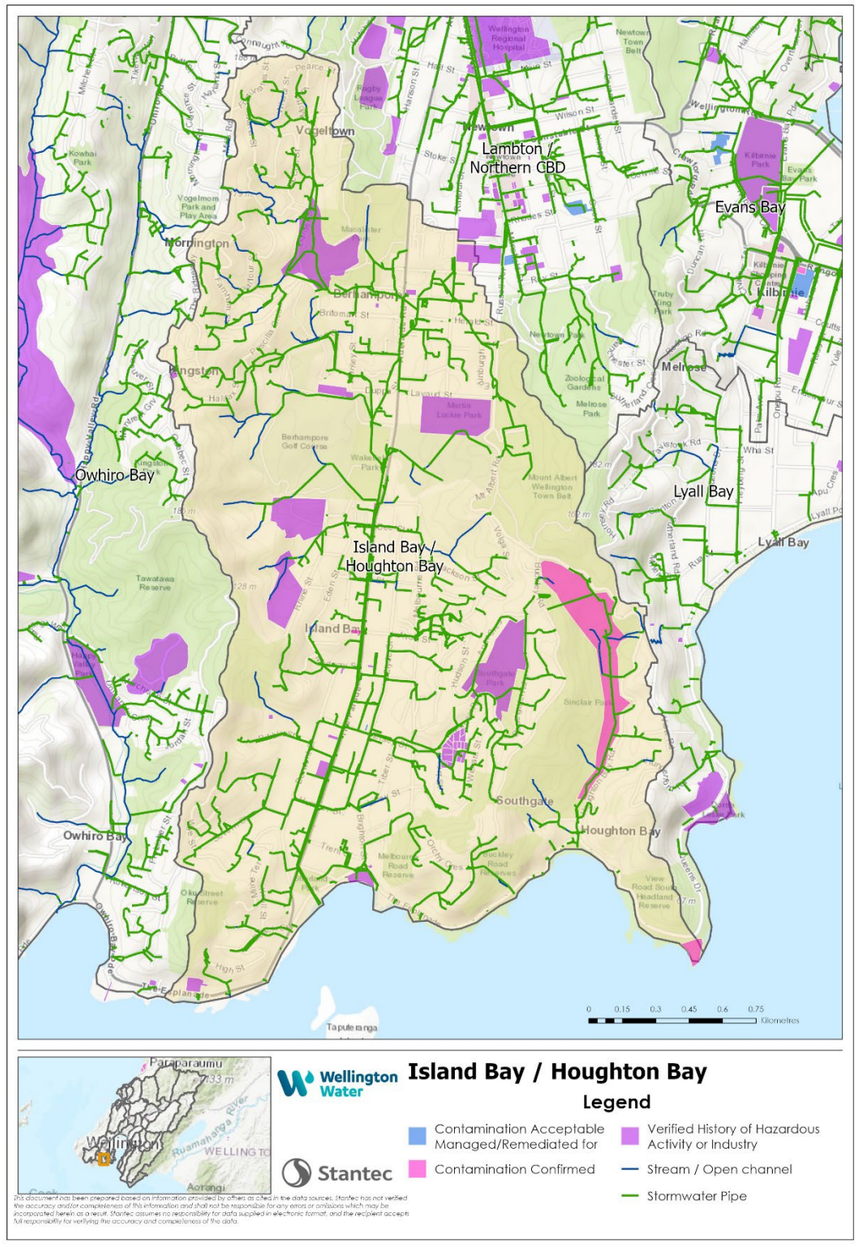
5 monitoring sites (2 freshwater sites, 1 coastal site, 1 RWQE site, 1 stream/ marine sediment site). More detail on monitoring locations can be found in the ArcGIS Online StoryMap.

Section 4 of the Assessment of Effects on the Environment 2023 outlines the current state of the environment for this catchment.

1 Three highest land use proportions displayed as % of total area

Stormwater Catchment

Island Bay/ Houghton Bay



Key Issues for Stormwater Management

- 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).

Sub-catchment information

Total catchment Area (km^2)	SW Network area (km^2)	SW Network Area (%)	Impervious Surface Area (%)	SW Network length (km)	Number of stormwater outlets
6.0	4.2	70	17	56.2	52

Predominant existing land use

Land use proportions (%)[1]		Hazardous Activities and Industries within catchment	
Outer residential:	43	**SLUR sites**	Detailed maps outlining location of SLURS sites in Section 4 of the Assessment of Effects on the Environment 2023
Open Space C:	20	**Predominant HAIL activities**	• Historic landfills • Sports grounds managed with chemical treatment • Septic tanks
Open Space B:	9		

Wetlands (Schedule A)

No Schedule A wetlands present in catchment

Existing Monitoring

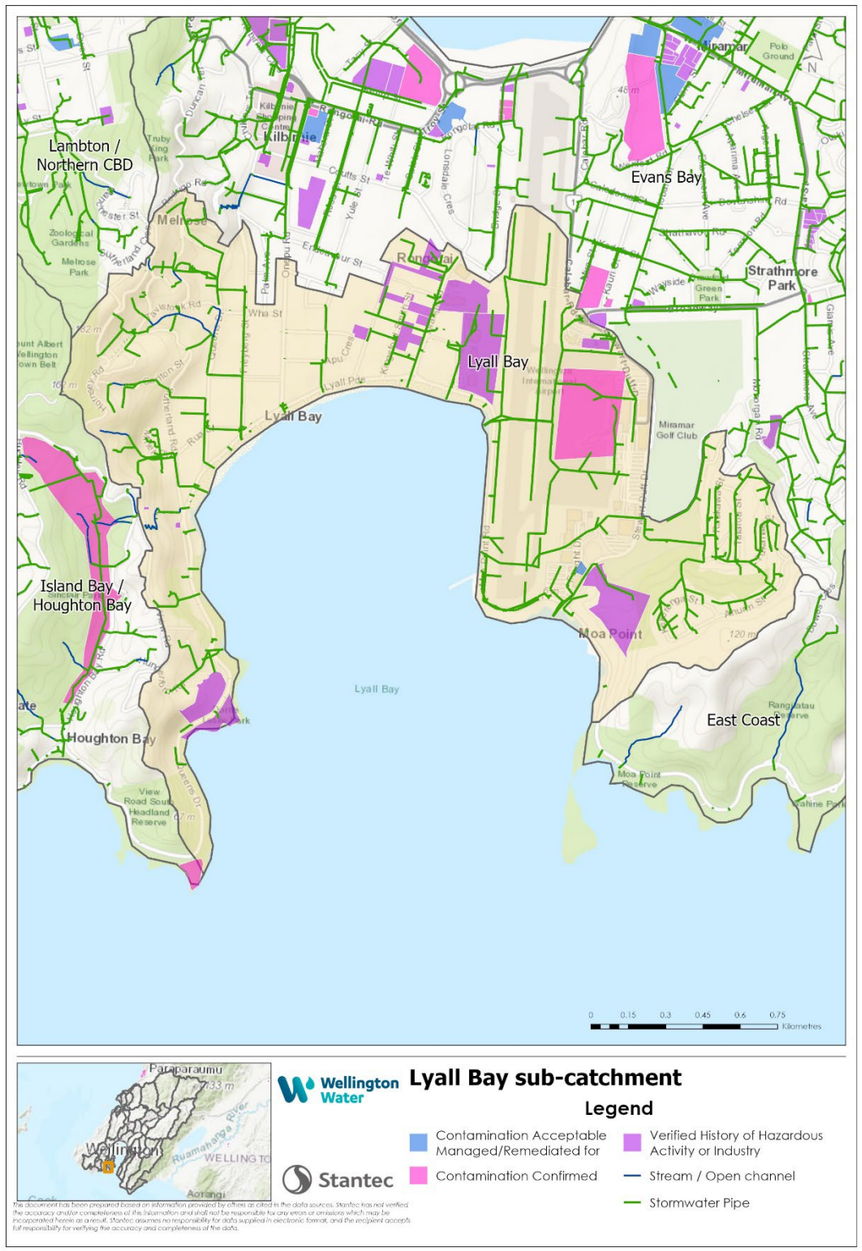
6 monitoring sites (4 coastal sites and 2 stormwater outlet sites). More detail on monitoring locations can be found in the ArcGIS Online StoryMap.

Section 4 of the Assessment of Effects on the Environment 2023 outlines the current state of the environment for this catchment.

1 Three highest land use proportions displayed as % of total area

Stormwater Catchment

Lyall Bay



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.

Sub-catchment information

Total catchment Area (km^2)	SW Network area (km^2)	SW Network Area (%)	Impervious Surface Area (%)	SW Network length (km)	Number of stormwater outlets
2.8	2.1	73	34	26.3	32

Predominant existing land use

Land use proportions (%)[1]		Hazardous Activities and Industries within catchment	
Outer residential:	36	**SLUR sites**	Detailed maps outlining location of SLURS sites in Section 4 of the Assessment of Effects on the Environment 2023
Airport	35	**Predominant HAIL activities**	• Historic quarry • Bulk storage of hydrocarbons • Chemical storage
Open Space B:	11		

Wetlands (Schedule A)

No Schedule A wetlands present in catchment

Existing Monitoring

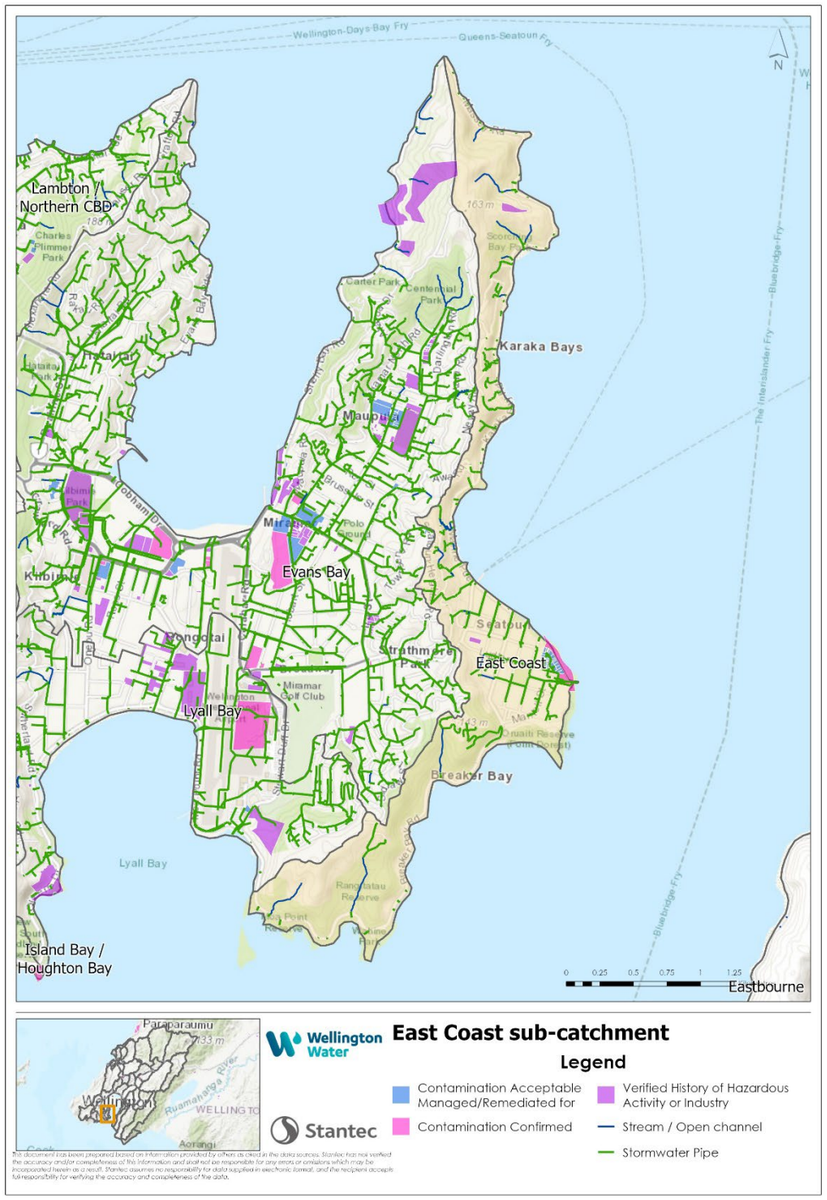
4 monitoring sites (2 coastal sites and 2 stormwater outlet sites). More detail on monitoring locations can be found in the ArcGIS Online StoryMap.

Section 4 of the Assessment of Effects on the Environment 2023 outlines the current state of the environment for this catchment.

1 Three highest land use proportions displayed as % of total area

Stormwater Catchment

East Coast



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.

Sub-catchment information

Total catchment Area (km^2)	SW Network area (km^2)	SW Network Area (%)	Impervious Surface Area (%)	SW Network length (km)	Number of stormwater outlets
2.9	1.1	36	20	12.2	30

Predominant existing land use

Land use proportions (%)[1]		Hazardous Activities and Industries within catchment	
Outer Residential:	36	**SLUR sites**	Detailed maps outlining location of SLURS sites in Section 4 of the Assessment of Effects on the Environment 2023
Open Space B:	34	**Predominant HAIL activities**	• Subsurface storage of chemicals • Sports grounds managed with chemical treatment
Conservation:	11		

Wetlands (Schedule A)

No Schedule A wetlands present in catchment

Existing Monitoring

No monitoring sites within this catchment.

Section 4 of the Assessment of Effects on the Environment 2023 outlines the current state of the environment for this catchment.

1 Three highest land use proportions displayed as % of total area

Stormwater Catchment

Evans Bay

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.

Sub-catchment information

Total catchment Area (km^2)	SW Network area (km^2)	SW Network Area (%)	Impervious Surface Area (%)	SW Network length (km)	Number of stormwater outlets
9.5	5.9	62	25	102.6	51

Predominant existing land use

Land use proportions (%)[1]		Hazardous Activities and Industries within catchment	
Outer Residential:	48	**SLUR sites**	Detailed maps outlining location of SLURS sites in Section 4 of the Assessment of Effects on the Environment 2023
Open Space B:	9	**Predominant HAIL activities**	• Historic landfill sites • Air Force base • Industrial activities such as mechanics, electroplating, painting • Public transport depot
Airport:	5		

Wetlands (Schedule A)

No Schedule A wetlands present in catchment

Existing Monitoring

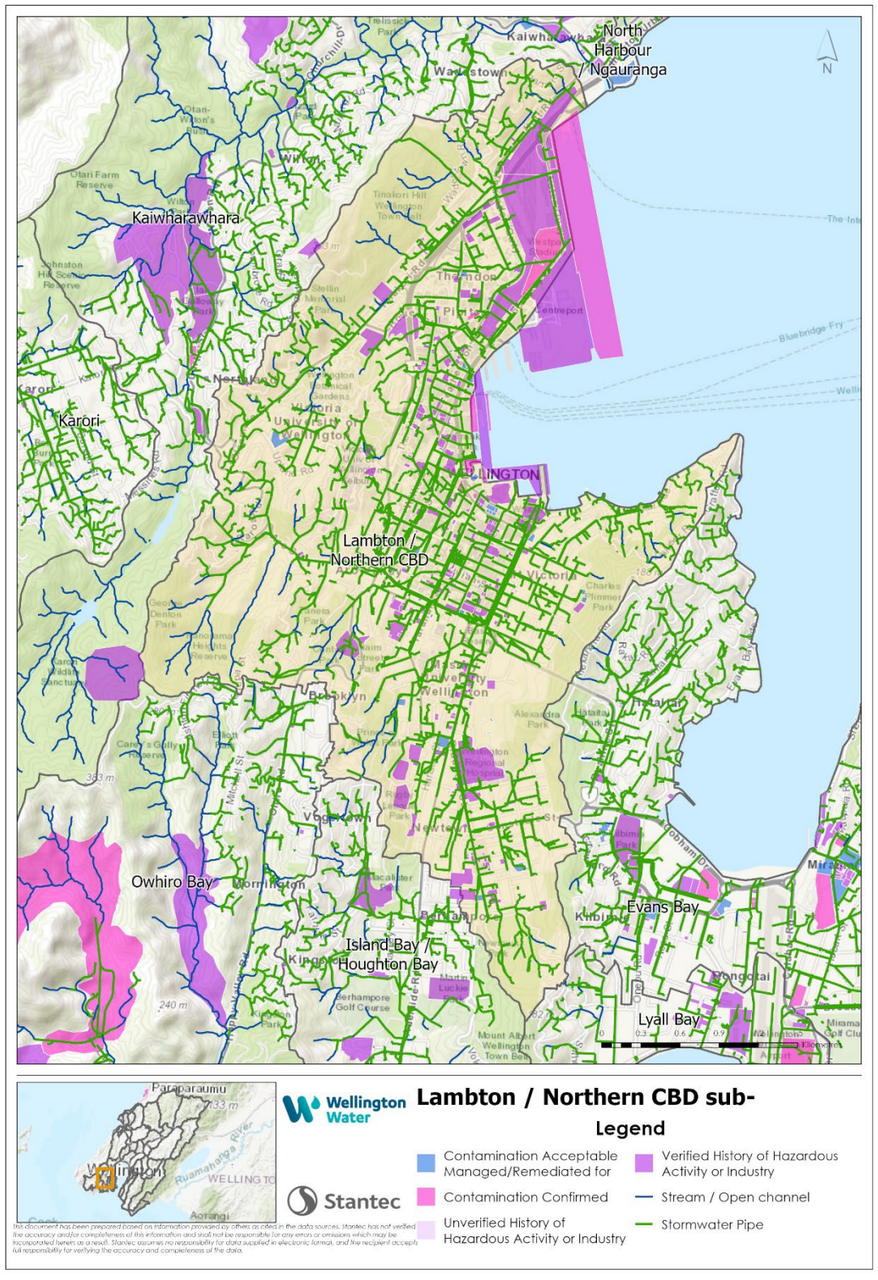
7 monitoring sites (3 freshwater sites and 4 stormwater outlet sites). More detail on monitoring locations can be found in the ArcGIS Online StoryMap.

Section 4 of the Assessment of Effects on the Environment 2023 outlines the current state of the environment for this catchment.

1 Three highest land use proportions displayed as % of total area

Stormwater Catchment

Lambton



Key Issues for Stormwater Management

- Wellington Railway station is in this catchment
- State Highway 1 runs through 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.

Sub-catchment information

Total catchment Area (km^2)	SW Network area (km^2)	SW Network Area (%)	Impervious Surface Area (%)	SW Network length (km)	Number of stormwater outlets
13.7	8.5	62	26	155.7	92

Predominant existing land use

Land use proportions (%)[1]		Hazardous Activities and Industries within catchment	
Open Space C:	19	**SLUR sites**	Detailed maps outlining location of SLURS sites in Section 4 of the Assessment of Effects on the Environment 2023
Inner Residential:	20	**Predominant HAIL activities**	• Wellington Port • Historic landfills • Chemical storage • Cemetery • Industrial activities such as mechanics, and painting
Central Area:	15		

Wetlands (Schedule A)

No Schedule A wetlands present in catchment

Existing Monitoring

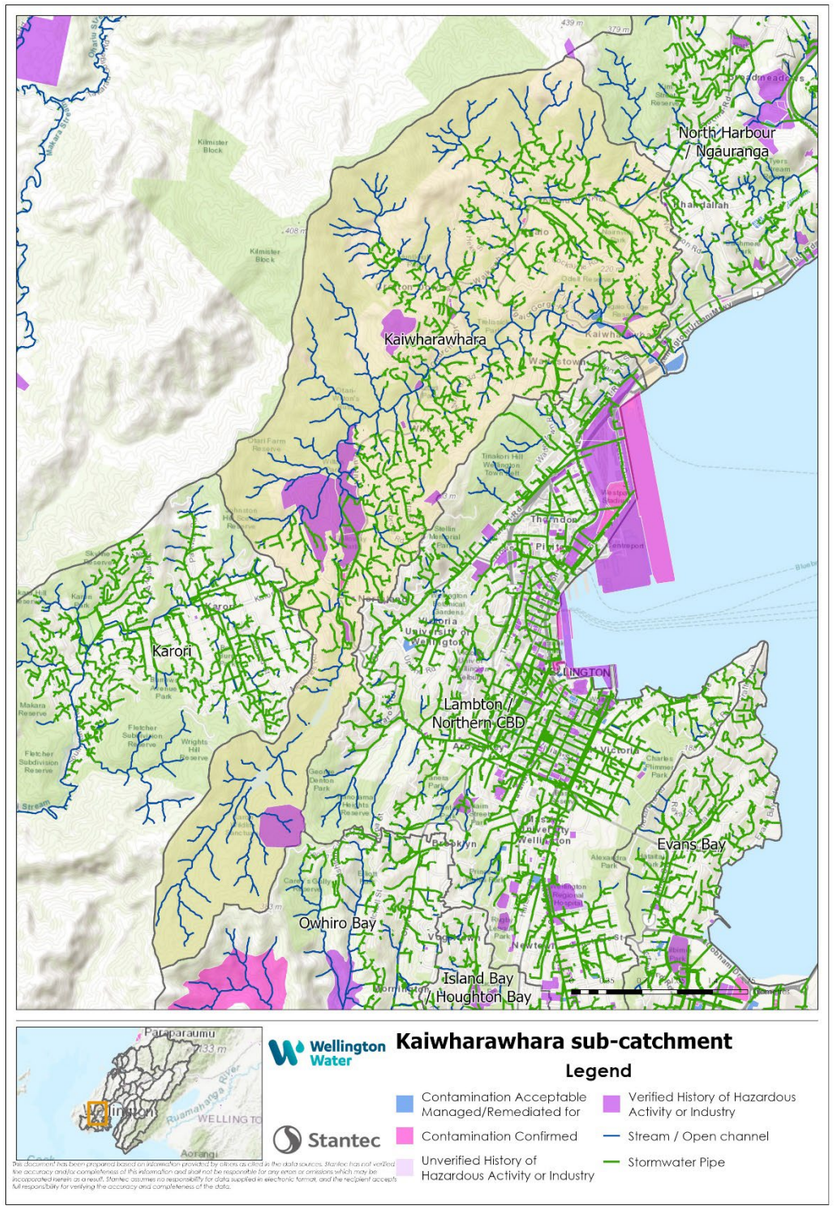
34 monitoring sites (6 coastal sites, 13 stormwater outlet sites, and 15 stream/ marine sediment sites). More detail on monitoring locations can be found in the ArcGIS Online StoryMap.

Section 4 of the Assessment of Effects on the Environment 2023 outlines the current state of the environment for this catchment.

1 Three highest land use proportions displayed as % of total area

Stormwater Catchment

Kaiwharawhara



Key Issues for Stormwater Management

- Kaiwharawhara piped stream of significance to Mana Whenua is present in this catchment.
- 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.

Sub-catchment information

Total catchment Area (km^2)	SW Network area (km^2)	SW Network Area (%)	Impervious Surface Area (%)	SW Network length (km)	Number of stormwater outlets
16.6	5.5	33	10	83.8	242

Predominant existing land use

Land use proportions (%)[1]		Hazardous Activities and Industries within catchment	
Outer Residential:	33	**SLUR sites**	Detailed maps outlining location of SLURS sites in Section 4 of the Assessment of Effects on the Environment 2023
Conservation:	32	**Predominant HAIL activities**	• Cemetery • Storage of chemicals • Historic landfill • Sports grounds managed with chemical treatment
Open Space B:	21		

Wetlands (Schedule A)

No Schedule A wetlands present in catchment

Existing Monitoring

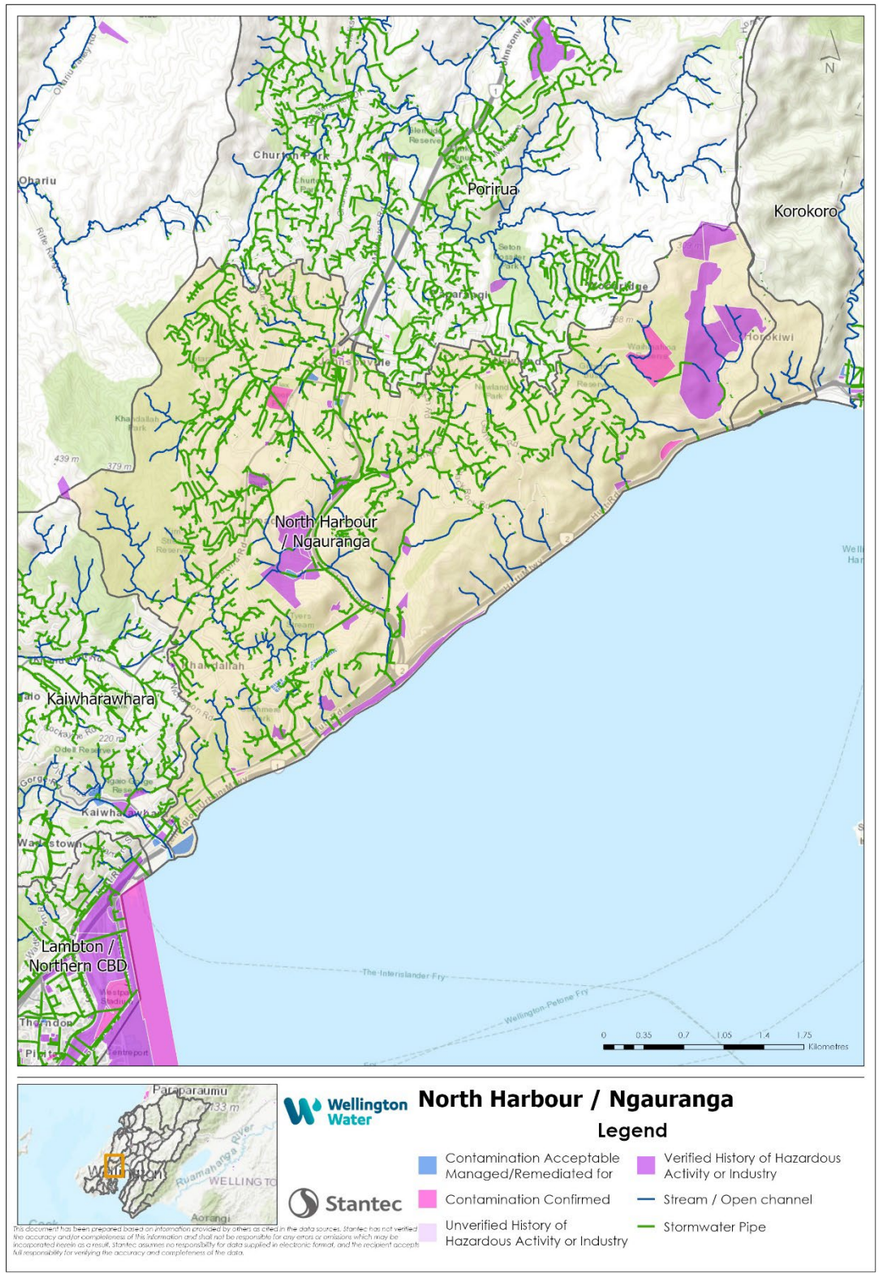
5 monitoring sites (3 freshwater sites, 1 RWQE site, 1 stream/ marine sediment site). More detail on monitoring locations can be found in the ArcGIS Online StoryMap.

Section 4 of the Assessment of Effects on the Environment 2023 outlines the current state of the environment for this catchment.

1 Three highest land use proportions displayed as % of total area

Stormwater Catchment

Ngauranga/North Harbour



Key Issues for Stormwater Management

- The catchment is bisected by the Wellington to Porirua motorway (State Highway 1).
- 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.
- No sites of significance to Mana Whenua are listed in NRP Schedule C.

Sub-catchment information

Total catchment Area (km^2)	SW Network area (km^2)	SW Network Area (%)	Impervious Surface Area (%)	SW Network length (km)	Number of stormwater outlets
15.8	7.1	45%	15%	104.4	225

Predominant existing land use

Land use proportions (%)[1]		Hazardous Activities and Industries within catchment	
Outer Residential:	33	**SLUR sites**	Detailed maps outlining location of SLURS sites in Section 4 of the Assessment of Effects on the Environment 2023.
Rural	17	**Predominant HAIL activities**	• B4 (power stations, substations, or switchyards) • F7 (service stations including retail or commercial refuelling facilities) • G3 (landfill sites)
Open Space B:	14		

Wetlands (Schedule A)

No Schedule A wetlands present in catchment

Existing Monitoring

5 monitoring sites (2 freshwater sites, 2 stormwater outlet sites, 1 stream/ marine sediment site). More detail on monitoring locations can be found in the ArcGIS Online StoryMap.

Section 4 of the Assessment of Effects on the Environment 2023 outlines the current state of the environment for this catchment.

1 Three highest land use proportions displayed as % of total area

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.

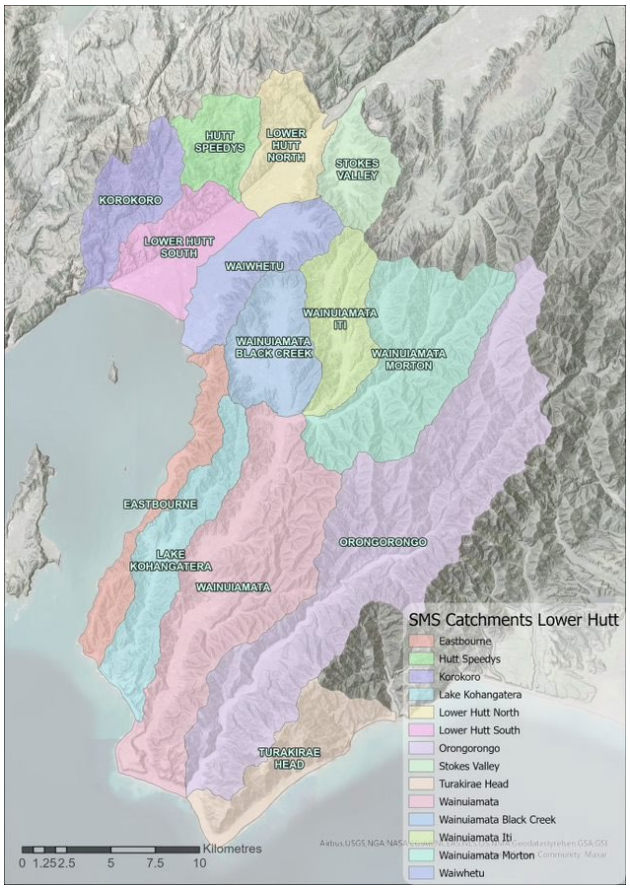


Figure D 9 Map showing Hutt City Catchments

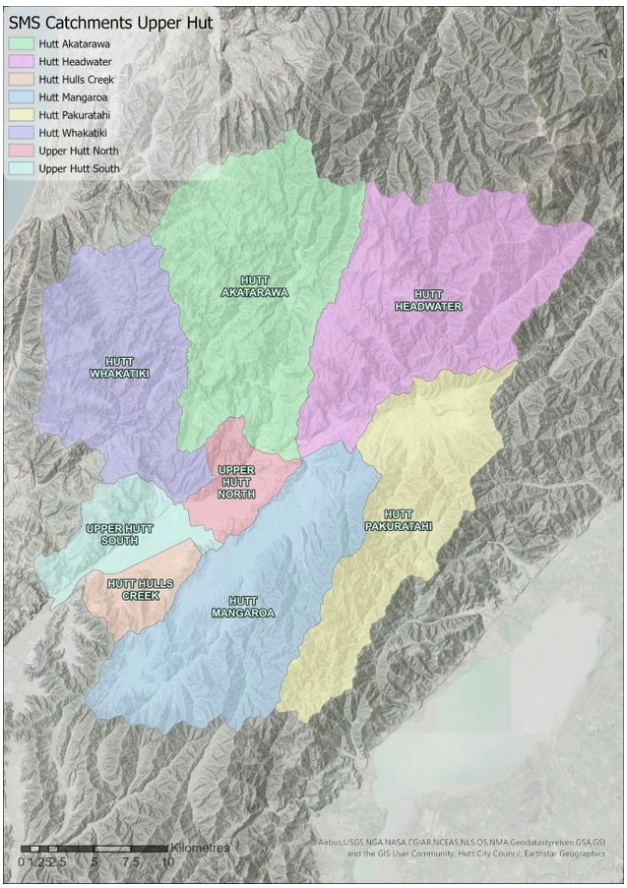


Figure D 10 Map showing Upper Hutt City Catchments

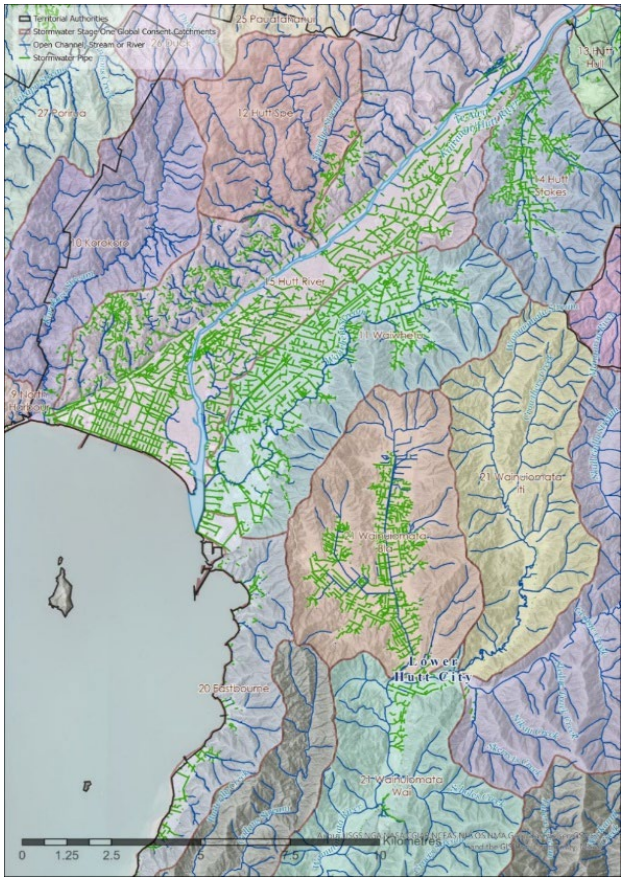


Figure D 11 Map showing the Stormwater network in City

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 [4] from the Stage 1 Global Stormwater Consent shown in **Figure D 13** and **Figure D 14** below indicate better water quality in the upper reaches of the Hutt River, but that other sites have poor water quality in regards to *E. coli*, copper, zinc and nutrients, shown in **Table D-3** and **Table D-4**.

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

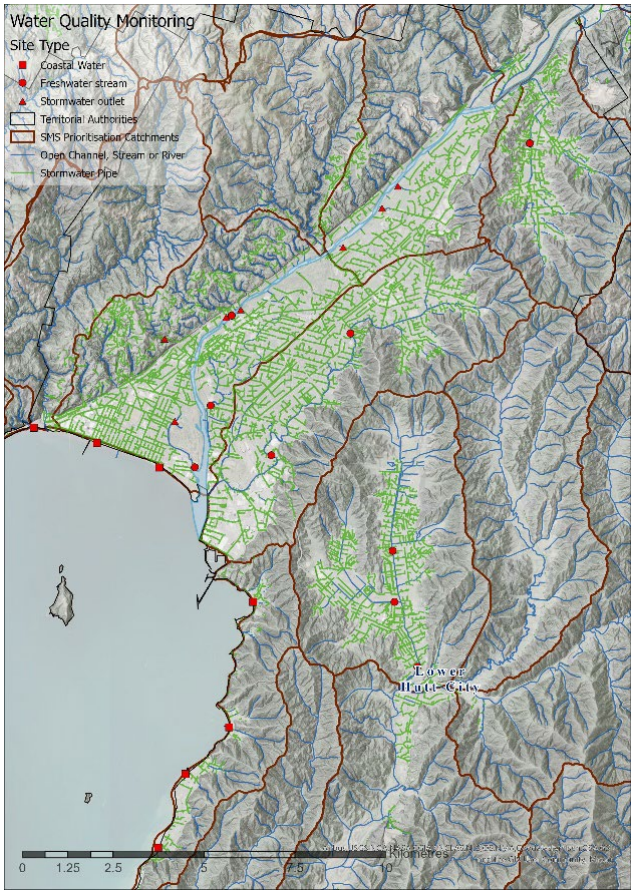


Figure D 13 Monitoring locations for the Stage 1 Stormwater Consent in Hutt City

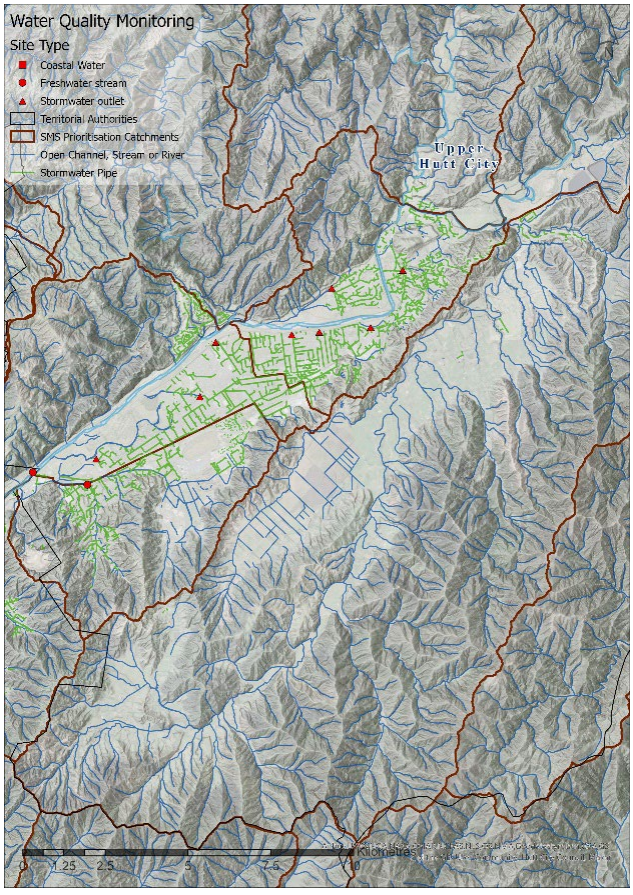


Figure D 14 Monitoring locations for the Stage 1 Global Global Stormwater Consent in Upper Hutt catchments. Catchments

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 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
Ammonia-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
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 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?

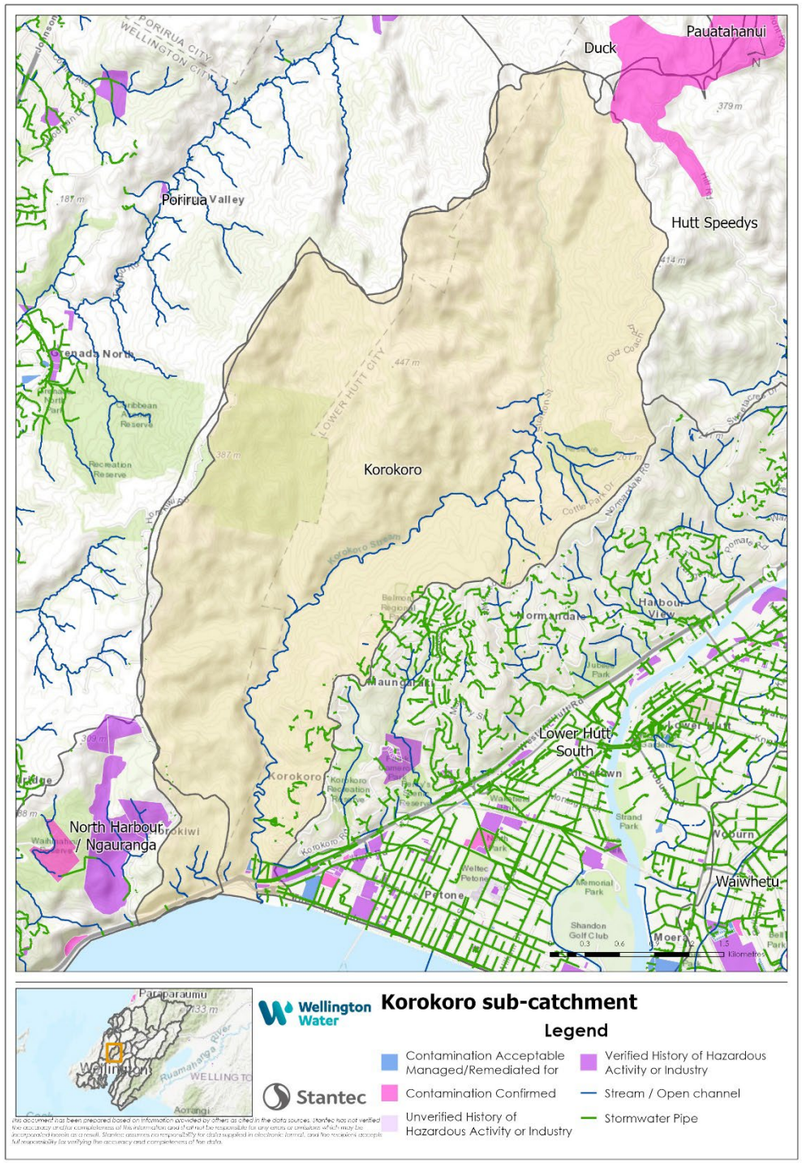
The Riverlink project in Hutt City in the case study below highlights several challenges and opportunities for stormwater management where the available space to incorporate and retrofit water quality devices is limited within the existing urban footprint.

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 waterbodies, particularly during and immediately following rainfall events.

Stormwater Catchment

Korokoro



Key Issues for Stormwater Management

- State Highway 2 bisects the base of this catchment.
- Korokoro Stream drains a moderately small catchment which is mostly mature indigenous forest and scrub, including the last significant stand of rimu-rata-tawa-kohekohe in the southwest of the Wellington Region.
- Korokoro Stream is identified in Schedule F1 of NRP as a watercourse with significant indigenous value and Schedule C as a site of significance for mana whenua.
- Catchment drains into the Wellington Harbour which is identified in Schedule B of the NRP as a taonga by mana whenua.

Sub-catchment information

Total catchment Area (km^2)	SW Network area (km^2)	SW Network Area (%)	Impervious Surface Area (%)	SW Network length (km)	Number of stormwater outlets
16.6	5.5	33	10	83.8	242

Predominant existing land use

Land use proportions (%)	Hazardous Activities and Industries within catchment	
Land use is mostly mature indigenous forest and scrub with light commercial and industrial area at the bottom of the catchment	**SLUR sites**	Detailed maps outlining location of SLURS sites in Section 4 of the Assessment of Effects on the Environment 2023
	Predominant HAIL activities	• Foundry using iron, aluminium, and bronze • Hydrocarbon storage • Motor vehicle manufacturing

Wetlands (Schedule A)

No Schedule A wetlands present in catchment

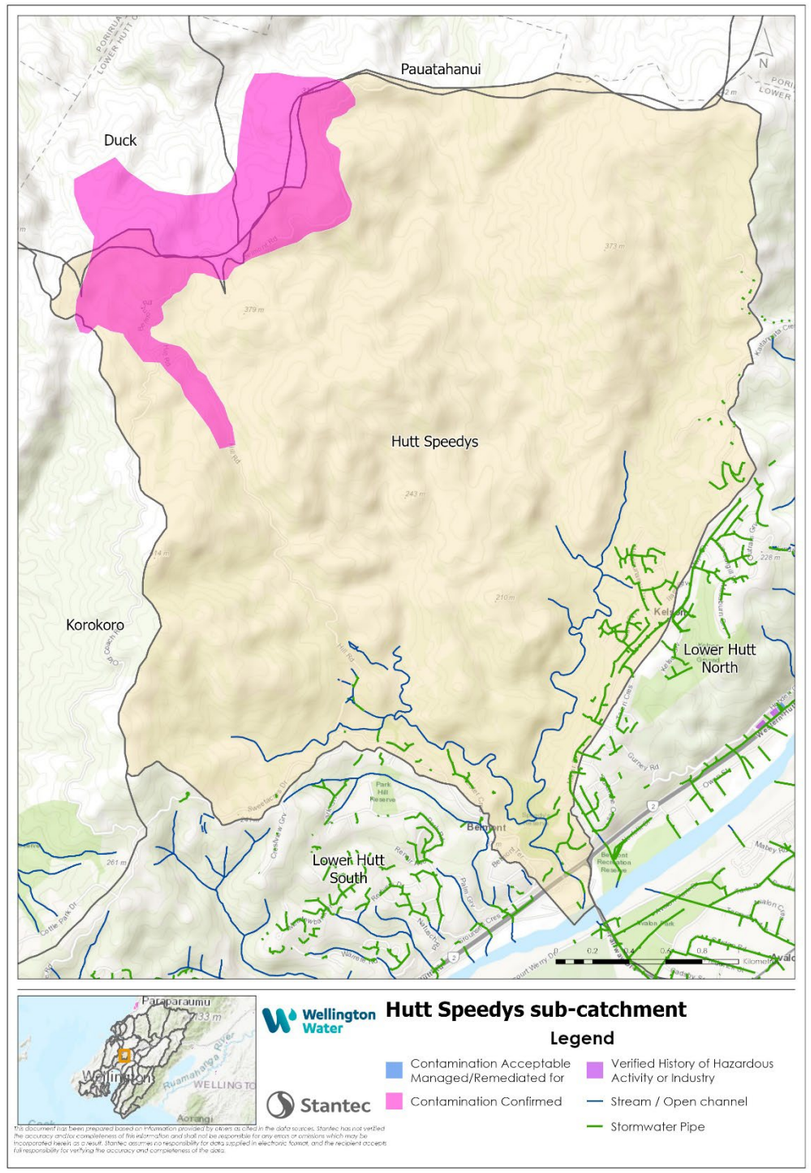
Existing Monitoring

1 monitoring site (1 coastal site). More detail on monitoring locations can be found in the ArcGIS Online StoryMap.

Section 4 of the Assessment of Effects on the Environment 2023 outlines the current state of the environment for this catchment.

Stormwater Catchment

Speedys



Key Issues for Stormwater Management

- The base of this catchment is bisected by State Highway 2
- Speedys Stream drains a small steep forested catchment on the western side of the Hutt River valley adjacent to the suburb of Kelson and joins the Hutt River on its true right bank immediately downstream of the Kennedy Good Bridge.
- Catchment-wide contaminant sources are dominated by runoff from pasture, regenerating forest and scrub.
- Schedule C4 of the PNRP identifies the confluence of Speedys Stream with the Hutt River as a site of significance to mana whenua

Sub-catchment information

Total catchment Area (km^2)	SW Network area (km^2)	SW Network Area (%)	Impervious Surface Area (%)	SW Network length (km)	Number of stormwater outlets
11.7	0.9	8	6	7.4	23

Predominant existing land use

Land use proportions (%)	Hazardous Activities and Industries within catchment	
Urban area is predominately residential, remaining catchment is open space, predominately in pasture, scrub and indigenous forest	**SLUR sites**	Detailed maps outlining location of SLURS sites in Section 4 of the Assessment of Effects on the Environment 2023
	Predominant HAIL activities	• Historic ammunition storage

Wetlands (Schedule A)

No Schedule A wetlands present in catchment

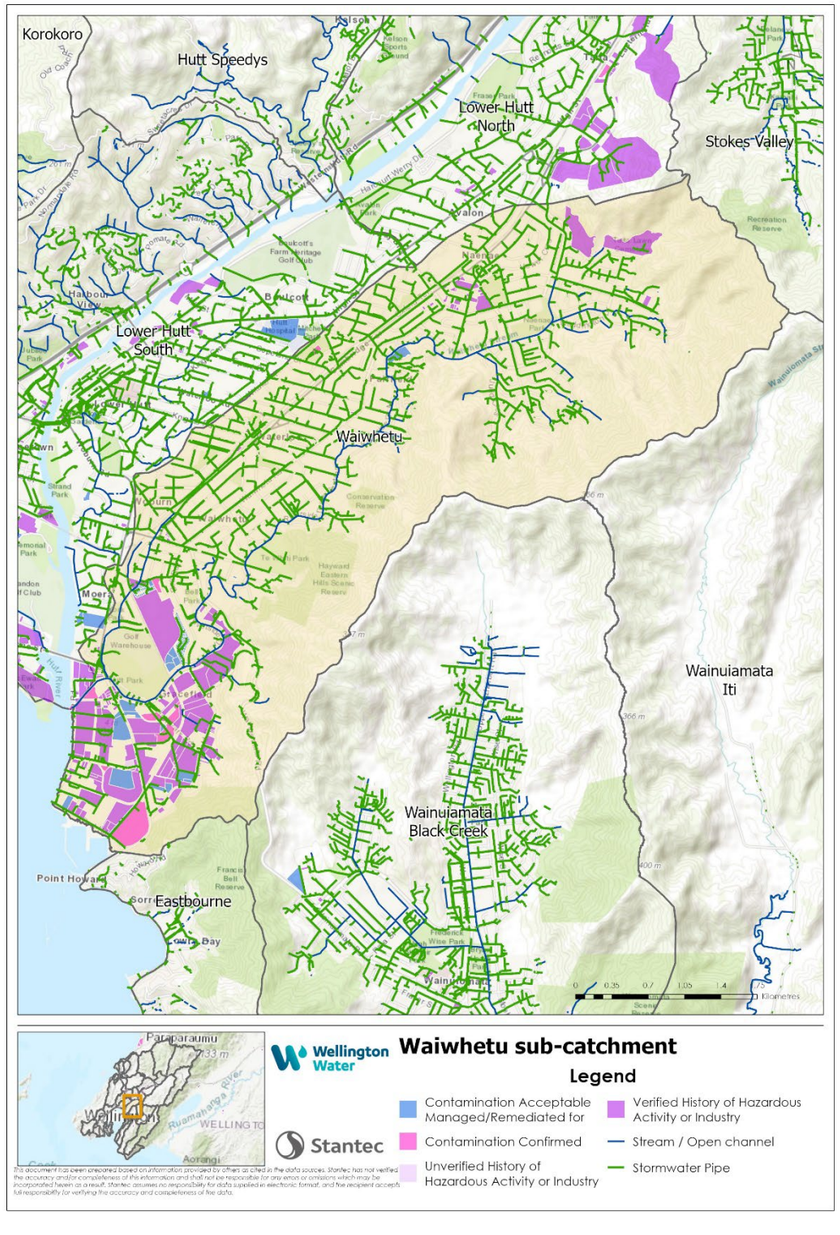
Existing Monitoring

No monitoring sites within this catchment.

Section 4 of the Assessment of Effects on the Environment 2023 outlines the current state of the environment for this catchment.

Stormwater Catchment

Waiwhetu



Key Issues for Stormwater Management

- A large industrial area is present at the base of this catchment in Seaview
- Over 50% of the catchment is urban (modified), therefore a high proportion is covered in impermeable surfaces.
- Wellington Harbour (including the Hutt/Waiwhetu estuary) is identified in Schedule B of the PNRP as a taonga by mana whenua iwi in the Wellington region.

Sub-catchment information

Total catchment Area (km^2)	SW Network area (km^2)	SW Network Area (%)	Impervious Surface Area (%)	SW Network length (km)	Number of stormwater outlets
19.1	11.5	60	53	125.5	157

Predominant existing land use

Land use proportions (%)[1]		Hazardous Activities and Industries within catchment	
Urban	53	**SLUR sites**	Detailed maps outlining location of SLURS sites in Section 4 of the Assessment of Effects on the Environment 2023
Indigenous/ Exotic Forest and Scrub	42	**Predominant HAIL activities**	• Railway workshop • Chemical storage • Wastewater treatment • Vehicle manufacturing and repairs • Industrial activities such as painting, vehicle repairs and heavy machinery servicing
Pasture	5		

Wetlands (Schedule A)

No Schedule A wetlands present in catchment

Existing Monitoring

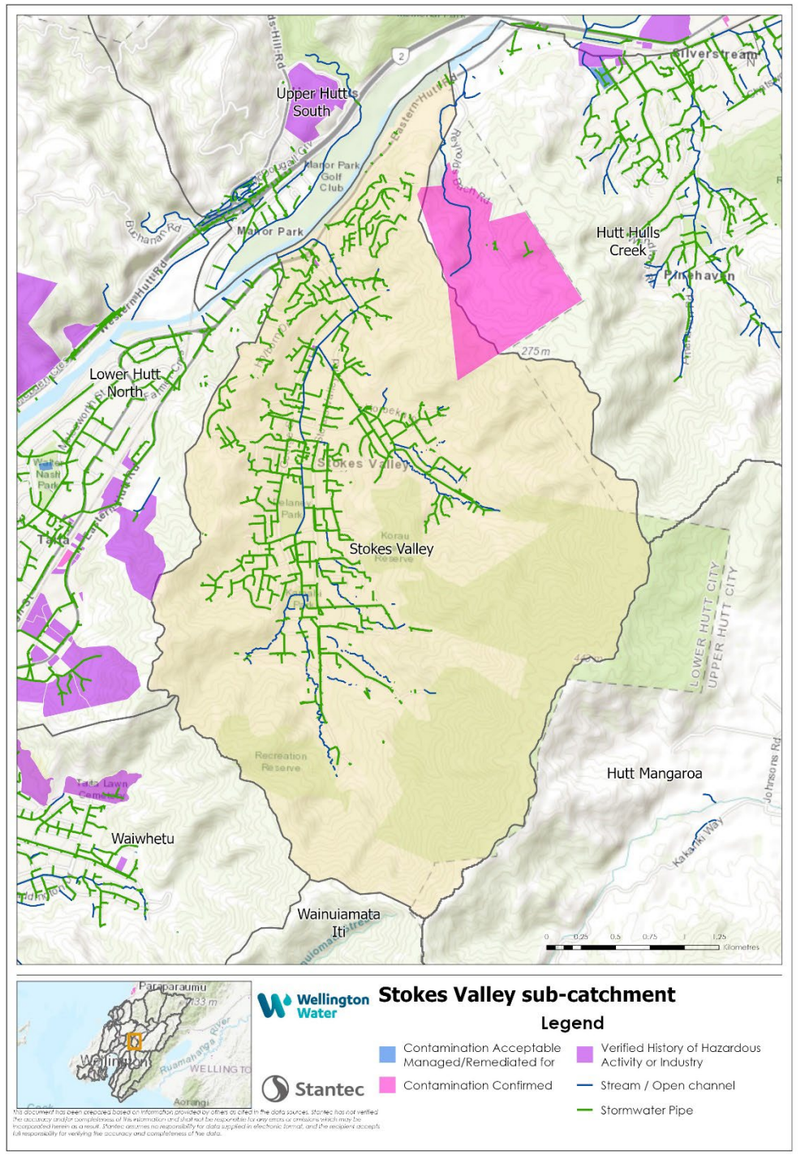
5 monitoring sites (2 freshwater sites, 1 stormwater outlet site, 1 RWQE site, and 1 stream/ marine sediment site). More detail on monitoring locations can be found in the ArcGIS Online StoryMap.

Section 4 of the Assessment of Effects on the Environment 2023 outlines the current state of the environment for this catchment.

1 Three highest land use proportions displayed as % of total area

Stormwater Catchment

Stokes Valley



Key Issues for Stormwater Management

- The Stokes Valley catchment has been modified, whereby the base of the valley is now urban development.
- There are historic landfills and chemical storage present in the catchment.

Sub-catchment information

Total catchment Area (km^2)	SW Network area (km^2)	SW Network Area (%)	Impervious Surface Area (%)	SW Network length (km)	Number of stormwater outlets
12.2	6.5	53	27	51.4	90

Predominant existing land use

Land use proportions (%)	Hazardous Activities and Industries within catchment	
Urban area is residential and light commercial while remaining 61% of catchment is open space, mostly regenerating indigenous vegetation.	SLUR sites	Detailed maps outlining location of SLURS sites in Section 4 of the Assessment of Effects on the Environment 2023
	Predominant HAIL activities	• Hydrocarbon storage • Chemical storage • Landfill

Wetlands (Schedule A)

No Schedule A wetlands present in catchment

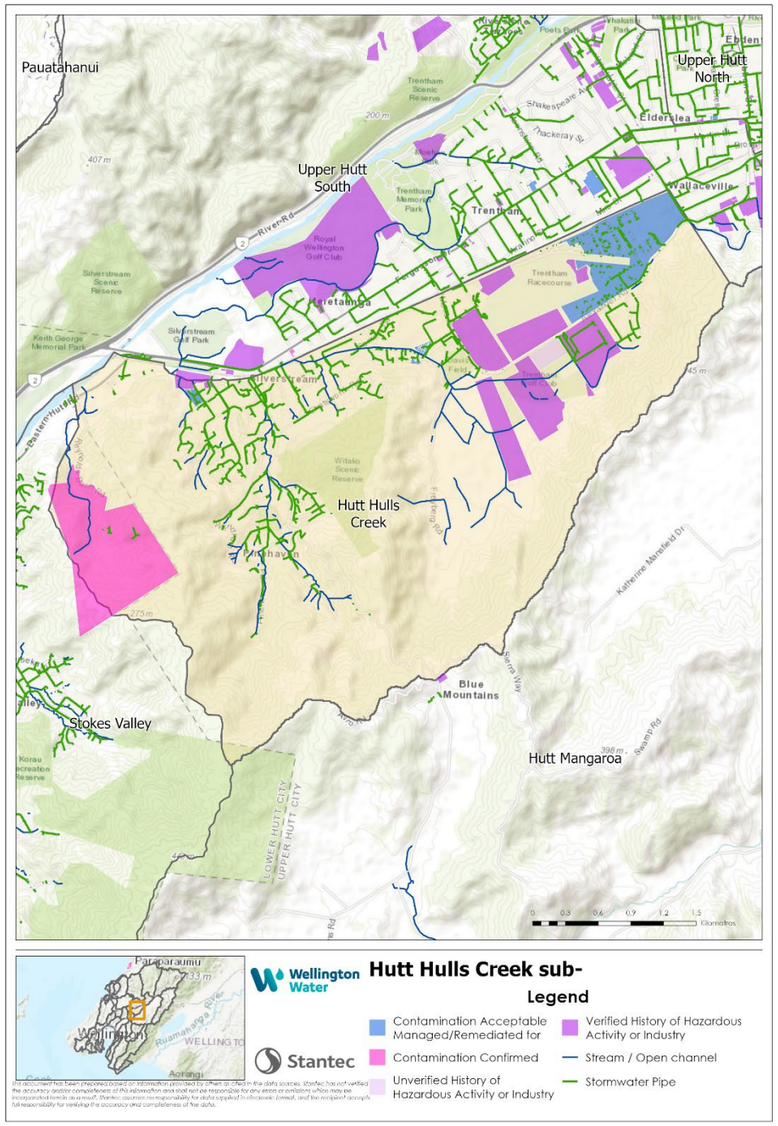
Existing Monitoring

3 monitoring sites (1 freshwater site, 1 RWQE site, and 1 stream/ marine sediment site). More detail on monitoring locations can be found in the ArcGIS Online StoryMap.

Section 4 of the Assessment of Effects on the Environment 2023 outlines the current state of the environment for this catchment.

Stormwater Catchment

Hulls



Key Issues for Stormwater Management

- No state highway or airport intercept the catchment
- Large developments in this catchment include Trentham Military Camp and Trentham Racecourse.
- Catchment-wide sources include roofs and other building materials found in older largely residential urban areas, road surfaces and other permeable pavements, soil disturbance (gardening, landscaping, surface soil damage), vegetation, wild and domestic animals. Vehicles (tyres, brake linings, oil leakage, exhaust) are a significant generic source.

Sub-catchment information

Total catchment Area (km^2)	SW Network area (km^2)	SW Network Area (%)	Impervious Surface Area (%)	SW Network length (km)	Number of stormwater outlets
16.7	4.0	24	21	35.5	60

Predominant existing land use

Land use proportions (%)	Hazardous Activities and Industries within catchment	
The dominant land cover classes in the Hulls Creek catchment are scrub, urban (63%) and indigenous forest.	**SLUR sites**	Detailed maps outlining location of SLURS sites in Section 4 of the Assessment of Effects on the Environment 2023
	Predominant HAIL activities	• Landfill • Trentham Military Camp • Riffle range • Chemical storage

Wetlands (Schedule A)

No Schedule A wetlands present in catchment

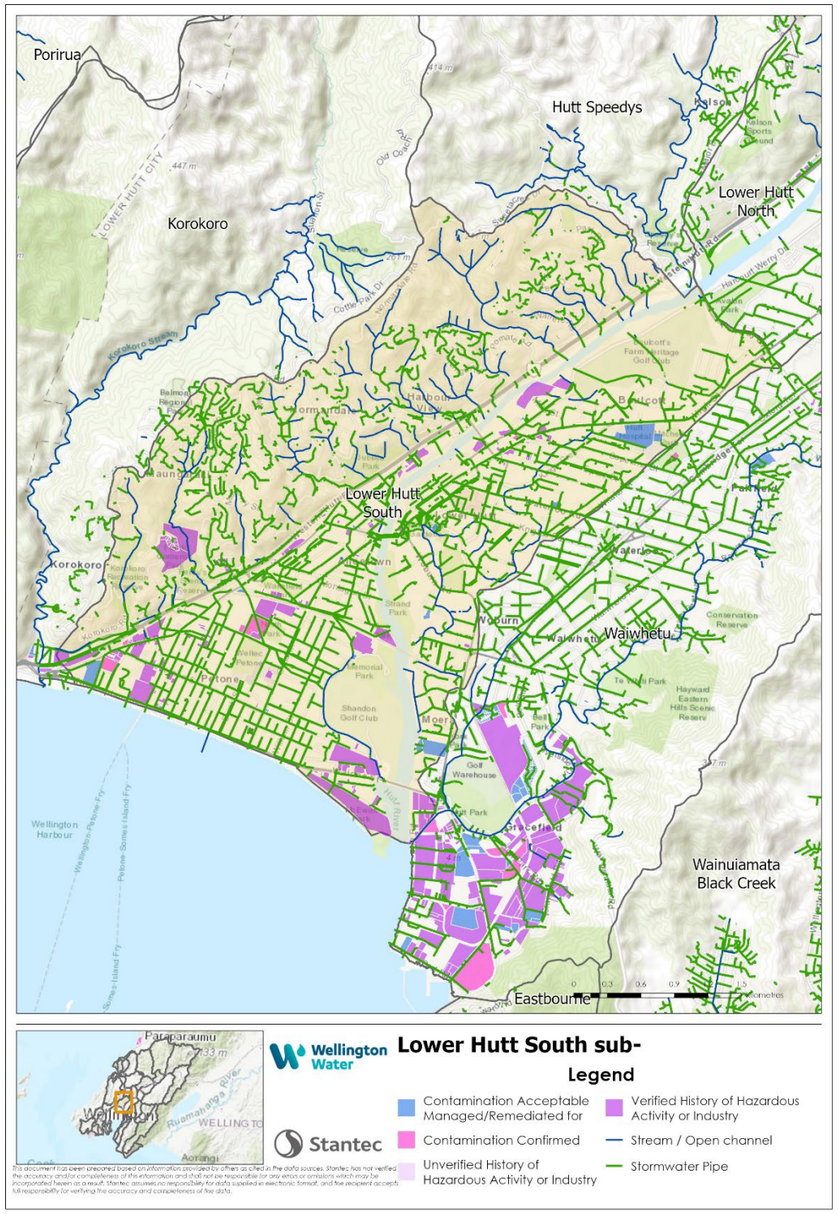
Existing Monitoring

3 monitoring sites (1 freshwater site, 1 RWQE site, and 1 stream/ marine sediment site). More detail on monitoring locations can be found in the ArcGIS Online StoryMap.

Section 4 of the Assessment of Effects on the Environment 2023 outlines the current state of the environment for this catchment.

Stormwater Catchment

Lower Hutt South



Key Issues for Stormwater Management

- The Lower Hutt South Catchment is predominantly urban land use, both on the Hutt Valley floor and the surrounding hills.
- State Highway 2 runs through the centre of this catchment.
- The Hutt River is identified in Schedule B of the NRP as a taonga by mana whenua iwi in the Wellington region.
- Hutt River is also identified in Schedule C as sites of significance to mana whenua.
- Within the residential, commercial and light industrial areas of the Hutt Valley, sources include roofs and other building materials found in urban areas, road surfaces and other permeable pavements. Vehicles (tyres, brake linings, oil leakage, exhaust) are probably the major generic source; from major city streets and parking lots and Hutt motorways (SH2).

Sub-catchment information

Total catchment Area (km^2)	SW Network area (km^2)	SW Network Area (%)	Impervious Surface Area (%)	SW Network length (km)	Number of stormwater outlets
17.9	13.6	76	59	168.4	226

Predominant existing land use

Land use proportions (%)	Hazardous Activities and Industries within catchment	
The dominant land cover classes in the Lower Hutt South catchment are urban land use	**SLUR sites**	Detailed maps outlining location of SLURS sites in Section 4 of the Assessment of Effects on the Environment 2023
	Predominant HAIL activities	• Waste disposal/ landfill sites • Chemical storage • Hydrocarbon storage • Vehicle manufacturing

Wetlands (Schedule A)

1 wetland is present within the Lower Hutt South catchment: Te Awa Kairangi/ Hutt River Mouth (3.2ha)

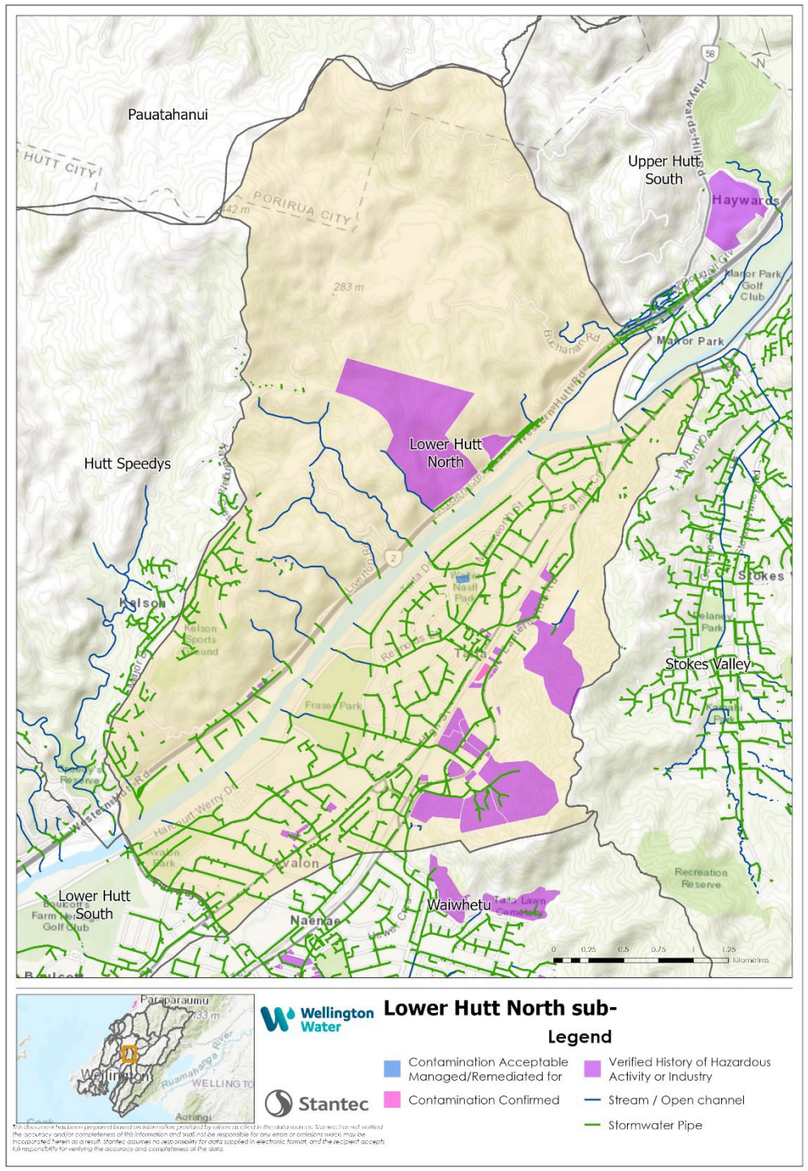
Existing Monitoring

11 monitoring sites (3 freshwater sites, 3 coastal sites, 4 stormwater outlet sites, and 1 RWQE site). More detail on monitoring locations can be found in the ArcGIS Online StoryMap.

Section 4 of the Assessment of Effects on the Environment 2023 outlines the current state of the environment for this catchment.

Stormwater Catchment

Lower Hutt North



Key Issues for Stormwater Management

- There are large urban developments present at in the Hutt valley in this catchment, resulting in large proportions of impervious surfaces.
- There is a large quarry located in the Lower Hutt North catchment.
- State Highway 2 runs through the centre of this catchment.
- The Lower Hutt South Catchment is predominantly urban land use, both on the Hutt Valley floor and the surrounding hills.
- State Highway 2 runs through the centre of this catchment.
- The Hutt River is identified in Schedule B of the NRP as a taonga by mana whenua iwi in the Wellington region.
- Hutt River is also identified in Schedule C as sites of significance to mana whenua.
- Within the residential, commercial and light industrial areas of the Hutt Valley, sources include roofs and other building materials found in urban areas, road surfaces and other permeable pavements. Vehicles (tyres, brake linings, oil leakage, exhaust) are probably the major generic source; from major city streets and parking lots and Hutt motorways (SH2).

Sub-catchment information

Total catchment Area (km^2)	SW Network area (km^2)	SW Network Area (%)	Impervious Surface Area (%)	SW Network length (km)	Number of stormwater outlets
15.8	6.6	42	27	57.9	48

Predominant existing land use

Land use proportions (%)	Hazardous Activities and Industries within catchment	
The dominant land cover classes in the Lower Hutt North catchment are urban land use and indigenous forest.	**SLUR sites**	Detailed maps outlining location of SLURS sites in Section 4 of the Assessment of Effects on the Environment 2023
	Predominant HAIL activities	• Historic landfills • Vehicle manufacturing and repairs • Chemical storage • Timber processing and treatment • Aggregate quarry

Wetlands (Schedule A)

No Schedule A wetlands present in catchment

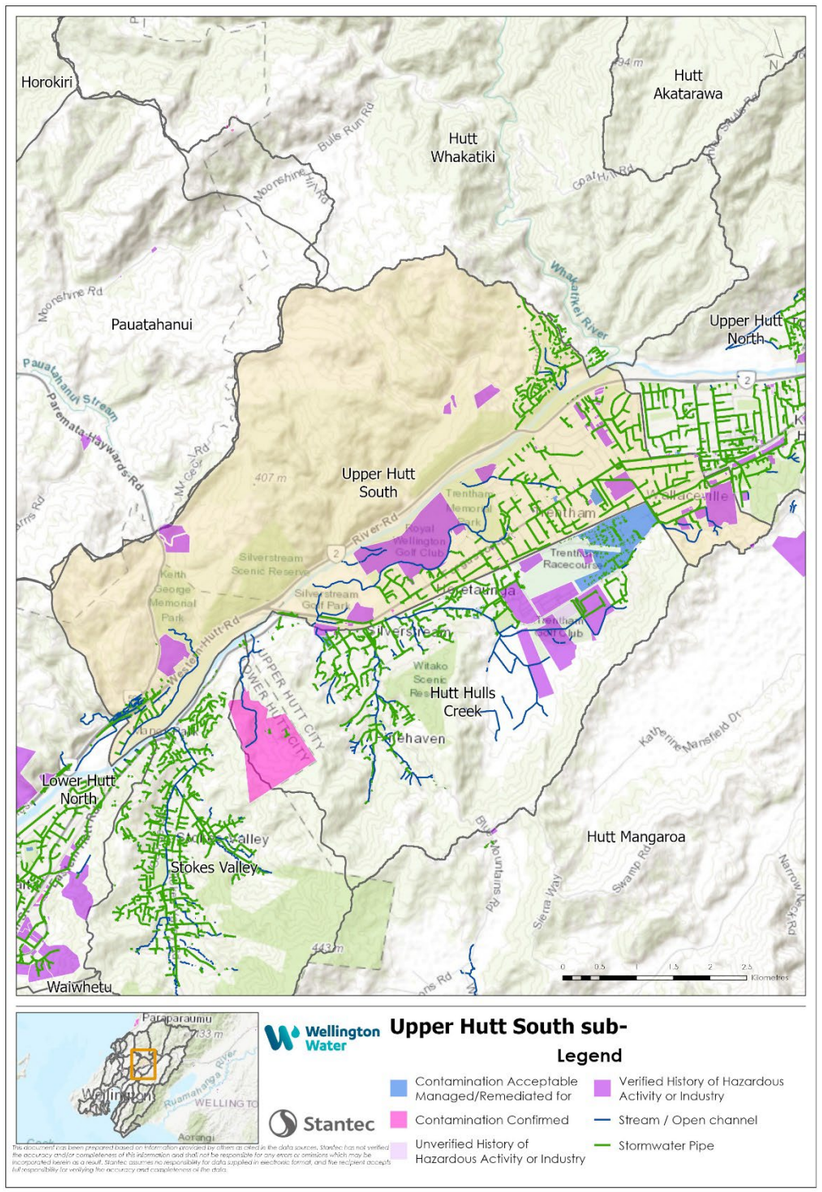
Existing Monitoring

3 monitoring sites (3 stormwater outlet sites). More detail on monitoring locations can be found in the ArcGIS Online StoryMap.

Section 4 of the Assessment of Effects on the Environment 2023 outlines the current state of the environment for this catchment.

Stormwater Catchment

Upper Hutt South



Key Issues for Stormwater Management

- State Highway 2 and State Highway 58 bisect this catchment.

Sub-catchment information

Total catchment Area (km^2)	SW Network area (km^2)	SW Network Area (%)	Impervious Surface Area (%)	SW Network length (km)	Number of stormwater outlets
28.2	5.8	20	20	52.0	55

Predominant existing land use

Land use proportions (%)	Hazardous Activities and Industries within catchment	
The dominant land cover classes in the Upper Hutt South catchment are urban land use and indigenous forest	SLUR sites	Detailed maps outlining location of SLURS sites in Section 4 of the Assessment of Effects on the Environment 2023
	Predominant HAIL activities	• Hydrocarbon storage • Historic landfill • Clean fill disposal • Chemical production and storage

Wetlands (Schedule A)

No Schedule A wetlands present in catchment

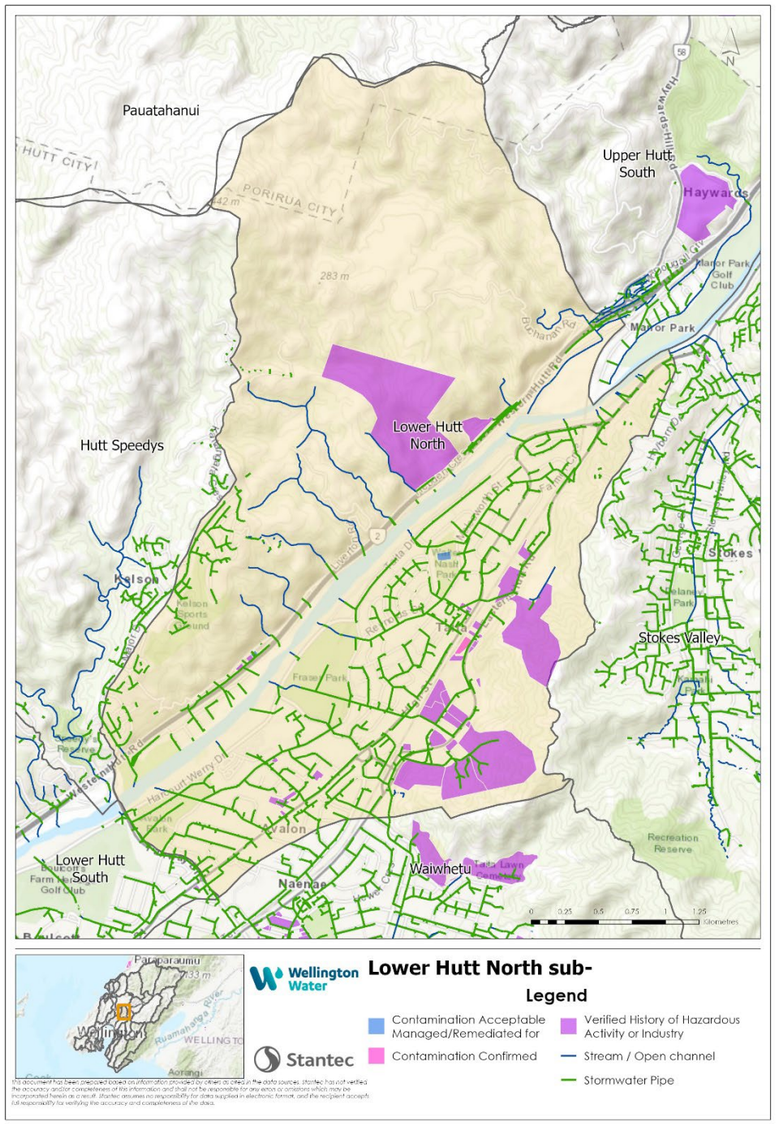
Existing Monitoring

5 monitoring sites (1 freshwater site, 3 stormwater outlet sites, and 1 RWQE site). More detail on monitoring locations can be found in the ArcGIS Online StoryMap.

Section 4 of the Assessment of Effects on the Environment 2023 outlines the current state of the environment for this catchment.

Stormwater Catchment

Upper Hutt North



Key Issues for Stormwater Management

- State Highway 2 bisects this catchment.
- Urban development has occurred through the centre of this catchment.

Sub-catchment information

Total catchment Area (km^2)	SW Network area (km^2)	SW Network Area (%)	Impervious Surface Area (%)	SW Network length (km)	Number of stormwater outlets
19.2	7.3	38	32	85.9	75

Predominant existing land use

Land use proportions (%)[1]	Hazardous Activities and Industries within catchment	
The dominant land cover classes in the Upper Hutt South catchment are urban land use, indigenous forest and pasture	**SLUR sites**	Detailed maps outlining location of SLURS sites in Section 4 of the Assessment of Effects on the Environment 2023
	Predominant HAIL activities	• Railway maintenance site • Chemical storage • Clean fill storage • Hydrocarbon storage

Wetlands (Schedule A)

No Schedule A wetlands present in catchment

Existing Monitoring

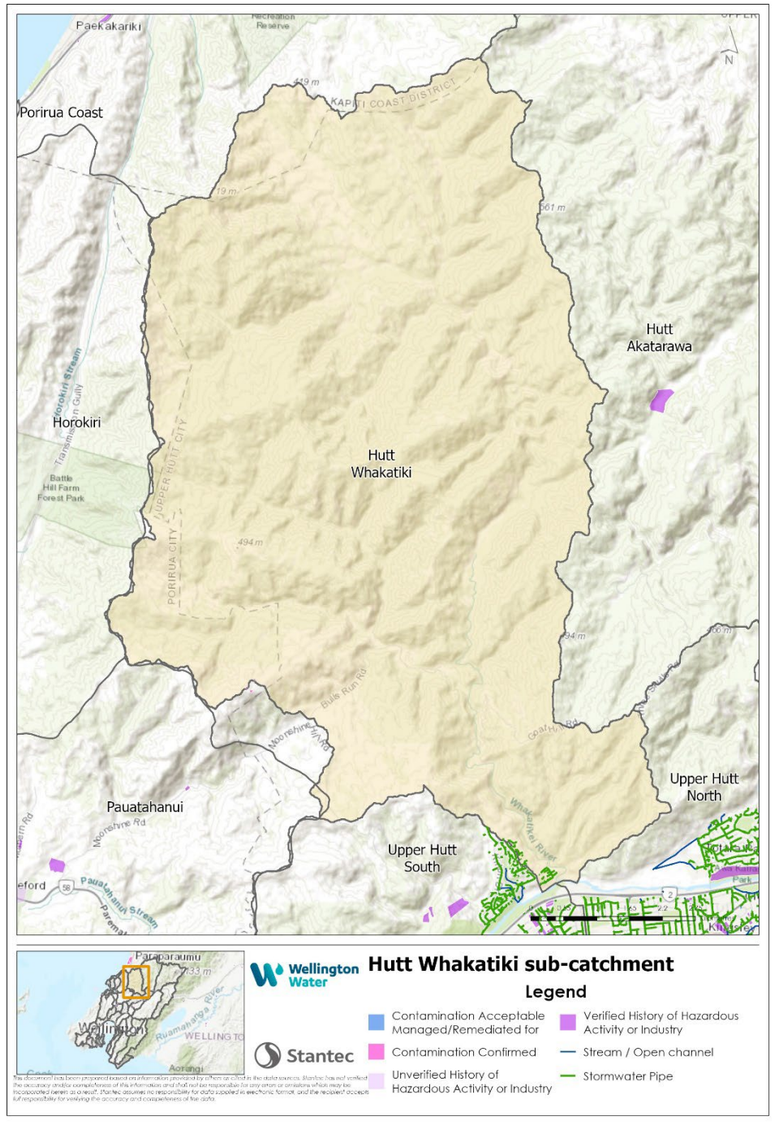
5 monitoring sites (5 stormwater outlet sites). More detail on monitoring locations can be found in the ArcGIS Online StoryMap.

Section 4 of the Assessment of Effects on the Environment 2023 outlines the current state of the environment for this catchment.

1 Three highest land use proportions displayed as % of total area

Stormwater Catchment

Hutt Whakatiki



Key Issues for Stormwater Management

- The Whakatikei River flows into the Hutt River near Riverstone at Upper Hutt.
- Majority of this catchment is open space made up of indigenous forest and scrub.
- Catchment-wide sources are dominated by runoff from regenerating forest, plantation forest and scrub. Within the very small residential urban area at the bottom of the catchment, sources include roofs and other building materials found in urban areas, road surfaces, other permeable pavements, soil disturbance (gardening, landscaping, surface soil damage), vegetation, wild and domestic animals

Sub-catchment information

Total catchment Area (km^2)	SW Network area (km^2)	SW Network Area (%)	Impervious Surface Area (%)	SW Network length (km)	Number of stormwater outlets
80.2	0.3	0	<1	1.7	5

Predominant existing land use

Land use proportions (%)[1]		Hazardous Activities and Industries within catchment	
Indigenous Forest and Scrub	68	**SLUR sites**	No SLUR sites identified in this catchment.
Pine Forestry	23	**Predominant HAIL activities**	No HAIL activities identified in this catchment

Wetlands (Schedule A)

2 wetlands in the Hutt Whakatiki catchment: Whakatiki Headwater Swamp (10.44ha) and Whakarikei Wetland (6.55ha).

Existing Monitoring

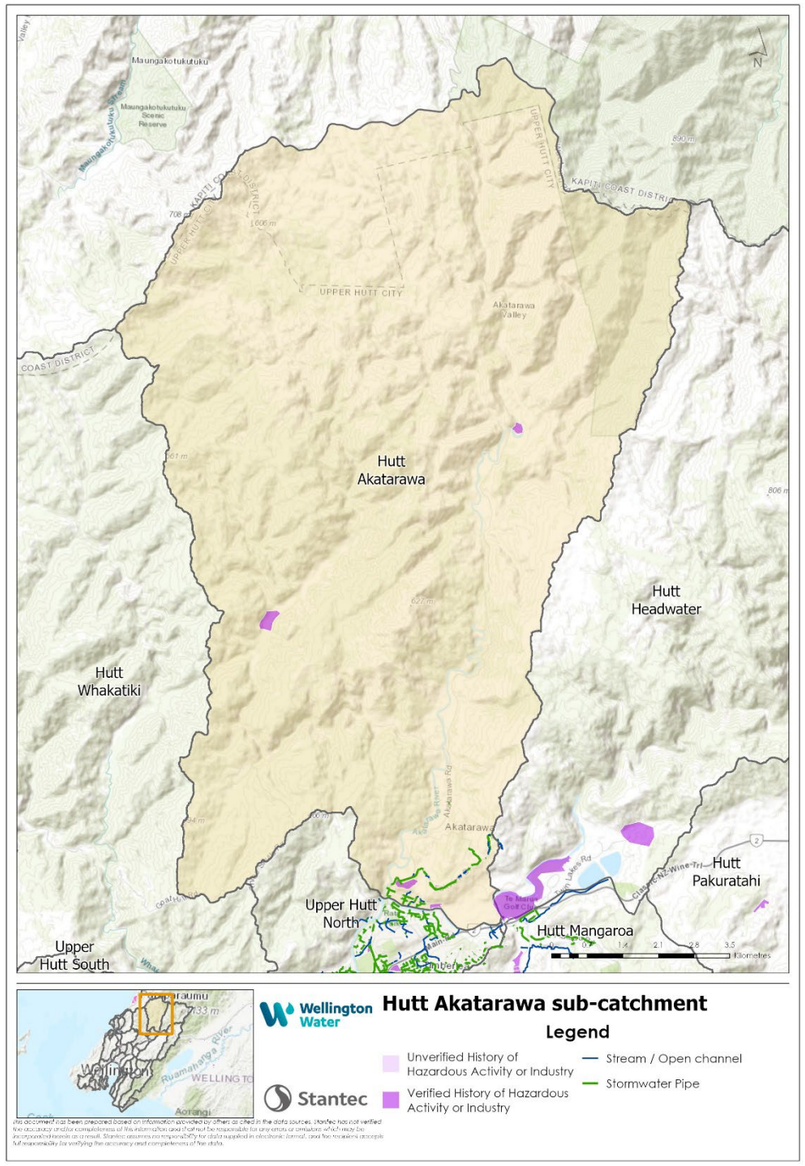
No monitoring sites within this catchment.

Section 4 of the Assessment of Effects on the Environment 2023 outlines the current state of the environment for this catchment.

1 Three highest land use proportions displayed as % of total area

Stormwater Catchment

Hutt Akatarawa



Key Issues for Stormwater Management

- The Akatarawa River flows into the Hutt River at Birchville near Upper Hutt.
- Very little urban development has occurred in the catchment where a majority of the catchment is open space made up of indigenous forest and scrub.
- Catchment-wide sources are dominated by runoff from regenerating forest, plantation forest, pasture and scrub. They include soil disturbance (gardening, landscaping, surface soil damage), vegetation, wild and domestic animals.

Sub-catchment information

Total catchment Area (km^2)	SW Network area (km^2)	SW Network Area (%)	Impervious Surface Area (%)	SW Network length (km)	Number of stormwater outlets
118.1	1.9	2	<1	2.2	5

Predominant existing land use

Land use proportions (%)[1]		Hazardous Activities and Industries within catchment	
Indigenous Forest and Scrub	86	**SLUR sites**	Detailed maps outlining location of SLURS sites in Section 4 of the Assessment of Effects on the Environment 2023
Pine Forestry	14	**Predominant HAIL activities**	• Cemetery • Clean fill storage • Timber processing

Wetlands (Schedule A)

1 wetland in the Hutt Akatarawa Catchment: Martin River Wetland (8.43ha)

Existing Monitoring

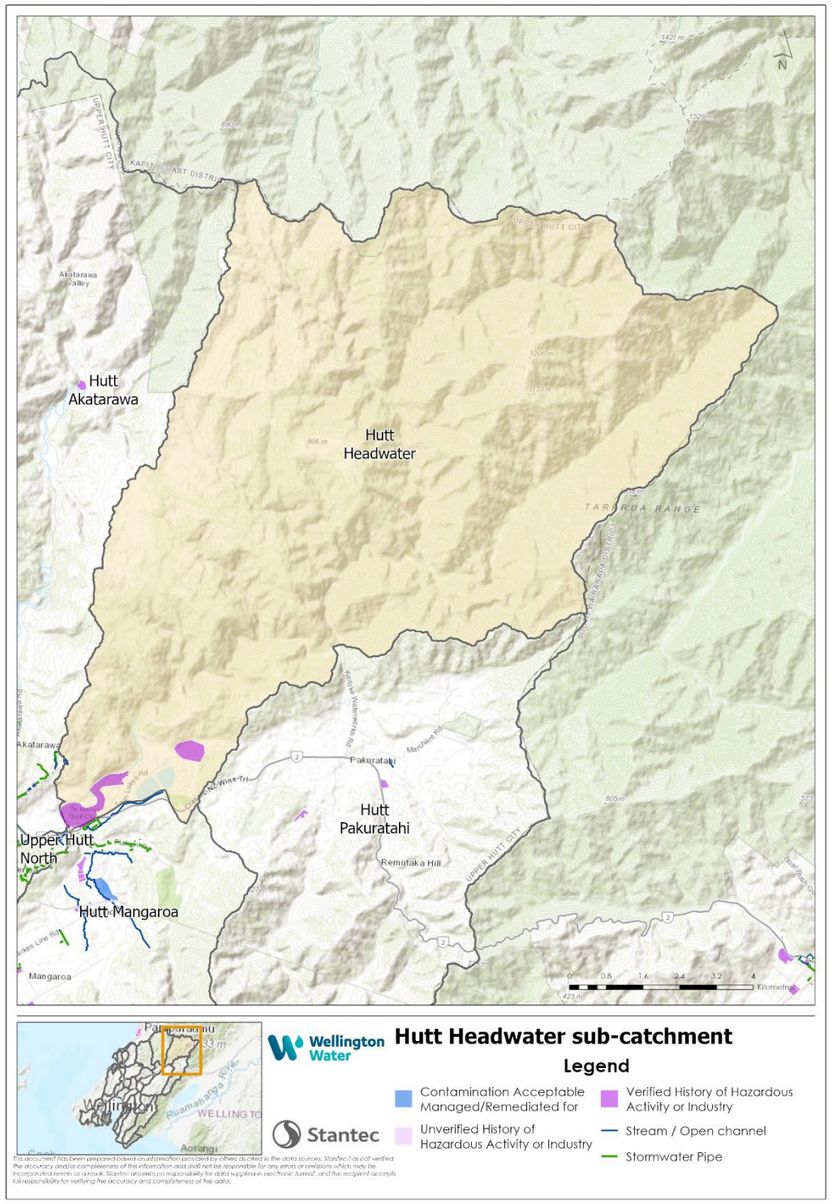
No monitoring sites within this catchment.

Section 4 of the Assessment of Effects on the Environment 2023 outlines the current state of the environment for this catchment.

1 Three highest land use proportions displayed as % of total area

Stormwater Catchment

Hutt Headwater



Key Issues for Stormwater Management

- The Hutt Headwater catchment has no reticulated stormwater network and are not affected by stormwater discharges.
- Maymorn Wetlands and Hutt River are identified in Schedule A of the NRP as outstanding waterbodies

Sub-catchment information

Total catchment Area (km^2)	SW Network area (km^2)	SW Network Area (%)	Impervious Surface Area (%)	SW Network length (km)	Number of stormwater outlets
115.4	0.2	0	<1	0	0

Predominant existing land use

Land use proportions (%)[1]	Hazardous Activities and Industries within catchment	
The dominant land cover classes in the Hutt Headwater catchment indigenous forest and pasture land.	**SLUR sites**	Detailed maps outlining location of SLURS sites in Section 4 of the Assessment of Effects on the Environment 2023
	Predominant HAIL activities	• Hydrocarbon storage

Wetlands (Schedule A)

2 wetlands in the Hutt Headwater catchment: Maymorn Wetlands (13.15ha) and Stock Car Wetland (3.1ha).

Existing Monitoring

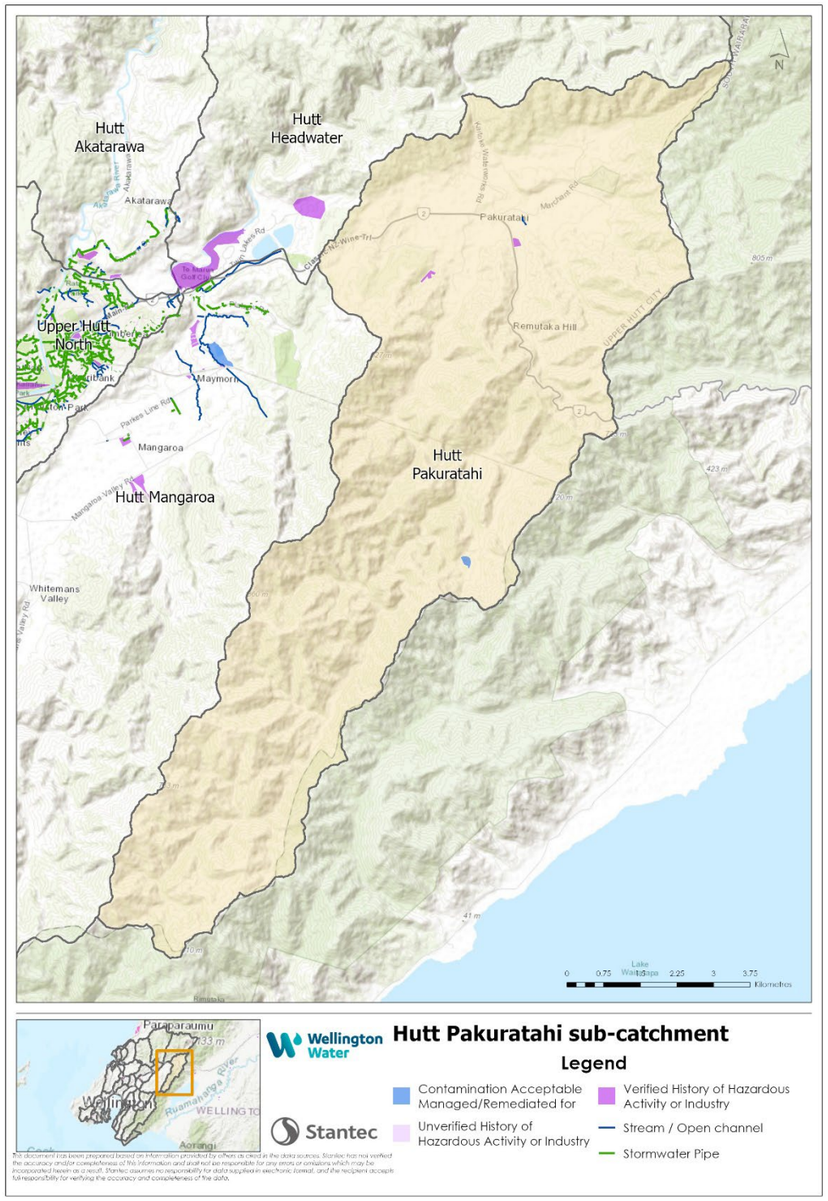
1 monitoring site (1 RWQE site). More detail on monitoring locations can be found in the ArcGIS Online StoryMap.

Section 4 of the Assessment of Effects on the Environment 2023 outlines the current state of the environment for this catchment.

1 Three highest land use proportions displayed as % of total area

Stormwater Catchment

Hutt Pakuratahi



Key Issues for Stormwater Management

- State Highway 2 runs through the northern extent of this catchment.
- The Pakuratahi River flows into the Hutt River at Kaitoke north of Upper Hutt. It drains a steep catchment with a predominant land cover of indigenous forest and scrub with some production pasture and pine production forestry.
- The Hutt Pakuratahi catchment has no reticulated stormwater network and are not affected by stormwater discharges.

Sub-catchment information

Total catchment Area (km^2)	SW Network area (km^2)	SW Network Area (%)	Impervious Surface Area (%)	SW Network length (km)	Number of stormwater outlets
81.2	0	0	<1	0	0

Predominant existing land use

Land use proportions (%)[1]		Hazardous Activities and Industries within catchment	
Indigenous Forest and Scrub	80	**SLUR sites**	Detailed maps outlining location of SLURS sites in Section 4 of the Assessment of Effects on the Environment 2023
Pasture and Pine Forestry	7	**Predominant HAIL activities**	• Landfill • Riffle range

Wetlands (Schedule A)

1 wetland in the Hutt Pakuratahi catchment: Ladel Bend Wetland (2.56ha).

Existing Monitoring

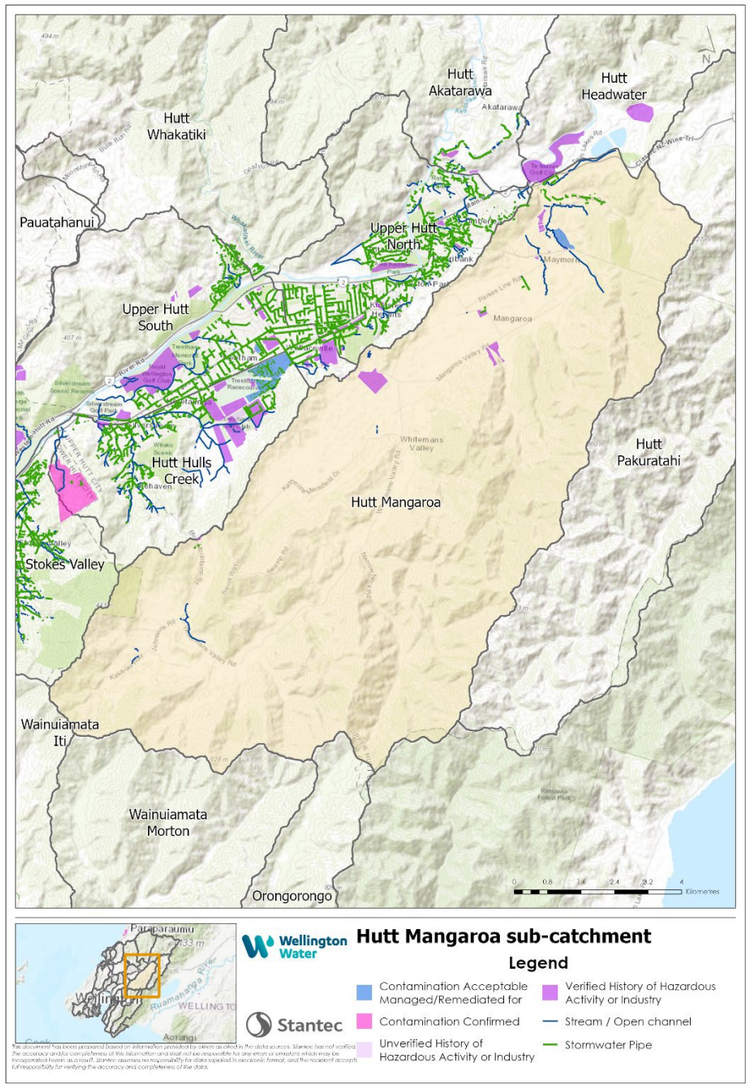
No monitoring sites within this catchment.

Section 4 of the Assessment of Effects on the Environment 2023 outlines the current state of the environment for this catchment.

1 Three highest land use proportions displayed as % of total area

Stormwater Catchment

Hutt Mangaroa



Key Issues for Stormwater Management

- The Mangaroa River flows into the Hutt River at Te Marua north of Upper Hutt. It drains a broad low gradient valley which is predominantly indigenous forest and scrub with substantial areas of production pasture and pine plantation forestry.
- Catchment-wide sources are dominated by runoff from productive pasture and scrub. They include soil disturbance (farming, landscaping, surface soil damage), vegetation, wild and domestic animals. No constructed wastewater overflow structures are in the catchment.

Sub-catchment information

Total catchment Area (km^2)	SW Network area (km^2)	SW Network Area (%)	Impervious Surface Area (%)	SW Network length (km)	Number of stormwater outlets
103.5	0.8	1	1	2.9	13

Predominant existing land use

Land use proportions (%)[1]		Hazardous Activities and Industries within catchment	
Indigenous Forest and Scrub	53	**SLUR sites**	Detailed maps outlining location of SLURS sites in Section 4 of the Assessment of Effects on the Environment 2023
Pasture	31	**Predominant HAIL activities**	• Landfill • Timber processing and treatment • Fertiliser manufacturing • Defence Force storage facility • Rifle range
Pine Forestry	14		

Wetlands (Schedule A)

2 wetlands in the Hutt Mangaroa catchment: Blue Mountain Bush Swamp Forest (7.72 ha) and Johnson's Road Wetland (0.59ha).

Existing Monitoring

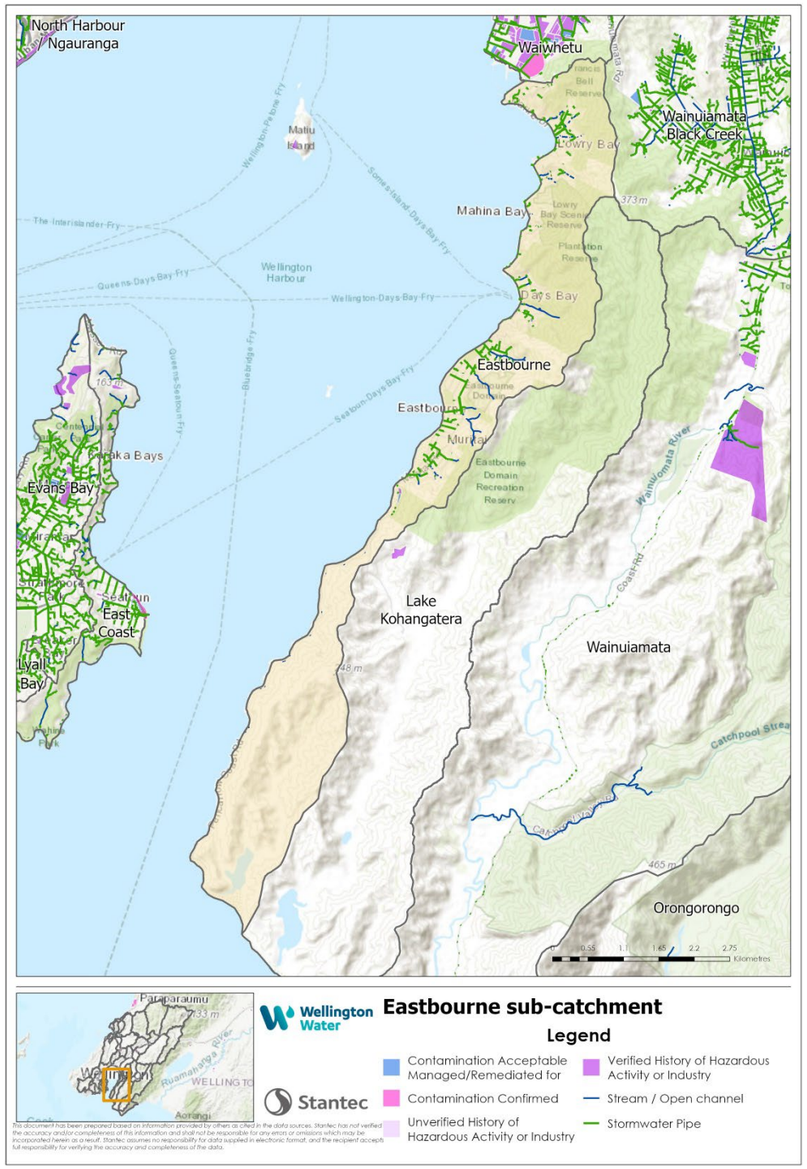
No monitoring sites within this catchment.

Section 4 of the Assessment of Effects on the Environment 2023 outlines the current state of the environment for this catchment.

1 Three highest land use proportions displayed as % of total area

Stormwater Catchment

Eastbourne



Wellington Water

Eastbourne sub-catchment

Stantec

Legend

- Contamination Acceptable Managed/Remediated for
- Contamination Confirmed
- Unverified History of Hazardous Activity or Industry
- Verified History of Hazardous Activity or Industry
- Stream / Open channel
- Stormwater Pipe

Key Issues for Stormwater Management

- Urban development has occurred along the harbour margin of this catchment.
- Land-use in the Eastbourne catchment is mostly open space, predominantly indigenous forest on the eastern hills behind the residential area.
- Catchment-wide sources are dominated by runoff from the forested hills. Contaminant sources within the urban area are minor and include roofs and other building materials found in residential land, soil disturbance (gardening, landscaping, surface soil damage), vegetation, wild and domestic animals. Vehicles (tyres, brake linings, oil leakage, exhaust) are a significant generic source, but traffic volumes are relatively low.
- Wellington Harbour (including the Hutt/Waiwhetu estuary) is identified in Schedule B of the NRP as a taonga by mana whenua iwi in the Wellington region.
- The east harbour coast is identified in as a site of significance in C as a site of significance for mana whenua

Sub-catchment information

Total catchment Area (km^2)	SW Network area (km^2)	SW Network Area (%)	Impervious Surface Area (%)	SW Network length (km)	Number of stormwater outlets
14.5	3.2	22	11	12.5	38

Predominant existing land use

Land use proportions (%)	Hazardous Activities and Industries within catchment	
The dominant land cover classes in the Eastbourne catchment are mostly open space, predominately indigenous forest.	**SLUR sites**	Detailed maps outlining location of SLURS sites in Section 4 of the Assessment of Effects on the Environment 2023
	Predominant HAIL activities	• Chemical storage • Transport depot

Wetlands (Schedule A)

1 wetland in the Eastbourne catchment: Kohangapiripiri Wetlands (22.3ha).

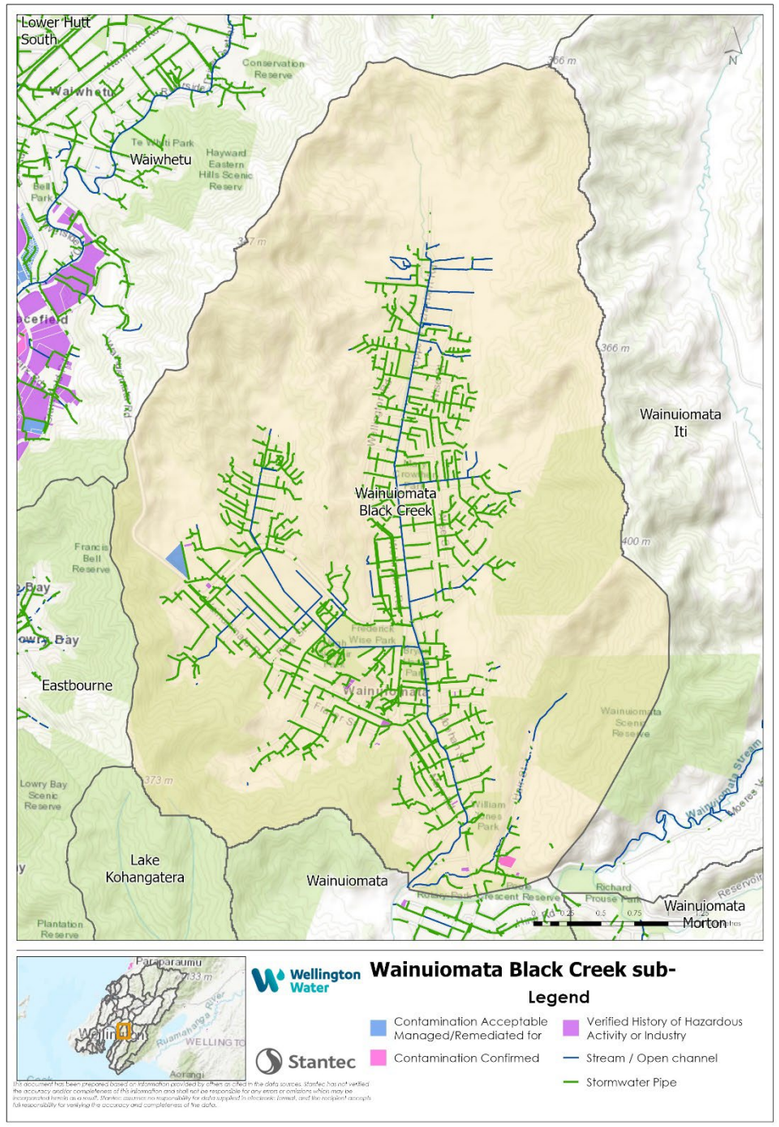
Existing Monitoring

4 monitoring sites (4 coastal sites). More detail on monitoring locations can be found in the ArcGIS Online StoryMap.

Section 4 of the Assessment of Effects on the Environment 2023 outlines the current state of the environment for this catchment.

Stormwater Catchment

Black Creek



Key Issues for Stormwater Management

- There is a large urban area within this catchment where it is predominantly residential and light commercial.
- The Wainuiomata River originates in a native forest catchment of the southwestern Remutaka Ranges, and flows southwest for approximately 35km, eventually discharging into Cook Strait east of Bearing Head.
- Catchment-wide sources are dominated by runoff from indigenous forest, scrub and low production pasture. These include soil disturbance by erosion during flood events, and wild animals. Within catchment contaminant sources include roofs and other building materials found in residential land. Vehicles (tyres, brake linings, oil leakage, exhaust) are a significant generic source.

Sub-catchment information

Total catchment Area (km^2)	SW Network area (km^2)	SW Network Area (%)	Impervious Surface Area (%)	SW Network length (km)	Number of stormwater outlets
18.7	7.6	41	27	80.5	165

Predominant existing land use

Land use proportions (%)[1]		Hazardous Activities and Industries within catchment	
Indigenous Forest and Scrub	77	**SLUR sites**	Detailed maps outlining location of SLURS sites in Section 4 of the Assessment of Effects on the Environment 2023
Pasture	10.4	**Predominant HAIL activities**	• Chemical storage • Industrial activities such as vehicle repairs • Hydrocarbon storage
Urban	6.3		

Wetlands (Schedule A)

1 wetland in the Black Creek catchment: Gracefield Scrub/ Waiau Wetland (0.21ha).

Existing Monitoring

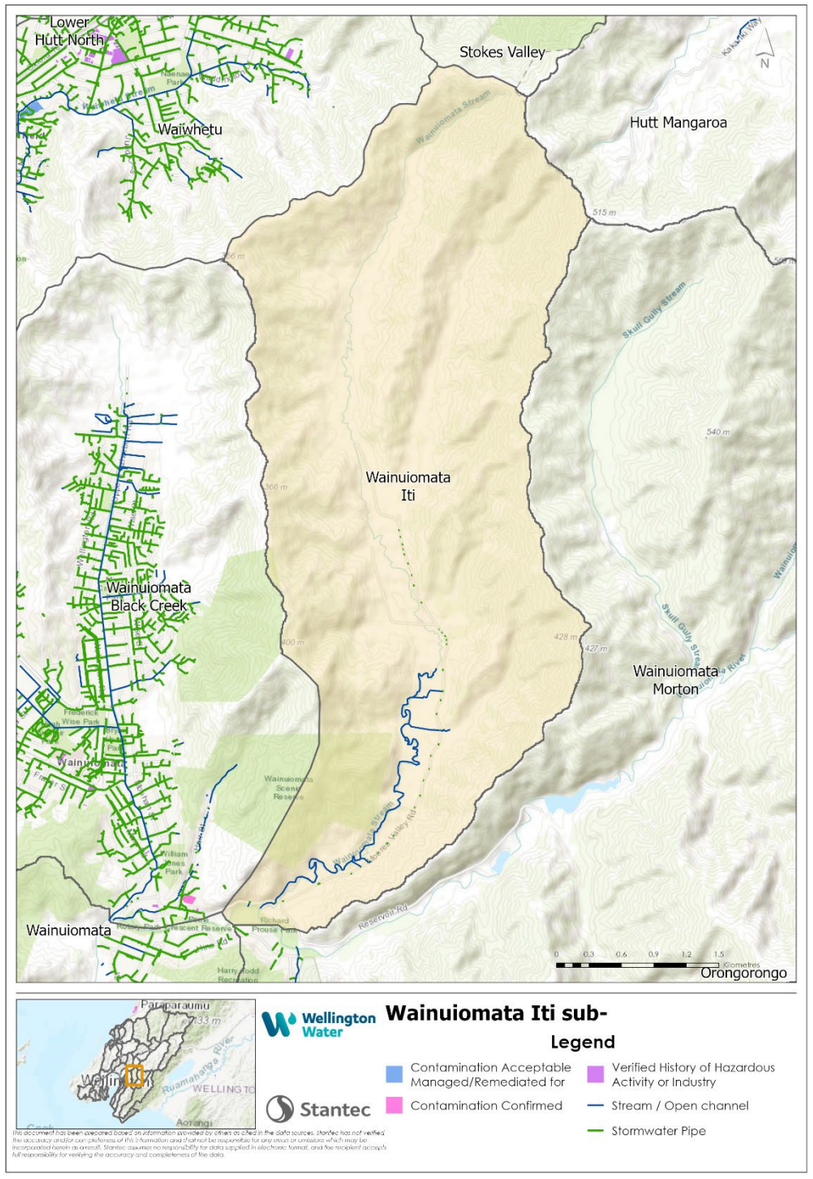
5 monitoring sites (3 freshwater sites, 1 RWQE site, 1 stream/ marine sediment site). More detail on monitoring locations can be found in the ArcGIS Online StoryMap.

Section 4 of the Assessment of Effects on the Environment 2023 outlines the current state of the environment for this catchment.

1 Three highest land use proportions displayed as % of total area

Stormwater Catchment

Wainuiomata - Iti



Key Issues for Stormwater Management

- The Wainuiomata River originates in a native forest catchment of the southwestern Remutaka Ranges, and flows southwest for approximately 35km, eventually discharging into Cook Strait east of Bearing Head.
- Catchment-wide sources are dominated by runoff from indigenous forest, scrub and low production pasture. These include soil disturbance by erosion during flood events, and wild animals.
- The Wainuiomata – Iti catchment has no reticulated stormwater network and are not affected by stormwater discharges.

Sub-catchment information

Total catchment Area (km^2)	SW Network area (km^2)	SW Network Area (%)	Impervious Surface Area (%)	SW Network length (km)	Number of stormwater outlets
17.7	0.0	0	<1	0	0

Predominant existing land use

Land use proportions (%)[1]	Hazardous Activities and Industries within catchment	
The dominant land cover classes in the Wainuiomata-Iti catchment includes plantation forestry, low productivity pasture, scrub, and with approximately 6% under urban land cover	SLUR sites	No SLUR sites identified in this catchment.
	Predominant HAIL activities	

Wetlands (Schedule A)

1 wetland in the Wainuiomata Iti catchment (16 not surveyed): Moore's Valley Wetland (0.21ha).

Existing Monitoring

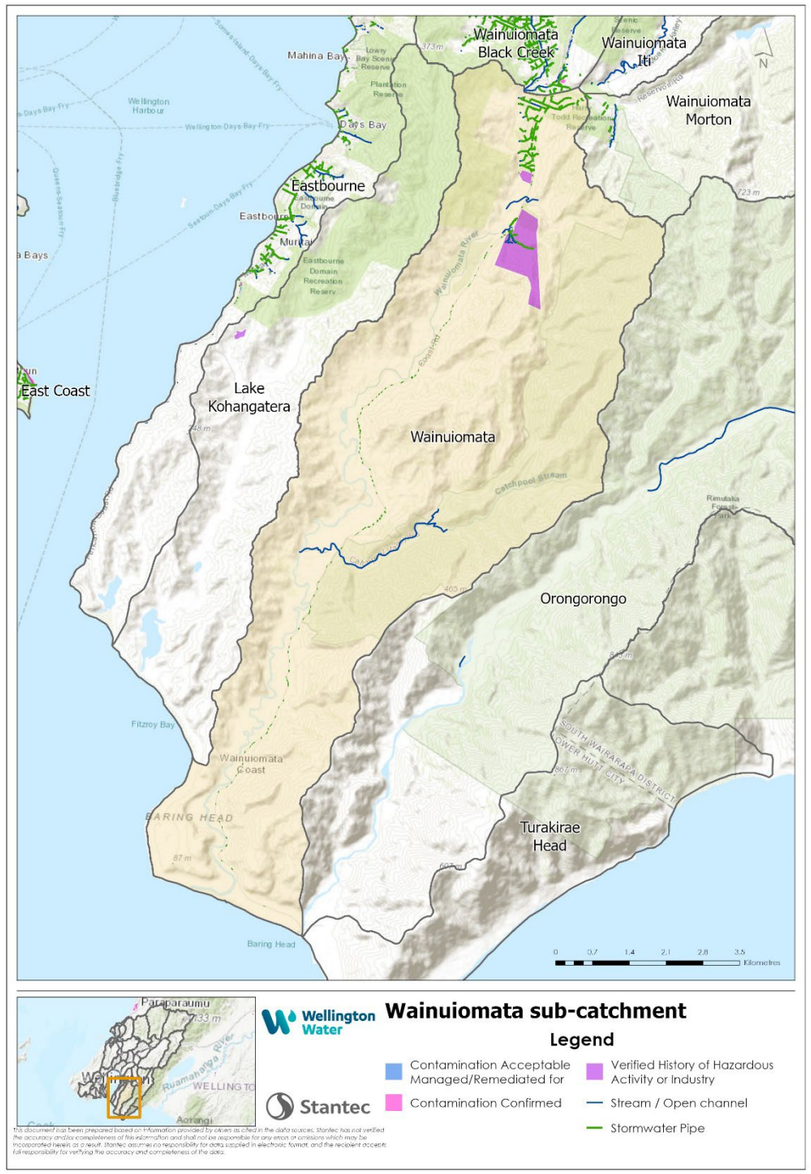
No monitoring sites within this catchment.

Section 4 of the Assessment of Effects on the Environment 2023 outlines the current state of the environment for this catchment.

1 Three highest land use proportions displayed as % of total area

Stormwater Catchment

Wainuiomata



Key Issues for Stormwater Management

- Wainuiomata Catchment has no reticulated stormwater network and are not affected by stormwater discharges.

Sub-catchment information

Total catchment Area (km^2)	SW Network area (km^2)	SW Network Area (%)	Impervious Surface Area (%)	SW Network length (km)	Number of stormwater outlets
60.3	0.9	2	1	9.5	15

Predominant existing land use

Land use proportions (%)	Hazardous Activities and Industries within catchment	
The dominant land cover classes in the Wainuiomata catchment includes plantation forestry, low productivity pasture, scrub, and with approximately 6% under urban land cover	**SLUR sites**	Detailed maps outlining location of SLURS sites in Section 4 of the Assessment of Effects on the Environment 2023
	Predominant HAIL activities	• Historic wastewater treatment facility • Hydrocarbon storage • Landfill

Wetlands (Schedule A)

2 wetlands in the Wainuiomata catchment (11 not surveyed): Wainuiomata River Bush A (0.8ha) and Curtis Swamp (0.64ha).

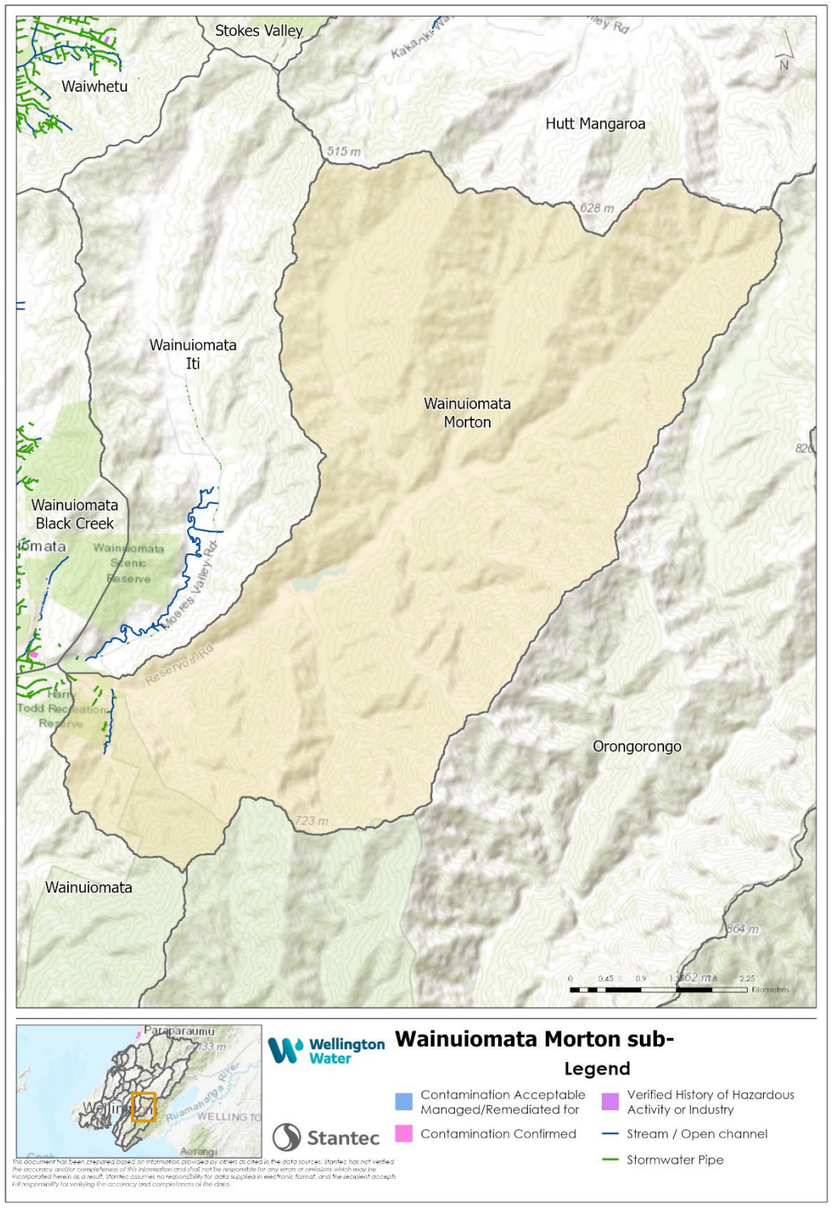
Existing Monitoring

No monitoring sites within this catchment.

Section 4 of the Assessment of Effects on the Environment 2023 outlines the current state of the environment for this catchment.

Stormwater Catchment

Morton



Key Issues for Stormwater Management

- Catchment-wide sources dominated by runoff from mature indigenous forest. These include soil disturbance by erosion during flood events, and wild animals.
- Wainuiomata River is in Schedule A in the NRP as an outstanding water body.

Sub-catchment information

Total catchment Area (km^2)	SW Network area (km^2)	SW Network Area (%)	Impervious Surface Area (%)	SW Network length (km)	Number of stormwater outlets
40.5	0.2	1	<1	0.7	5

Predominant existing land use

Land use proportions (%)	Hazardous Activities and Industries within catchment	
The dominant land cover classes in the Morton catchment includes plantation forestry, low productivity pasture, scrub, and with approximately 6% under urban land cover	**SLUR sites**	No SLUR sites identified in this catchment.
	Predominant HAIL activities	

Wetlands (Schedule A)

2 wetlands in the Morton catchment: Wainuiomata Waterworks Swamp lower (4.8ha) and Skull Gully Wetland (2.9ha).

Existing Monitoring

No monitoring sites within this catchment.

Section 4 of the Assessment of Effects on the Environment 2023 outlines the current state of the environment for this catchment.

1 Three highest land use proportions displayed as % of total area

Appendix E 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 potential 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. However not all these options are within the responsibility of Wellington Water or fall within the scope of the of the Stage 2 Global Stormwater Consent, and some of them could be implemented by others. Over the course of our journey to wai ora new options will become available and will be incorporated, following good management practice[5].

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 GWRC'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."[6]

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 waterbodies .

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 encourage developments to use the treatment train approach to stormwater management.

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 waterbodies 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 waterways.

The toolbox of options in this appendix is made up of non-structural approaches, such as policy and planning, education and engagement, and structural approaches, such as stormwater devices consistent with WSD guidelines, as shown in **Figure E-1**.

[5] *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.*
[6] *Waikato Stormwater Management Guideline 2020*

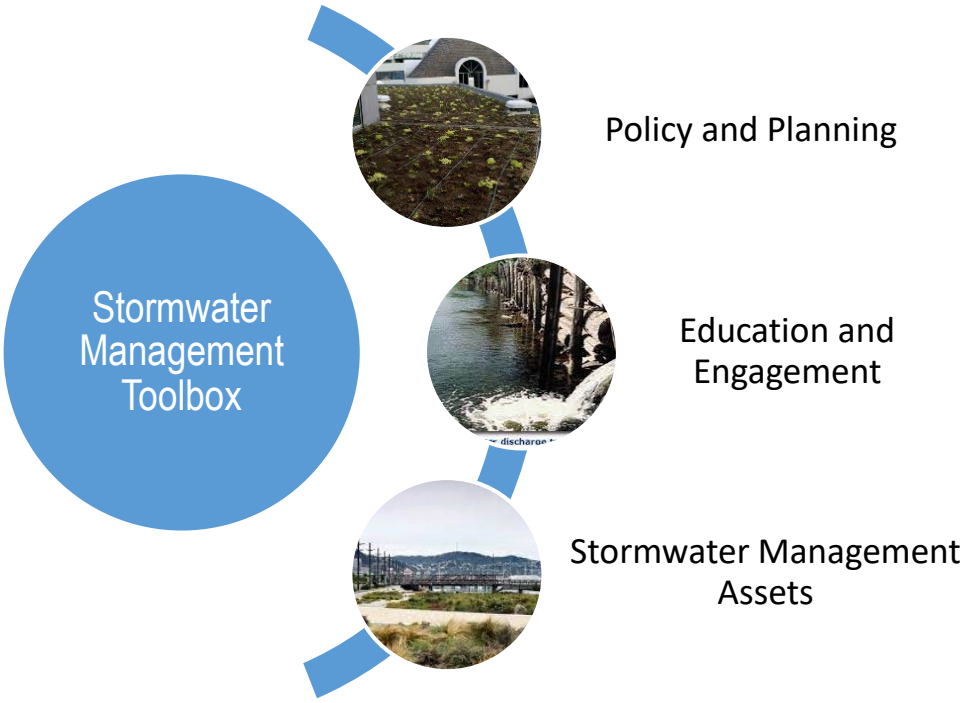


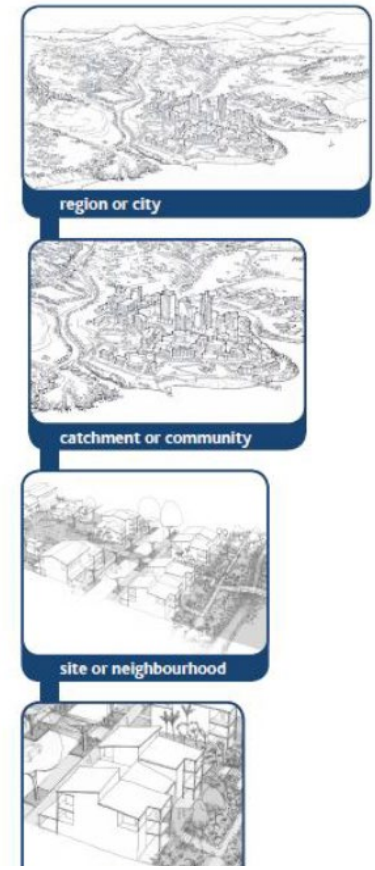
Figure E-1 Our approaches to influence better stormwater outcomes.

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.



The key principles of the WSD philosophy, as described in Auckland Council's technical guidance document GD04 (Lewis et al, 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 E-2** is borrowed from GD04 and depicts this idea of scale, cascading WSD from the region down to the individual lot scale.

Figure E-2 Cascading WSD taken from Auckland Council's technical guidance document GD04

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.

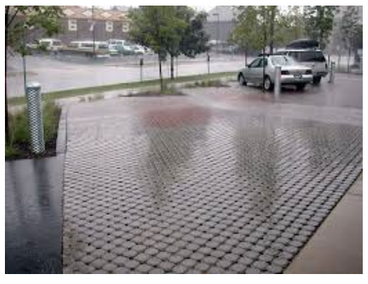
Approaches

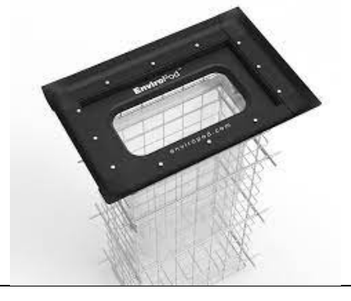
Sustainable stormwater management requires stormwater devices that are well planned, designed, constructed, and maintained to reduce the impacts of stormwater, deliver multiple outcomes for the community, and protect waterways and harbours. Stormwater management should follow a treatment train approach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

Structural Approaches

Table E-1 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 E-1 Range of stormwater management assets that will be implemented across urban areas covered by this SMS.

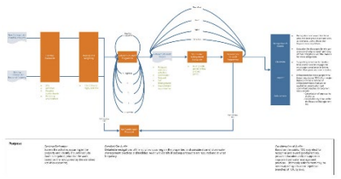
Stormwater Management Option		Type of Option & Applicability		Example of Implementation	Effectiveness L=Low M=Medium H=High						Source Pathway Receptor	Location Suitability	Benefit	Drawback
					Nutrients		Erosion (TSS (Total Suspended Solids))	*E. coli* (Bacteria)	Heavy metals					
Option	Description	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 waterbodies	Could be limited by space between properties and road.
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
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

Stormwater Management Option		Type of Option & Applicability		Example of Implementation	Effectiveness L=Low M=Medium H=High						Source Pathway Receptor	Location Suitability	Benefit	Drawback
					Nutrients		Erosion (TSS (Total Suspended Solids))	*E. coli* (Bacteria)	Heavy metals					
Option	Description	Option	Wellington Water Applicability		Nitrogen	Phosphorus			Zinc	Copper				
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
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
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

Stormwater Management Option		Type of Option & Applicability		Example of Implementation	Effectiveness L=Low M=Medium H=High						Source Pathway Receptor	Location Suitability	Benefit	Drawback
					Nutrients		Erosion (TSS (Total Suspended Solids))	*E. coli* (Bacteria)	Heavy metals					
Option	Description	Option	Wellington Water Applicability		Nitrogen	Phosphorus			Zinc	Copper				
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

Stormwater Management Option		Type of Option & Applicability		Example of Implementation	Effectiveness L=Low M=Medium H=High						Source Pathway Receptor	Location Suitability	Benefit	Drawback
					Nutrients		Erosion (TSS (Total Suspended Solids))	*E. coli* (Bacteria)	Heavy metals					
Option	Description	Option	Wellington Water Applicability		Nitrogen	Phosphorus			Zinc	Copper				
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 waterbodies 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 waterbody 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.	

Stormwater Management Option		Type of Option & Applicability		Example of Implementation	Effectiveness L=Low M=Medium H=High						Source Pathway Receptor	Location Suitability	Benefit	Drawback
					Nutrients		Erosion (TSS (Total Suspended Solids))	*E. coli* (Bacteria)	Heavy metals					
Option	Description	Option	Wellington Water Applicability		Nitrogen	Phosphorus			Zinc	Copper				
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			

Stormwater Management Option		Type of Option & Applicability		Example of Implementation	Effectiveness L=Low M=Medium H=High						Source Pathway Receptor	Location Suitability	Benefit	Drawback
					Nutrients		Erosion (TSS (Total Suspended Solids))	*E. coli* (Bacteria)	Heavy metals					
Option	Description	Option	Wellington Water Applicability		Nitrogen	Phosphorus			Zinc	Copper				
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			

STORMWATER DESIGN GUIDELINES

*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

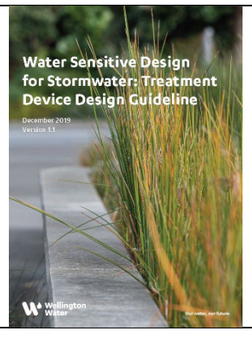
Non-structural stormwater management approaches are designed and implemented at the regulatory or community level to minimise contaminants from entering the stormwater network and to mitigate the effects of flooding and scour. The approaches are complementary to structural approaches and involve shifting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

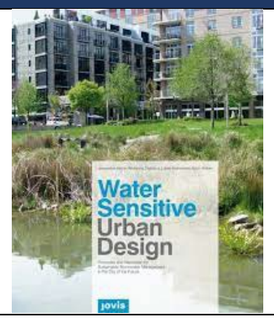
These approaches compliment physical works by providing clear direction and guidance which can minimise contaminants in our stormwater. To ensure this, Wellington Water will work closely with regional and district councils to address stormwater management in new and existing urban areas. **Table E-2** 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 E-3** below illustrates the range of education and engagement approaches that can be used as management options for stormwater quality.

Table E-2 Range of stormwater management related to policy and planning that can be implemented.

Stormwater Management Option		Type of Option & Applicability		Example of Implementation	Effectiveness L=Low M=Medium H=High						Source Pathway	Location Suitability	Benefit	Drawback
					Nutrients		Erosion (TSS)	*E. coli* (Bacteria)	Heavy Metals					
Option	Description	Option	Wellington Water Applicability		Nitrogen	Phosphorus			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.
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 usually come from corrugated iron roofs	Cost to implement and source roof materials. Buildings will have to be retrofitted with roof linings that can hold new materials etc.

Stormwater Management Option		Type of Option & Applicability		Example of Implementation	Effectiveness L=Low M=Medium H=High						Source Pathway	Location Suitability	Benefit	Drawback
					Nutrients		Erosion (TSS)	*E. coli* (Bacteria)	Heavy Metals					
Option	Description	Option	Wellington Water Applicability		Nitrogen	Phosphorus			Zinc	Copper				
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.
CODE OF PRACTICE														
Risk assessment and environment management systems by local authorities	Risk assessments and environmental management systems can identify, characterise, and manage the associated stormwater risks with each catchment.	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	
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.	

Stormwater Management Option		Type of Option & Applicability		Example of Implementation	Effectiveness L=Low M=Medium H=High						Source Pathway	Location Suitability	Benefit	Drawback
					Nutrients		Erosion (TSS)	*E. coli* (Bacteria)	Heavy Metals					
Option	Description	Option	Wellington Water Applicability		Nitrogen	Phosphorus			Zinc	Copper				
Water Sensitive 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						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 infrastructure 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 stormwater tariff to invest in water quality	Policy / Program	Low Influence 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
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	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

Stormwater Management Option		Type of Option & Applicability		Example of Implementation	Effectiveness L=Low M=Medium H=High						Source Pathway	Location Suitability	Benefit	Drawback
					Nutrients		Erosion (TSS)	*E. coli* (Bacteria)	Heavy Metals					
Option	Description	Option	Wellington Water Applicability		Nitrogen	Phosphorus			Zinc	Copper				
	expensive than traditional pads and they are easily available.													
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 E-3 Range of education and engagement approaches that can be used as management options for stormwater quality.

Stormwater Management Option				Benefit	Drawback
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
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

Stormwater Management Option				Benefit	Drawback
Option	Type	Wellington Water Applicability	Description		
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
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.

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