Healthy Waters Stormwater Network Discharge Consent 6-Yearly Review

September 2022, Version 2.2

aucklandcouncil.govt.nz

Contents

Figures & tables

1. Introduction

Auckland Council's Healthy Waters department is responsible for the operation, maintenance, and improvement of Auckland's extensive stormwater system. The department's planning, projects and operations are focused on achieving Healthy Waters' vision to future proof Auckland's waters for a resilient, water sensitive community. The management of stormwater and its effects on the environment contributes to Auckland Council's strategic goals. This report outlines the first 6-yearly review of the implementation of the Regionwide Stormwater Network Discharge Consent (NDC) in accordance with Condition 25 of the NDC.

1.1 Auckland's stormwater systems

Well-designed, constructed and managed stormwater systems combined with good land use planning provide flood protection to people and properties, as well as reduce waterborne pollutants from getting into waterways and marine environments. Auckland's stormwater network has been built over the last 150 years. Throughout this time, there have been different drivers behind designs including use of combined sewer networks, using networks designed almost exclusively for volume conveyance through to more modern designs where water quality outcomes have become a higher priority.

The public stormwater systems collect stormwater runoff from over 400,000 properties and 7,400 km of roads. Over 500 million cubic metres of stormwater is discharged into the receiving environments annually.

Stormwater finds its way to the coast through piped systems, overland flow paths and waterways, or permeates through soil, sand and cracked rock to replenish underground aquifers. The natural landforms are an inseparable part of the stormwater path. We refer to them as "natural assets".

Streams, rivers and lakes

Over 16,000 km of permanent streams

Over 4,500 km of intermittent streams

3,700 ha of freshwater wetlands

Coastal and Marine Environments

3200 km of coastline

Four main harbours:

Waitematā Harbour
Manukau Harbour
Kaipara Harbour
Mahurangi

Aquifers

Auckland Isthmus volcanic fields receive 20 percent of stormwater runoff in Central Auckland

Four Aquifers in the Auckland region

Overland flow paths

79,000 km of overland flow paths across the Auckland region

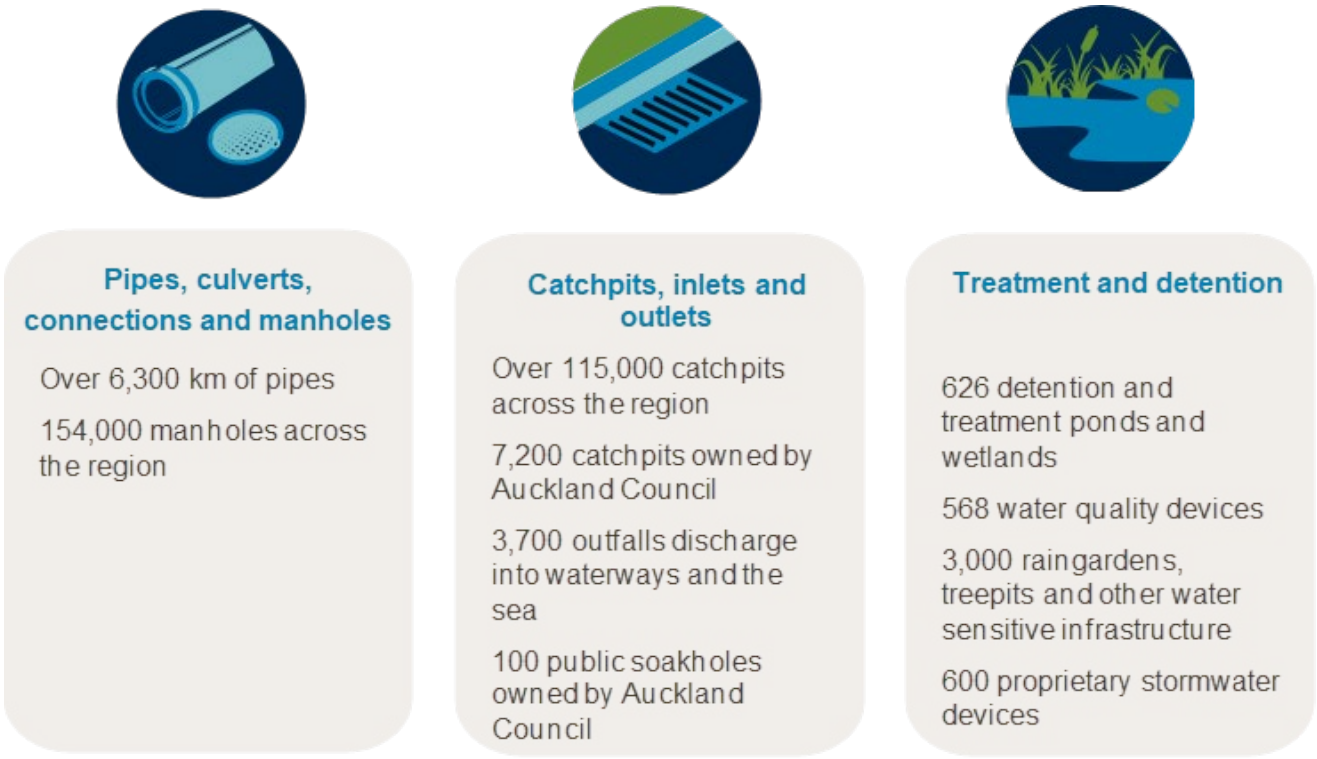


Figure 1. Natural and constructed assets in the stormwater system.

The built stormwater network takes stormwater away from properties to reduce regular or nuisance flooding. Detention and treatment facilities and devices manage stormwater flows and reduce pollutants from entering receiving environments.

Managing an open, interconnected system

The stormwater network is an open, interconnected system of constructed infrastructure, natural waterways, and coastal receiving environments across the region. As a result, there are a range of factors that influence the health of receiving environments beyond discharges from the piped network. These include existing and changing land uses, diffuse and point source contaminant discharges from a range of sources, and management of streams. Many of these issues are outside of the direct control of Healthy Waters and need a high level of cooperation, collaboration and engagement with mana whenua, communities, other infrastructure providers, regulators and developers in order to achieve meaningful receiving water outcomes.

1.2 Driving transformation: Te Mana o te Wai and Te Mauri o Te Wai

Te Mana o te Wai is a concept set out in the National Policy Statement for Freshwater Management that "refers to the fundamental importance of water and recognises that protecting the health of freshwater protects the health and well-being of the wider environment. It protects the mauri of the wai. Te Mana o te Wai is about restoring and preserving the balance between the water, the wider environment, and the community."

Te Mauri o te Wai is the vision set out in Auckland's Water Strategy demonstrating council's commitment in considering the protection and enhancement of water as a priority in all relevant decisions making. Mauri is life sustaining capacity, and therefore Te Mauri o te Wai outlines the vision of a future where the region's waters are healthy, thriving and treasured, where there are deep connections between water, the environment and people. This vision further recognises mana whenua as kaitiaki within the region.

Both these concepts have set a clear direction that the health of water must be prioritised in decision making. However, it must be recognised that while both concepts have been set out in central and local government direction, the concepts themselves are based on mātauranga Māori and cannot be defined without iwi, hapu and marae in their respective takiwā and their own tikanga in relation to the waterways/freshwater bodies within their rohe.

Healthy Waters is committed to a partnership approach with Te Tiriti partners and will continue to explore and co-design what the approaches may look like to mana whenua. This is vital in anticipation of the various reforms currently taking place and to enable mana whenua to exercise kaitiakitanga and tino rangatiratanga over their waterways. More cross-council and inter-governmental strategic collaboration will also help enable a more integrated approach reflective of the concept of 'ki uta ki tai.'

Healthy Waters is currently transforming how it works with mana whenua and maataawaka, building on its project-based engagement to work in partnership through the collaborative identification of stormwater issues and their resolution. This transformation seeks to empower Healthy Waters specialists to meaningful work with mana whenua and maataawaka to achieve improved cultural, social, and economic wellbeing outcomes for Māori in Tāmaki Makaurau.

1.3 Auckland Council Regionwide Stormwater Network Discharge Consent

1.3.1 What is the Regionwide Stormwater Network Discharge Consent

The Regionwide Stormwater Network Discharge Consent (NDC) is a key tool in managing and integrating land uses, stormwater discharges and the region's built and natural water assets. The Environment Court issued a consent order for the NDC in October 2019. The NDC authorises the diversion and discharge of stormwater from the current and future public stormwater network in the urban area, including within rural and coastal settlements that have reticulated networks. Schedule 1 of the NDC (figure 2) includes a map of the 'urban' area and current extent of the public stormwater network. The map has been updated as part of this review.

Healthy Waters is the department within Auckland Council responsible for NDC implementation and meeting the requirements of the consent conditions. Since the commencement of the consent, Healthy Waters' focus has been on establishing and embedding the new processes needed to implement the consent. During this time, Healthy Waters have also been working to share this information with the stormwater industry.

To account for the complexity of urban stormwater, as well as how its improvements can be monitored and assessed, the NDC outlines objectives, outcomes and targets (set out in full in Schedule 2 of the conditions of the NDC) for each of the following urban issues:

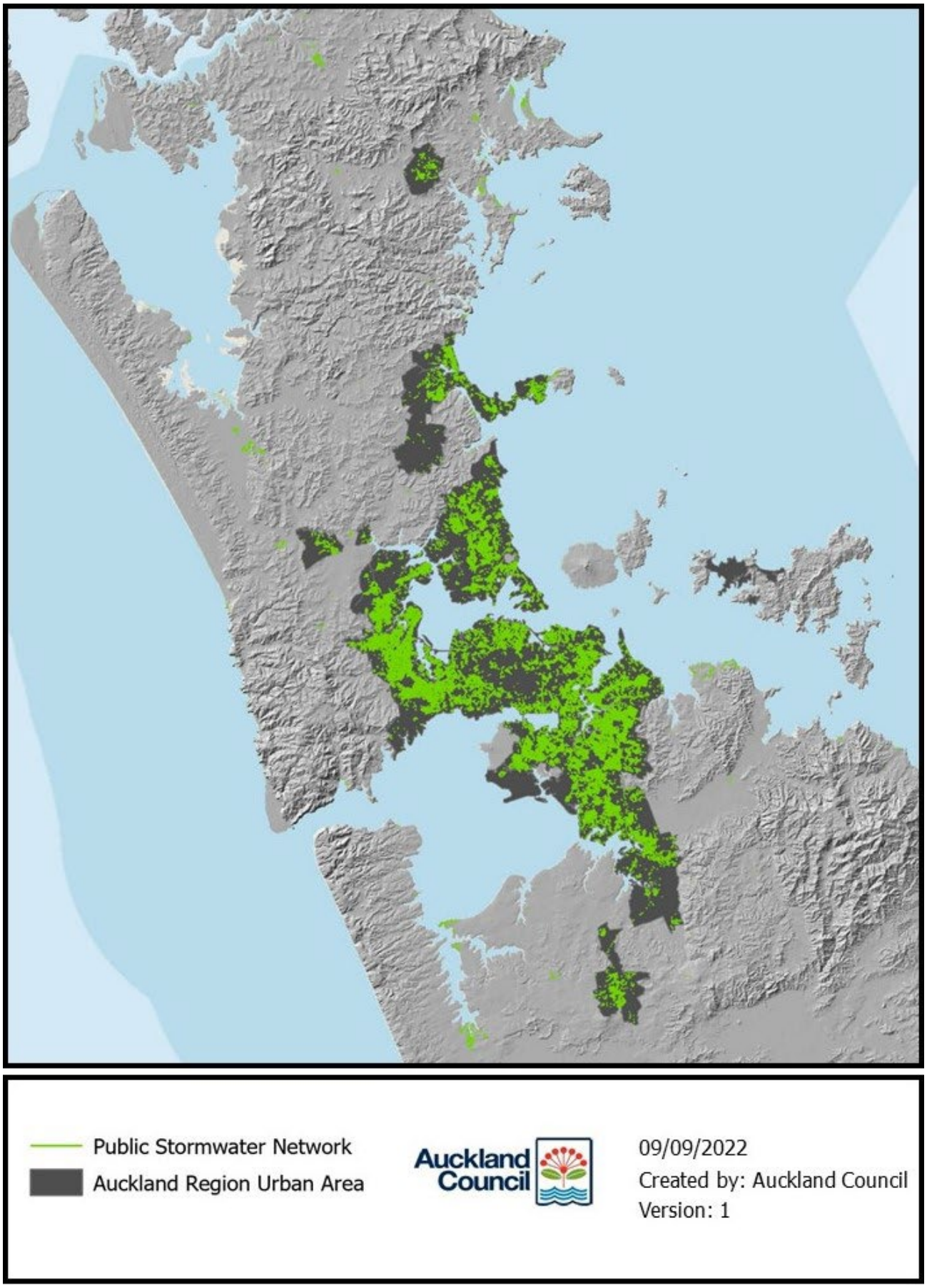


Figure 2. Map showing the current extent of the public stormwater network (Schedule 1 of the NDC).

Figure 3. Issues identified in Schedule 2 of the NDC for managing the Auckland stormwater network.

The NDC objectives, outcomes and targets take into account programmes that council:

- directly undertakes to improve water outcomes, such as the upgrade of public infrastructure – termed "direct controls"
- uses to require, influence or guide others in achieving improved outcomes – termed "indirect controls"
- collaborates with others to achieve improved outcomes – termed "collaboration"

All these types of programmes collectively have been identified as part of the best practicable option (BPO) for the management of each of these issues and reflect not only that the stormwater system is "open" and therefore impacted by upstream land use and activities, but also relies on assets owned by others, such as overland flow paths and stream channels.

1.3.2 Reviews and reporting

An important element of the consent is a review process to report on performance and to ensure that the NDC remains relevant over its duration, as the management of a complex drainage network such as that in Auckland is not static, but a process that evolves over time due to factors including:

- changes in community priorities that result in changes to council aspirations and priorities
- improved understanding of network performance, issues and adverse effects and the effectiveness of management responses
- changes to diversions and discharges.

Therefore the conditions of the NDC include ongoing review and reporting to ensure transparency and accountability for this significant consent. A schematic showing how this cycle of continuous improvement is intended to be implemented is shown in figure 4.

- the "**triennial review"** is primarily a series of updates with some performance analysis included in the reporting from the monitoring strategy
- the "**6-yearly review"** is an in-depth review. It includes detailed consideration of the performance of the network and the NDC and an opportunity to reconsider the overall approach to the best practicable options for managing stormwater as a result. It also includes engagement with a range of stakeholders.

A three year review cycle is established with the timing of the reviews intended to precede and inform council's long-term plan. The first two reviews are out of sync of the long-term cycle due to the timing of the start of the consent and the need for the cycle to align with council's long-term planning cycle. The first triennial review was completed in 2021. The first 6-yearly review is required to be submitted for certification by 30 September 2022. The reviews will then alternate every three years.

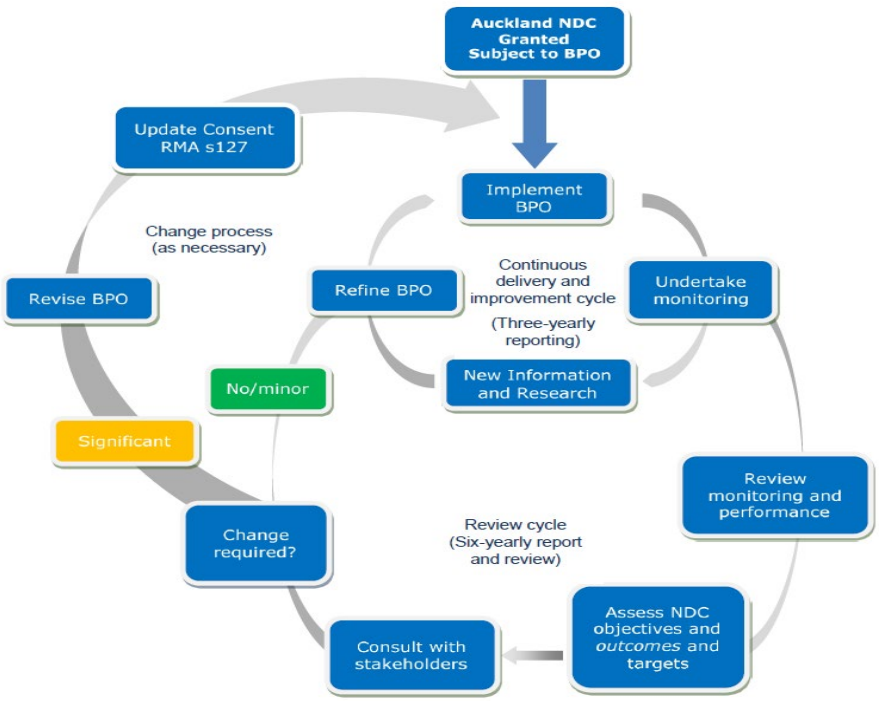
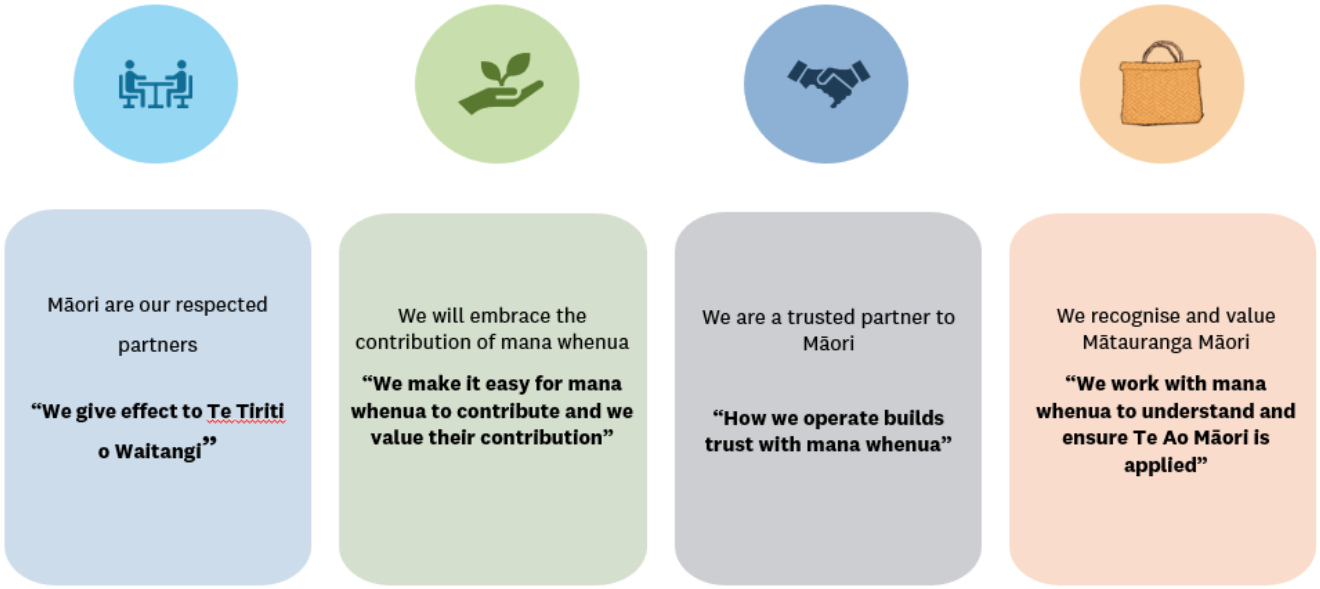


Figure 4. Reporting and review cycles in the NDC.

1.3.3 Mana whenua engagement strategy

Condition 21 of the NDC requires the development of a mana whenua engagement strategy. Developed in conjunction with mana whenua, the engagement strategy outlines Healthy Waters engagement and partnering objectives as well as channels, tools and opportunities to engage on areas of implementation of the network discharge consent and to support mana whenua involvement in the department's work. It identifies key focus areas to improve the relationship and future initiatives that need to be scoped and implemented to work towards genuine partnerships. The mana whenua engagement strategy is built on a regular engagement and continuous improvement approach. This approach provides the feedback necessary from mana whenua to ensure the strategy would address the key challenges experienced by the partners over the length of the consent.

There are four focus areas and principles outlined in the NDC mana whenua engagement strategy:



1.3.4 Monitoring strategy

Condition 37 of the NDC requires the development of a monitoring strategy and associated programme to assess performance and progress against the NDC objectives, outcomes and six-yearly targets. The purpose of the NDC monitoring strategy is to detail the information that will be used to:

- assess the outcomes and objectives of the stormwater diversion and discharges authorised by the NDC as per Schedule 2 targets
- increase public transparency regarding the performance of the NDC
- provide evidence of the effectiveness of the NDC best practicable option (BPO) (including associated schedules, requirements and interventions) in managing these effects
- input into NDC review cycles so that the BPO to manage stormwater evolves to changing circumstances and remains fit for purpose over time.

The monitoring strategy was certified in July 2022 and is included in appendix 5. It currently contains a list of programmes and processes used to meet the targets. Considering the complexity of stormwater management, the Monitoring Strategy encompass a variety of types of monitoring, both evaluative and measurable (figure 5). The strategy includes operational and management programmes of work that contribute to achieving the objectives and targets of NDC and tailored environmental and modelling programmes that are currently being scoped. Environmental monitoring data from Auckland Council State of the Environment (SoE) and Freshwater Management Tool (FWMT) reporting are also used to offer a baseline and best-practice assessment (benefits of modelled and monitored understanding – see section 3.1 below).

Because of the nature of the stormwater system as an open network, it is important to acknowledge that the performance of the NDC is affected by third parties. Therefore, the BPO and associated targets in Schedule 2 extends beyond the piped network as well as direct control of Healthy Waters, with work programmes scoped to enable working with third parties to improve water outcomes. However, it must be

recognised the ability of Healthy Waters to influence third parties is limited. The monitoring strategy therefore includes actions and programmes for which Healthy Waters has direct control as well as the ones it can only influence.

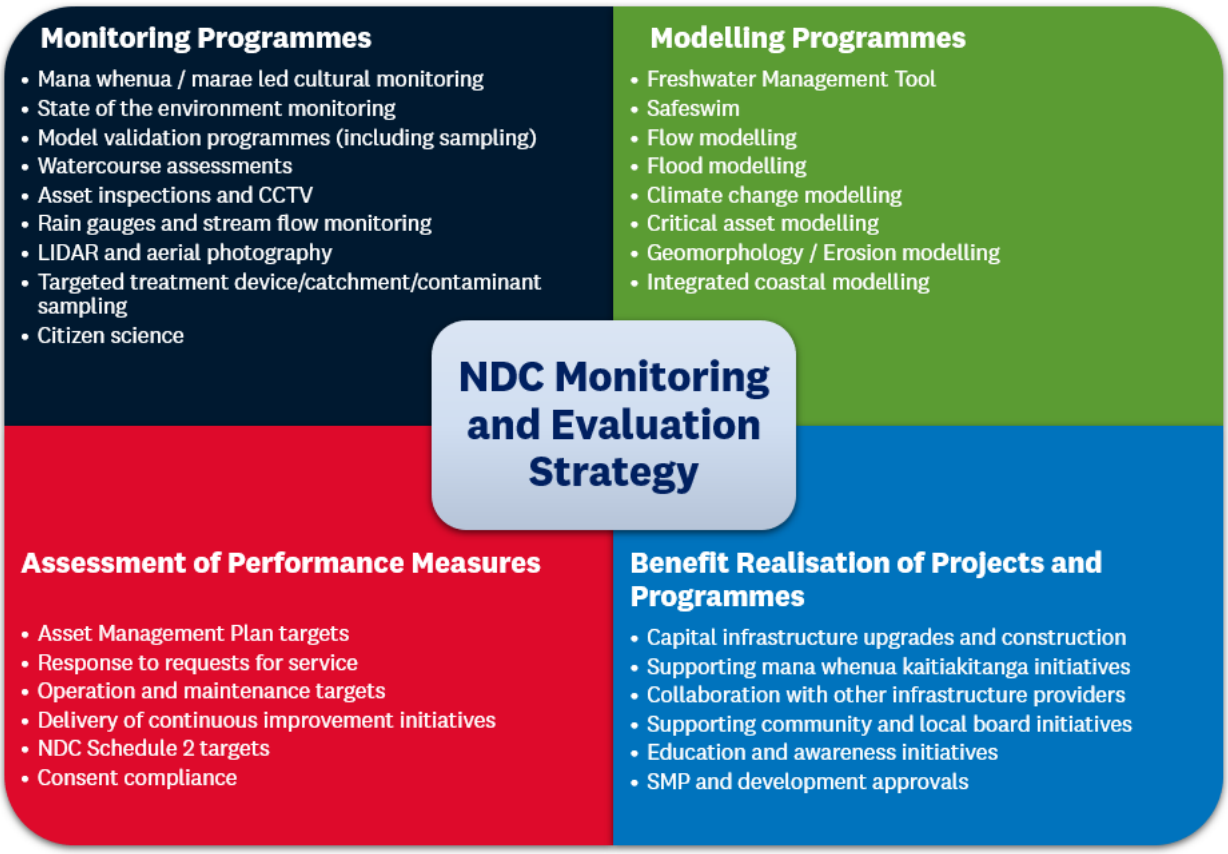


Figure 5. Monitoring and evaluation strategy of the NDC.

1.3.5 Six-yearly review 2022

This report documents the first 6-yearly review and focuses on performance against the six year targets to assess progress in achieving the NDC outcomes. The review report also incorporates each of the matters outlined in condition 25 of the NDC which include discussion of the state of the environment and other monitoring information as well as policy and legislative changes which will affect the NDC.

A detailed assessment of performance against each of the NDC six year targets is in Appendix 1 and a summary of performance against each of the NDC conditions is in Appendix 2. A summary of where each of the matters set out in conditions 25-32 can be found in this report is included as Appendix 3.

Conditions 29-32 set out engagement with mana whenua, stakeholders and community which is required to be undertaken as part of the review. Summaries of the key matters raised through engagement with each of these groups is in section 5 of this report and responses to the matters raised have been incorporated throughout the report and into the recommendations.

2. NDC Performance

2.1 Overview

Healthy Waters is tracking well across the targets set out in the NDC (figure 6) and overall is making progress towards achieving the outcomes and objectives in Schedule 2. However, areas of improvement have been identified and several of the targets need to be amended. The sections below discuss the performance for each issue in more detail, the programmes in place to manage each of the issues, and identify gaps and future changes that may be required. A detailed assessment of performance against each of the NDC six year targets is in Appendix 1.

To develop projects and programmes and to measure performance, Healthy Waters generates and collates a range of information and data on assets, flood risks and the environment. Figure 7 provides an overview of the information generated by Healthy Waters.

Many of the programmes and projects that are discussed are shown on the publicly available Healthy Waters projects viewer as shown in Figure 8. Because of the nature of the stormwater system as an open network, it is important to acknowledge that the performance of the NDC is affected by third parties upstream and downstream of network discharge. The targets in Schedule 2 therefore extend beyond the piped network as well as in some cases beyond the direct control of Healthy Waters. In order to achieve the outcomes and objectives of the NDC the consent holder must collaborate with iwi to implement Te Mauri o te Wai.

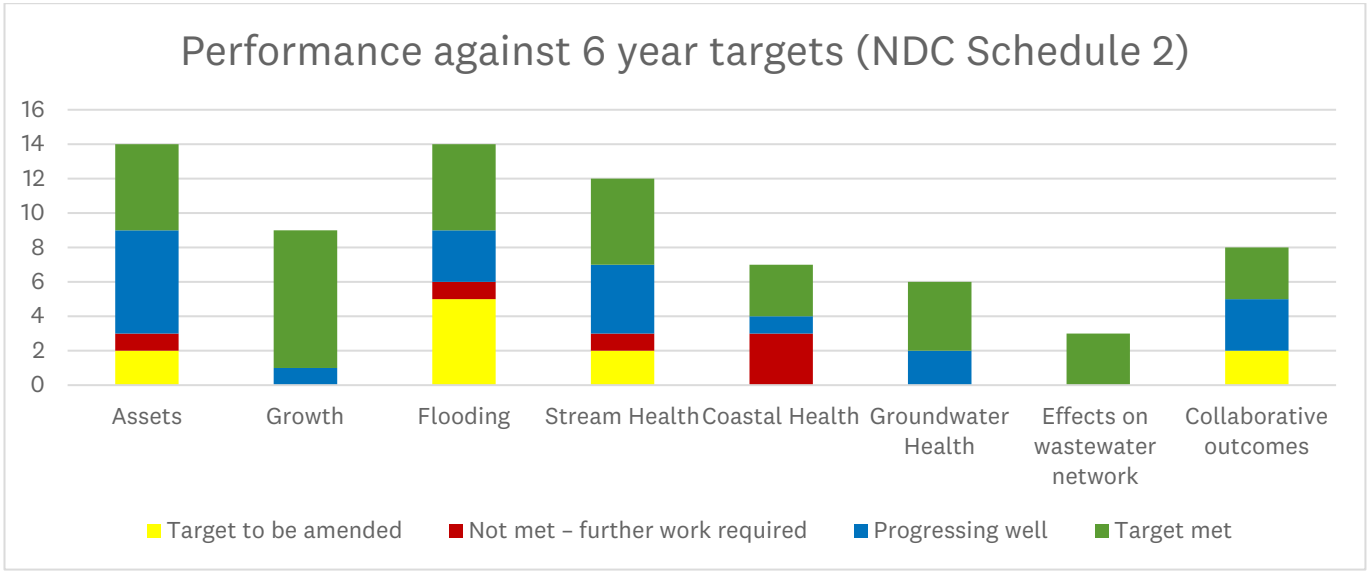


Figure 6. Overall Performance against the 6-year targets set out in Schedule 2 of the NDC.

Figure 7. Overview of the information and data generated and collated by Healthy Waters.

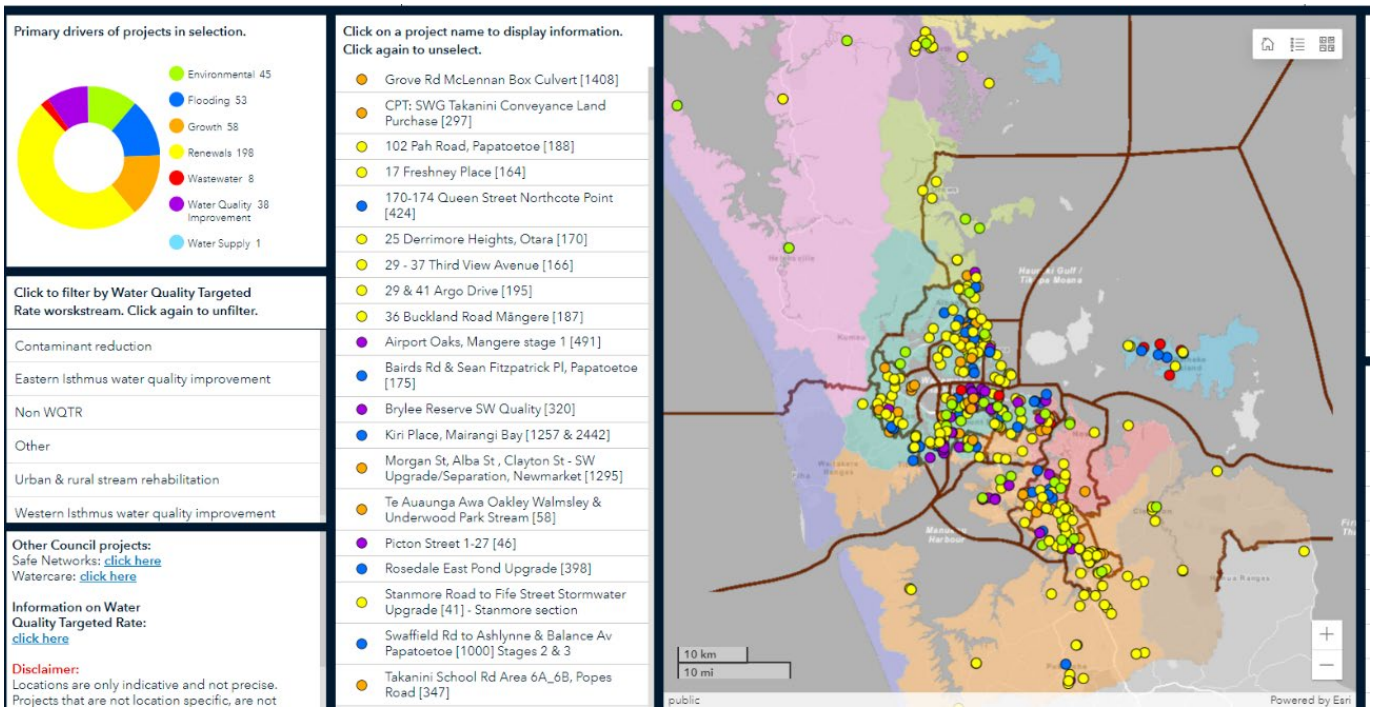


Figure 8. Snapshot of Healthy Waters project viewer accessible from https://aucklandcouncil.maps.arcgis.com/apps/dashboards/e5fc6fe9d6ed4561a16f535c70da8343.

2.2 Assets (Issue 1 under NDC Schedule 2)

2.2.1 Context

The stormwater system relies on a network of constructed assets, as well as natural assets such as streams and overland flow paths for the safe conveyance and treatment of flows. This section covers the management of existing constructed assets, which comprise both hard and green infrastructure, and more specifically, includes pipes, catchpits, manholes, ponds, wetlands, dams, outfalls, inlets and culverts. The management of 'natural assets' is covered in later sections (e.g., stream health, overland flow paths in flooding) and the management of new assets vested to council is discussed in the growth section.

The objectives sought for the management of assets under Schedule 2 of the NDC are:

> *Safe Communities: Risk to our communities, including people, property and infrastructure is reduced - ensure that risk to people and property is managed to levels that have been established in consultation with the community, and reduce existing flood risk where it is above these levels.*
>
> *Healthy and Connected Waterways that provide for te mauri o te wai: Stream, groundwater and coastal water values are maintained and enhanced, and communities are connected with them - utilise streams, aquifers and harbours as integral natural components of Auckland's stormwater system while reducing the adverse effects of stormwater runoff, restoring te mauri o te wai and enhancing our community's connection with, its waterways.*

Maintaining sustainable asset renewal levels is one of the biggest challenges facing every asset-rich organisation, particularly given the breadth of constructed assets that need to be managed. Keeping the stormwater systems reliable, safe and affordable therefore requires prudent planning and optimised funding of asset renewal programmes.

This is achieved by centring the management of constructed assets around the concept "asset criticality", which uses specific criteria to rate assets between 1 (very low) to 5 (very high), with critical assets/ system elements rating 4 and 5.

Based on this ranking, asset management is a risk-based intervention approach comprising the following key elements:

- prevent failures in high-risk parts of the system through renewals and/or urgent maintenance
- monitor and inspect areas of medium risk
- inspect areas of low-risk if opportunity exists
- unless included in larger projects, assets of low criticality will be run to failure and will be replaced when they start to affect system performance or customer experience.

Reflecting the above, Healthy Waters has developed the following risk-based strategies to support asset renewals:

- the Condition Monitoring Framework 2015, describes our risk-based condition monitoring strategies. Healthy Waters asset risk related strategies are reviewed every 5 years or as appropriate
- the Healthy Waters Renewal Strategy 2016, outlines the asset renewal concepts, objectives and principles. We have developed (or are developing) a renewal strategy for all asset classes with primary conveyance and treatment function.

Table 1 provides an overview of constructed stormwater assets as of 30 September 2020 and their status. Most notable is the high percentage of ponds in poor condition, which are anticipated to be a result of poor sediment management during building activities as well as poor quality of vested assets which do not enable affordable maintenance.

Table 1 Overview of stormwater assets condition as of 30 September 2020.

Asset Type	Estimated Quantity	Inspections	Status
Pipes	6,300 km of pipes	Completed for: 600 km of non-critical pipes 505 km of critical pipes	70% of all pipes less than 30 years old 1,200 km modelled as critical 8% of inspected non critical pipes in poor condition 6% of inspected critical pipes in poor condition
Manholes, catchpits, soakholes	154,000 manholes 6000 catchpits owned by Auckland Council (115,000 regionwide) 100 public soakholes	Roll out of inspection through asset safety improvement programme	200 catchpits have been retrofitted with spring latch safety grates as part of the asset safety improvement programme
Outfalls	3,700 outfalls	Coastal outfall survey completed in 2016 Stream outfall assessments ongoing through watercourse assessment programme	
Treatment facilities	626 detention and treatment ponds and constructed wetlands 600 proprietary devices 3,000 raingardens, tree pits and other water sensitive design infrastructure	258 ponds inspected	44% of inspected ponds in poor condition

The performance of the built stormwater network varies across the region. The older network was built to varying design standards, and in some areas infrastructure upgrades are not keeping pace with land development. Healthy Waters has evidence of poorly designed newly installed water sensitive infrastructure, highlighting gaps in industry knowledge and urgent need for improving design guidelines

and construction practices. System performance will also be put under additional pressure from climate change.

2.2.2 Asset criticality assessments

Asset criticality is assessed differently for each asset type. To identify and renew high-risk pipes, culverts, manholes, outlets, inlets and ponds, Healthy Waters continues to use the 2015 Condition Monitoring Framework, while dams are assessed based on national dam safety guidance as well as upcoming regulatory requirements.

Key elements of asset criticality assessments include:

- being the backbone of the built stormwater network, pipes are subjected to asset deterioration modelling to project long-term renewal trends, with a 150-year renewal horizon. Deterioration models use condition, materials, pipe installation environments and other data which is updated every three years. The latest deterioration model (Worst Case Scenario, 2018) shows steep increase in renewals after 2052
- asset condition, which is a key indicator of asset remaining life and a main input into asset renewal considerations. Key asset condition programmes include:
    - condition of critical pipes being monitored proactively through a rolling three-year condition survey programme, predominantly through CCTV surveys. The roll out of this framework has recently been updated based on learnings from CCTV monitoring, as well as updates to the New Zealand pipeline manual
    - pond bathymetry programme, which has been operating since 2013, and aims to determine the percentage volume loss in ponds due to sediment build up, as well as assess the structural condition of the pond and any red flags associated with algae build up, weeds, rubbish etc
    - a coastal outfall data capture survey was completed in 2016, with erosion, asset condition, health and safety and other factors assessed
    - stream outlets have been inspected as part of watercourse assessment, under which poor or very poor condition outlets have been identified for approximately 25 catchments, together with initial solutions. Fish passage barriers are also identified under these assessments.

In terms of the management of dams, since the granting of the consent, Healthy Waters has identified 48 large dams out of the 600 dams/stormwater ponds managed by Healthy Waters (as of 2022). All dams form part of the public stormwater network and are often used to store flood water for smaller flood events or to create stormwater treatment wetlands and ponds. 'Large' stormwater dams are defined as those four metres or higher with a volume of 20,000m^3 (eight Olympic-sized pools) or greater.

Given the size and function of large dams, assessments of their safety and integrity, and maintenance is required. To date the following tasks have been completed as part of the large dam assessment programme, in line with the NZ Building Act and NZSOLD Guideline 2015 standards:

- large dam register is complete
- transfer data and map large dams on GIS (Auckland Council Geomaps) is complete
- as builts for 90% of large dams are complete
- potential impact classifications are 94% complete

- dam safety reviews are 45% complete
- dam effects and failure mode analysis is 70% complete
- operation maintenance and surveillance manuals (OMSM), criticality criteria model for dam failure and Emergency Action Plans (EAP) are progressing
- scoping of potential training programme related to dam inspection, surveillance to wider Auckland Council family.

Since the NDC was issued, new dam regulations from Building (Dam Safety) Regulations 2022 were made and are due to commence in May 2024. The main change from these regulations is that they include an alternate size making dams classifiable (1m high and 40,000 m^3). No additional sites meeting the new size classification have been identified as yet by Healthy Waters, and we do not expect major changes to the current programme due to the regulations – progress is already being made on the existing dams (4m high and 20,000 m^3).

2.2.3 Asset renewal

Assets are renewed for the following reasons:

- high risk of failure due to poor condition - this is the driver of the critical asset renewal subprogramme, and to some extent, of the pond renewal / rehabilitation programme
- a failure has already occurred, and it has negative effects on health and safety or customer experience – this is the driver for reactive asset renewals
- high risk of failure due to performance issues or changing demand - this is the driver for upgrading assets that are currently under capacity or will be under capacity. Assets are upgraded to protect the existing stormwater function or if there is a wider public benefit.

Healthy Waters prioritises and scopes renewal solutions based on risk and applies the most appropriate renewal / rehabilitation methodology. Renewals are prioritised based on risk as identified above, together with taking advantage of opportunities, such as collaborating with other infrastructure providers. Renewals are carried out using the most appropriate renewal / rehabilitation methodology, and every opportunity is undertaken to:

- naturalise piped streams when the pipes reach the end of their life
- convert stormwater ponds to wetlands when the pond silt levels are high
- improve stormwater pond design at the time of renewal
- explore opportunities to reuse silt material removed during pond rehabilitation.

The Healthy Waters Renewal Strategy, 2016 outlines the asset renewal concepts, objectives and principles. Renewal strategies are present for some asset types and in progress for others.

Opportunities for renewals are also undertaken in collaboration with other infrastructure providers, such as transport, as part of their infrastructure upgrades, as well as to support growth areas.

In terms of the asset targets set out in Schedule 2 for related to renewal *(i.e., b) All Grade 5 highly critical assets are repaired or renewed within 5 years and c) All Grade 4 critical assets are repaired or renewed within 5 years)*, these will need to be modified as the response to critical assets has changed since the NDC

was granted. This change was needed to ensure targeted focus on the most urgent renewals, particularly due to recent budget and other constraints. The revised process is as follows:

- if an urgent issue is identified through CCTV, operations are immediately informed and repairs undertaken, e,g. to address safety risks
- where there is a high risk, high consequence of failure, this is streamlined into the urgent renewals programme
- for less urgent issues, monitoring of critical assets is increased – this is particularly relevant for Grade 4 critical assets.

In addition, the above targets do not currently apply to stormwater ponds nor to outfalls. A pond renewal programme, based on a bespoke criticality framework, is currently being scoped. With respect to the stream rehabilitation works, pilot projects are currently being scoped for selected private streams known to have significant issues. This work recognises, that while these streams may be in private ownership, they provide a public good in terms of conveyance of water and management of associated flooding and erosion risk. As such Healthy Waters intends to use these pilots to assess holistic options for the rehabilitation of private urban streams, including opportunities for the reduction of catchment hydrological flows as well as for in-stream works, such as bank stabilisation and outfall remediation.

Appendix 9 includes a register of renewal projects completed or underway by Healthy Waters since 2017.

2.2.4 Asset Safety Improvement Programme

A new initiative since the NDC was issued is the asset safety improvement programme, which seeks to address the danger that some stormwater assets pose to public safety, particularly large and deep concrete structures that are not safeguarded. For example, when a manhole is surcharging, the excessive water flow blows the covers open, or stormwater outlets with high headwalls in public areas pose a danger to children. This programme comprises the development of a methodology to identify asset safety risk, with an associated inspection programme and asset safety register.

The current focus has largely been on catchpits, for which Healthy Waters has been working in collaboration with Auckland Transport. Working with suppliers, a newly designed self-locking grate has been developed and trialled, with standard specifications for “road stormwater catchpit – spring latch (safety) grates” incorporated into the Auckland Transport Engineering Design Manual, together with an associated practice note. To date approximately 200 catchpit grates have been installed as retrofits to existing catchpits, in addition to new installations in subdivisional developments.

Issues have also recently been raised by Auckland Transport related to injuries arising from poorly constructed raingardens (e.g. leg injuries sustained by pedestrians falling into these assets). Work is currently programmed to incorporate improved safety measures into the design and construction of these assets, as well as to explore how such devices can be retrofitted or replaced in line with the requirements of this consent.

2.2.5 Operation and Maintenance

Healthy Waters is required to operate and maintain its assets so that they continue to deliver the agreed services to the end of their useful life - operation and maintenance activities must meet the levels of service, whilst preventing and minimising environmental effects.

An operation and maintenance overview document has been developed outlining how these responsibilities are met, in accordance with condition 9 of the NDC. The intention of this document is not to provide details of specific operations and maintenance activities, but rather is a reference that maps the relevant responsibilities, documents and processes in place within Healthy Waters.

The overview includes updates and changes from the 2016 version of the operation and maintenance plan which was included in the NDC application. The functional updates include:

- the current Healthy Waters department and Auckland Council strategy and direction
- asset information management updates to reflect the current ICT systems and procedures
- the ponds chapter of the regional operation and maintenance manual
- the emergency management section with reference to Covid-19 and procedures for responding to emergency works situations.

This overview document was submitted to council compliance in March 2021, and certified in November 2021. No further changes are proposed at this time.

Operational activities are tracked through maintenance contracts and through requests for service (RFS) from customers. Volumes and types of RFS are reported monthly to the Healthy Waters leadership team and Auckland Council Finance department.

In addition, Healthy Waters has in place Service Level Agreements (SLAs) with Auckland Transport and council's Community Facilities department, which set out Healthy Waters responsibilities with regards to inspection and maintenance of certain assets owned by these respective arms of the council family (e.g. road corridor stormwater assets owned by AT, amenity urban lakes managed by Community Facilities). While these assets are not specifically covered by this consent, the SLAs demonstrate Healthy Waters commitment in working with others to achieve improved operational efficiency and water outcomes. They will need to be periodically reviewed, particularly to ensure appropriate scope and funding provisions.

2.2.6 Performance against asset related targets under Schedule 2

In terms of targets related to asset condition monitoring, two are on track *(i.e., i) Complete asset and risk assessment of public coastal* (now completed) *and stream outfalls* (progressing under the Watercourse Assessment programme), and *j) Complete condition and risk assessments of large public stormwater dams (completed by 2023).*However a third target, *a) Survey 95% of critical assets every five years,* is tracking below target As of the end of FY21 the remaining percentage of critical assets needed CCTV inspection was 52%. Covid-19 did impact progress against this target. There is nonetheless the expectation the target will be achieved, particularly under updated CCTV methodologies and contract key performance indicators (KPIs) which have recently been implemented. As part of this update, a revised target of 'Survey 95% of critical assets by 2026 'is recommended, as adding a date will make this an easier to measure contractually.

In terms of targets related to asset renewal, these will need to be reviewed. The current targets, namely, *b) Grade 4 critical assets will be repaired or renewed within five years (2015 -2045 AMP)* and *c) Grade 5 highly critical assets will be repaired or renewed within 24 months of identification (AMP)* are no longer considered fit for purpose for the following reasons:

- Since the consent was issued, there have been improvements in the understanding associated with the risk of failure of Grade 4 and 5 critical assets - they do not deteriorate as quickly as anticipated

and so do not pose a high risk of immediate failure; the risk can also be managed by increased condition monitoring

- Due to delays as a result of project consenting, as well as other factors such as a competitive infrastructure market, the delivery of critical renewals project is not taking place within 24 months
- Response to grade 5 assets has also been modified, focusing on the most urgent needs. For instance, the new asset safety improvement programme has now come into place to address urgent safety risks.

As a result, the following amendments to these targets are recommended:

b) 90% of Grade 4 critical assets will be repaired or renewed within 10 years

c) 90% of Grade 5 critical assets will be repaired or renewed within 5 years

In terms of targets related to operation and maintenance, two are on track *(i.e., d) Number of blockages in the stormwater network per 100km will be less than 20 per annum,* and *e) The number of complaints received about the performance of the stormwater network per 1000 properties connected to Auckland Council's stormwater network will be less than three per 1000*). A third target, namely *f) Stormwater manholes that pop open in flood events are made safe within two hours with a target of 100%)*, was slightly below target, though improving over the years. However it is also recommended that this last target be amended, as it is not the same as the current LTP target, which was subject to public consultation processes, namely: *The percentage of response time to close stormwater manholes within three hours: 90%,*

Further work was identified for targets related to continuous improvement processes, ie. *h) Implement identified stormwater asset management improvement measures (ongoing Business as Usual (BAU)* and *k) Ongoing review of criticality strategies and assessments for all asset types*. While these initiatives were started, they have been paused.

2.2.7 Key points and recommendations

While the focus of asset management was on pipes at the time of the granting of the consent, inspections of other asset types have been significantly progressed, particularly with respect to dams and ponds.

Constructed assets have the potential to endanger public safety and the environment when they fail. Given the scale and extensive nature of constructed assets managed by Healthy Waters however, prioritisation and planning on asset renewal to manage these risks is needed. This is reflected in the existing asset assessment and renewals strategies and frameworks, with focus on asset criticality.

As a result of this criticality framework, as well as of opportunities to collaborate with other infrastructure providers on their upgrades, close to 200 renewal projects have been undertaken since 2016 (refer Appendix 9 for project details)

A new initiative started since the issue of the *NDC has been the roll out of the a*sset safety improvement programme. This focuses on safeguarding assets that endanger public safety. To date over 200 catchpits have been retrofitted with safety latches as a result of this programme

Since the issue of the NDC, the following learnings have also been made, and should be considered in evaluating, and where required, updating the Schedule 2 targets for assets.

Table 2 Recommendations, future actions and programmes related to Assets

Reference	Recommendation and future actions
Assets 1 Schedule 2 Amendments	Proposed amendments to Schedule 2 targets • Target *a) Survey 95% of critical assets by 2026* – adding a specific date makes this target easier to measure as part of CCTV contracts. • Target *b) 90% of Grade 4 critical assets will be repaired or renewed within 10 years* – this reflects that these assets are not deteriorating as quickly as anticipated, and can be managed through increased monitoring. • Target *c) 90% of Grade 5 critical assets will be repaired or renewed within 5 years* – like Grade 4 assets, these assets are not deteriorating as quickly as anticipated, and can be managed through increased monitoring. In addition, due to a range of factors such as consenting, renewals projects are unlikely to be carried out within 24 months. Target *f) Stormwater manholes that pop open in flood events are made safe within three hours: 90%* - this reflects the current LTP target on this matter, which was subject to public consultation processes.
Assets 2	The 2015 Condition Monitoring Framework will need to be reviewed. Similarly, the review of the 2016 renewal strategy should continue. This review will need to consider assets such as coastal outfalls and ponds (see recommendation below).
Assets 3	Large proportion of ponds inspected were found to be in poor condition. This has been attributed to development activities upstream, as well as the vesting of poor-quality assets. A ponds renewal programme is being scoped for roll out, based on a criticality framework under development.
Assets 4	Issues have also recently been raised by Auckland Transport related to injuries arising from poorly constructed raingardens (e.g. leg injuries suffered by pedestrians falling into these assets). Work is currently programmed to incorporate improved safety measures in the design and construction of these assets, as well as to explore how such devices can be retrofitted or replaced in line with the requirements of this consent.

2.3 Growth (Issue 2 under NDC Schedule 2)

2.3.1 Context

Auckland is expected to grow to a population of 2.4 million by 2050 (Auckland Plan 2050). The increasing intensification of existing urban areas, as well as expansion of urban areas brings the risk of further degradation of waterways and increased flooding risk to properties if development is not well planned.

> *Objective: Support Growth*
>
> *Growth through water sensitive development and provision of quality stormwater infrastructure is enabled - new and re-developed areas are supported by effective stormwater management and good quality infrastructure and development is undertaken in a way that meets the needs of our communities and maintains and enhances natural water systems.*

The overarching best practicable option identified in Schedule 3 for growth is a mix of connection requirements for third party development (NDC Schedule 4) and Healthy Waters led projects and investment.

Growth is the area where the biggest changes have come about as a result of the implementation of the NDC including:

- stormwater diversion and discharge from new development and redevelopment can be authorised by the NDC instead of each development needing a separate consent for diversion and discharge under the Auckland Unitary Plan (operative in part) (AUP(OP)

- new processes established for authorising the diversion and discharge of stormwater under the NDC and the relationship of this with the AUP(OP) and existing resource consent process
- requirement for all development and redevelopment to comply with the Schedule 4 connection requirements
- requirement for the preparation of Stormwater Management Plans (SMPs)
- establishment of new processes for the approval of SMPs.

However, implementing these has raised many ongoing challenges to meeting the growth objectives and outcomes of the NDC and consequently the objectives and outcomes for the other issues also. These include:

- relationship and integration with the AUP(OP) and resource consent process
- interpretations of connection requirements - especially where the requirements differ from the existing rules in the AUP(OP)
- content of SMPs and systematically establishing site specific best practicable option
- incomplete application of water sensitive design or integrated stormwater management proposed by applicants in greenfield and brownfield development plans
- increasing quantity of small-scale brownfield redevelopment
- integrating the NDC requirements with plan change processes particularly in greenfield areas
- new processes and connection requirements has led to some inconsistency in interpretations and implementation.

2.3.2 Performance against the targets

Healthy Waters is meeting the targets for this issue including review of SMPs, response to enquiries and capital spend to support growth projects. However, there are still many challenges for the implementation of water sensitive design and achieving good quality stormwater assets as directed through the supporting growth objective and to achieve the outcomes which are not reflected in the target performance.

No changes to the targets are needed at this time.

2.3.3 Specialist Input

Healthy Waters specialists provide technical specialist input and asset owner approval to the council Resource Consent department across all stages of resource consent applications and engineering approvals. This includes advice on flooding, assets, pipe capacity, appropriate stormwater management, stormwater device design, and compliance with the code of practice. As shown in Figure 9 the volume of requests is increasing each year reflecting high consent application numbers received by the Resource Consent and Regulatory Engineering departments.

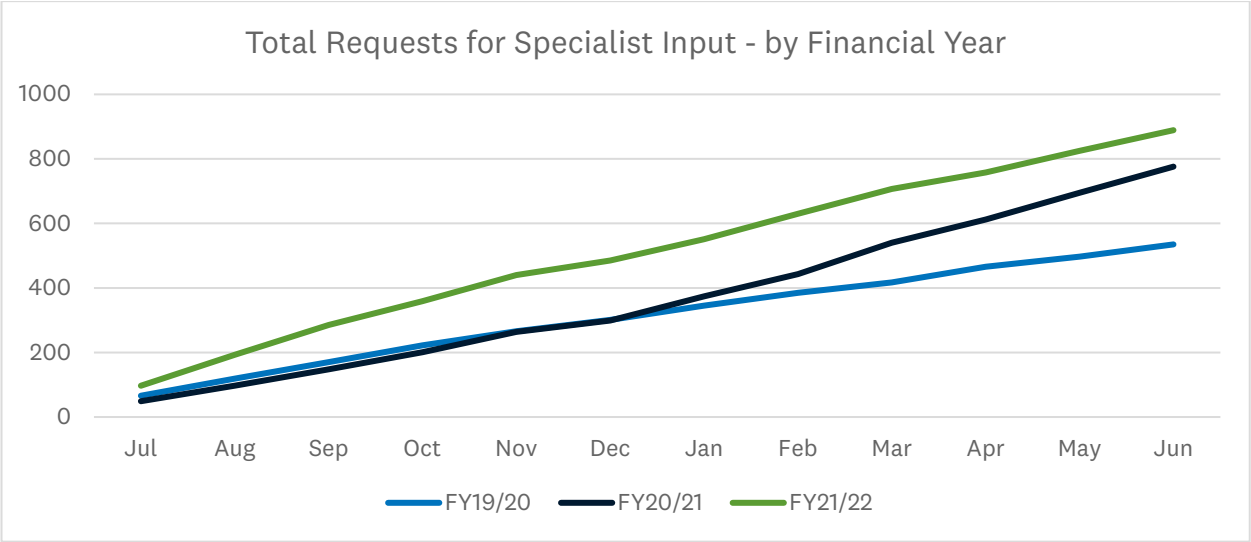


Figure 9. Number of requests for Healthy Waters specialist input and asset owner approval received from the Resource Consent Department.

In the three years since the NDC has been in effect, Healthy Waters specialists have likewise provided specialist stormwater related planning and engineering input to the council Plans and Places department for approximately 35 publicly notified - privately initiated plan changes, and eight notified Notices of Requirement (from Auckland Transport, Waka Kotahi and the Ministry of Education). Of the plan changes, 17 have related to brownfield sites, with the remaining 18 being greenfield plan changes. All the greenfield plan changes have been initiated out of sequence with/ahead of the timeframes identified in the Future Urban Land Supply Strategy. Healthy Waters has also provided significant specialist input to a similar number of private plan change enquiries and requests that are yet to be accepted or publicly notified.

Additionally, Healthy Waters receives and responds to requests for information which are not necessarily associated with the resource consent or plan change process. These are often initial enquires such as requests for flooding or network information before an application is lodged. As required by the six-year target, requests made by email receive an initial response within five days.

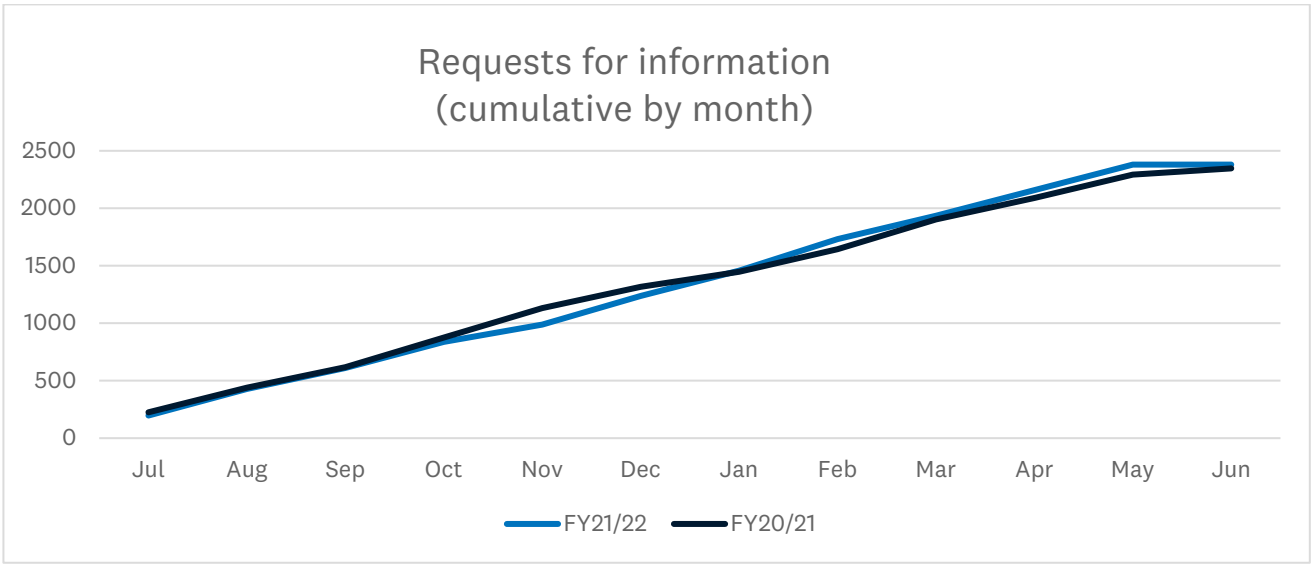
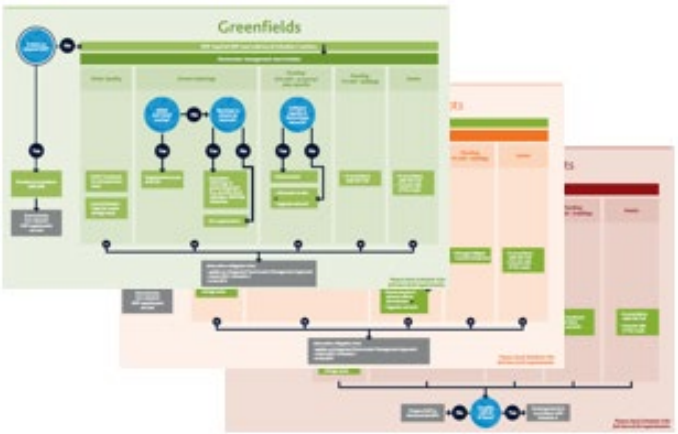


Figure 10. Number of requests for information to Healthy Waters over financial year 2020/21 and 2021/22.

2.3.4 Stormwater management plans



Stormwater management plans (SMPs) are the key tool that the NDC uses for managing the stormwater related effects of growth. The establishment and implementation of new processes, for the approval of SMPs across multiple council departments, and education of the stormwater industry has been the largest process change created by the NDC.

An SMP should demonstrate that the proposed stormwater management for new development or redevelopment is the best practicable option and how the proposed stormwater management will achieve the outcomes of the NDC. It takes into consideration the existing site features, the proposed development outcomes and a water sensitive design approach. Healthy Waters have developed a template to guide and assist developers and their professional teams in preparing an SMP.

Schedule 4 of the NDC "*Requirements for changes to be authorised under the Auckland Stormwater Network Discharge Consent*" sets out the connection requirements for development where the discharge of stormwater will be to the public network, or which will vest assets to Healthy Waters. The requirements in Schedule 4 include the need for and content of SMPs and specific stormwater management for different development types. These requirements are publicly available through the Auckland Design Manual along with a template and guidance notes for preparing an SMP.

Large scale brownfield redevelopment and any new greenfield development must be accompanied by an SMP. The SMP must be adopted into the NDC in order for the diversion and discharge of stormwater to be authorised by the NDC and for connection to the network. Condition 13 and Schedule 8 of the NDC set out the particulars for adoption. Once an SMP has been adopted, it then sets the requirements for how stormwater must be managed within its boundary.

The process that Healthy Waters have established for the review, approval and adoption of SMPs is intended to integrate with the existing resource management act (RMA) processes. This includes plan changes and resource consent applications where specialist input is provided. Provisional approval of an SMP (approval in principle subject to further changes) can be granted ahead of the rest of completion of the regulatory processes to provide certainty to the applicant and regulator.

As of 1 September 2022, 198 SMPs have been received for review. 71 have been formally adopted into Schedule 10 of the NDC, a further 22 provisional approvals have been granted and those SMPs will be adopted once the plan change or resource consents have been granted (figure 11). The types of development associated with the SMPs which have been received is shown in Figure 12. The locations and extents of approved SMPs are publicly available on Auckland Council's GeoMaps GIS viewer as shown in figure 13. The Geomaps data includes links to a summary of the stormwater management required by each SMP which is also available on the Auckland Design Manual website.

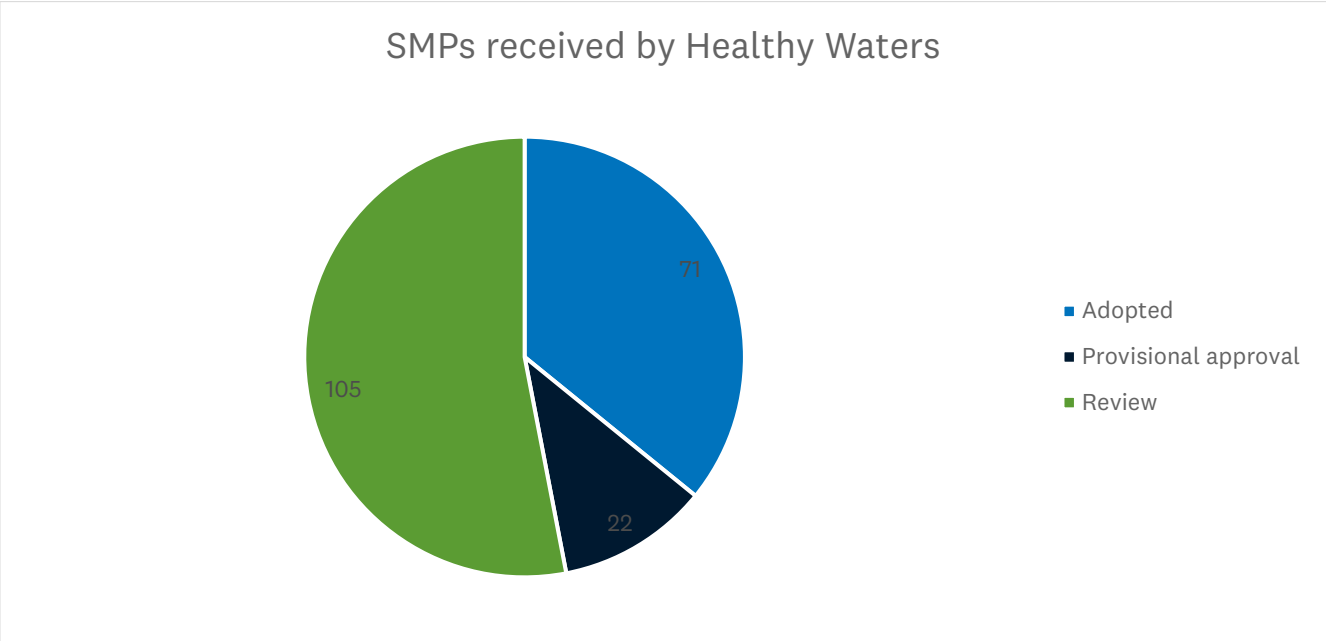


Figure 11. Approval status of Stormwater Management Plans received by Healthy Waters (October 2019 - September 2022).

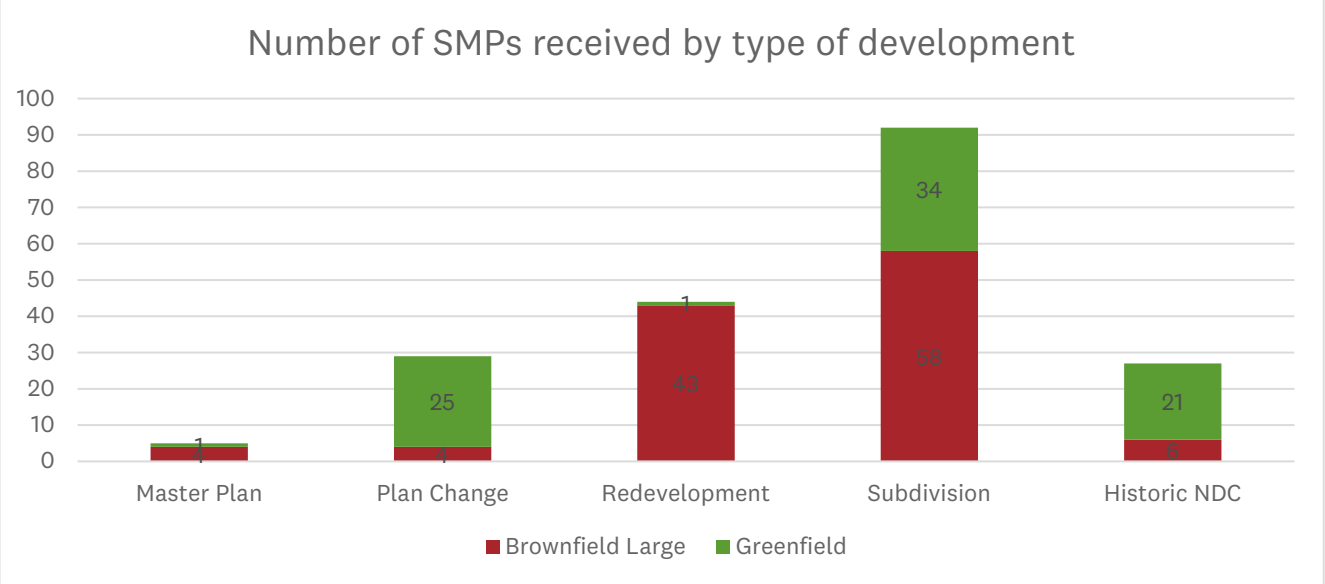


Figure 12. Types of development associated with Stormwater Management Plans reviewed by Healthy Waters. The number of SMPs is not reflective of the geographical extent of area covered by the SMPs. (October 2019-September 2022).

The process of preparing and approving SMPs was a focus of the industry engagement. Key messages include concerns about inconsistency or a lack of clarity in applying the requirements in Schedule 4 as well as about the time it can take to receive approval of SMPs. Given that the process for approval of SMPs has only been established since the commencement of the NDC it is expected that there are improvements which are needed to ensure that the process is successful.

Healthy Waters is committed to improving the process to respond to concerns raised through engagement. How this will be achieved is still to be established and will be a focus following the conclusion of the six-yearly review.

However, not all of the improvements to the process will need to come from within the department. As discussed below the quality and content of SMPs reviewed by Healthy Waters varies. The department will provide additional guidance and update to the template to help those preparing the SMPs to ensure that the needed information is provided up front.

Healthy Waters will continue to encourage applicants to engagement with them early in their design processes to resolve matters of difference early and therefore reduce delays later in the regulatory processes where timeframes become critical.

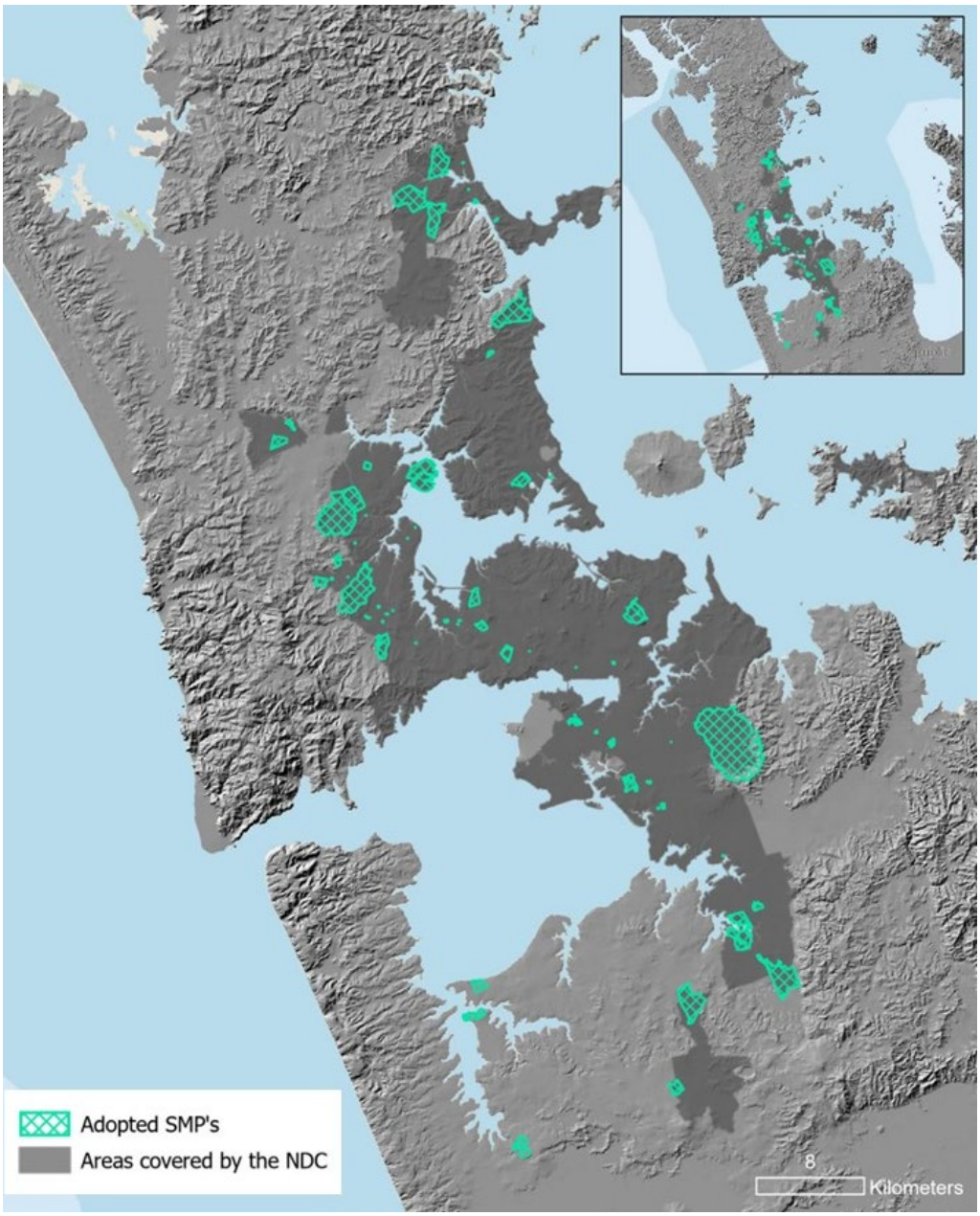


Figure 13. Map showing locations of adopted SMPs across the Auckland Region (at 9 September 2022).Source Auckland Council GeoMaps.

2.3.5 Stormwater management plan template

A stormwater management plan (SMP) template and preparation guidance were prepared and published at the time that the NDC commenced. Since then, most of the SMPs received by Healthy Waters have been prepared using the SMP template. The quality of SMPs received has improved over time as applicants and their professional teams have become familiar with the template and process. However, there are several common areas where submitted SMPs frequently lack detail and clarity. These include:

- identifying what the outcome of stormwater management is to achieve
- providing a sufficient level of information acceptable for the NDC around proposed public infrastructure
- providing an integrated stormwater management approach across the area of interest
- providing sufficient information on how the development will integrate with the natural environment
- providing clarity around why what is provided represents the best practicable option (BPO)
- providing detail around how the BPO will be implemented
- using a toolbox of devices without any direction on which elements in the toolbox should be chosen in which circumstances.

The SMP template was highlighted through the industry engagement as a key area for improvement in order to improve the overall SMP approval process and to achieve the overarching NDC outcomes. Feedback included:

- SMPs are too long, information requested is repetitive
- scalability – not clear from template about different levels of detail depending on size/complexity of development
- level of detail required is unclear
- different template needed for greenfield/brownfields.

Mana whenua raised the template and content of SMPs through hui and several have expressed interest in involvement with updates to the template as well as involvement in the review of proposed stormwater management for development. There is also a need to place greater emphasis on Te Mana o te Wai and Te Mauri o te Wai throughout the template.

Given the importance of the template in guiding the content of SMPs and the importance of SMPs in outlining and determining the management of stormwater runoff from development, updates to the template need to be made as a priority. Updates to the template will need to consider all of the feedback received from Healthy Waters teams, industry, mana whenua and other stakeholders.

2.3.6 Best practicable option

Schedule 4 sets out specific connection requirements for different scales of development, but also allows for flexibility by requiring SMPs to be prepared for large scale redevelopment and for greenfield development. A SMP is expected to demonstrate how the best practicable option has been achieved and through that, how the objectives and outcomes of the NDC can be achieved.

Schedule 4 allows that an alternative solution is acceptable where it is clearly demonstrated to be the BPO and lists matters which must be addressed as part of that demonstration:

- *"the management approach/ key elements including:*
    - *areas of development, including roads and reserves*
    - *location of vested infrastructure, including green infrastructure*
    - *areas of on-site and communal (public) stormwater management*
    - *significant site features and hydrology*
    - *how the connection/vesting requirements below are met or the alternative that is proposed*
- *an assessment, which includes such detail as corresponds with the scale and significance of the effects of the proposal, of how an integrated stormwater management approach has been adopted in the design and associated stormwater management in accordance with the policies in the AUP Sections E1.3, B7 and B8 to:*
    - *minimise the stormwater related effects of development*
    - *retain/restore natural hydrology as far as practicable*
    - *minimise the generation and discharge of contaminants (including gross stormwater pollutants) and stormwater flows at source*
    - *minimise temperature related effects*
    - *enhance freshwater systems including streams and riparian margins*
    - *protect the values of significant ecological areas as identified in the Auckland Unitary Plan*
- *any stormwater plan prepared as part of a relevant structure plan."*

For brownfield redevelopment, this allows recognition of constraints due to space, existing infrastructure and other physical challenges which can mean that it is not always practical to capture or treat all of the runoff. In greenfield areas this should allow for innovative approaches led by water sensitive design and the use of treatment trains. A review of the SMPs which have been adopted to date shows that most rely on some form of best practicable option rather than implementing the standard requirements of schedule 4.

It has been Healthy Waters experience that many applicants take BPO to mean that a lesser standard can be proposed and will be accepted with little justification. While a lesser standard may sometimes be appropriate, sufficient justification within an SMP is required. The experience of Healthy Waters specialists involved in the review of SMPs is that the justification and establishment of the BPO is rarely well explained or documented.

For greenfield developments the performance requirements are of a high standard in recognition that there is more potential in greenfield sites to apply water sensitive design, less constraints to optimal stormwater management and to reflect the policy direction in AUP(OP) Chapter E1.3.8 to '*avoid as far as practicable, or otherwise minimise or mitigate, adverse effects of stormwater runoff from greenfield development on freshwater systems, freshwater and coastal waters.*"

In brownfield areas reliance on alternative mitigation is more likely to be needed as the inherent constraints in this type of development are greater. A BPO enables flexibility in the process.

There are few examples of SMPs articulating why the methods proposed are the best for the site to achieve NDC outcomes and how these methods should be applied to deliver comprehensive stormwater management.

It is recommended that additional guidance is provided for applicants and their professional team around best practicable option, and the requirements of Schedule 4. This could form part of the SMP template refresh or be separate guidance.

Guidance and training are also required for Healthy Waters teams so that those reviewing SMPs have a clear understanding of the expectations of the justification of a BPO and when that is acceptable. This will improve consistency and timeliness in the review of SMPs.

2.3.7 Water quality mitigation

Figure 14 shows that approximately a third of the approved SMPs did not include water quality treatment for all of the impervious areas. A frequently posed justification of this is that the AUP(OP) only requires treatment of high contaminating areas and that therefore the NDC cannot require more in an SMP. This is a common misinterpretation of both the AUP(OP) and the NDC. The AUP(OP) prioritises water quality treatment of high contaminant generating areas by dedicating a set of rules to that. However, the policies of E1 are also clear that measures should be taken to reduce contaminants across all types of surfaces and expect the use of an integrated stormwater management approach for both greenfield development and brownfield redevelopment (e.g. for all management of all cumulative effects from mountains to sea – inclusive of sensitive coastal receiving environments). Policy E1.3.8 states '*to avoid adverse effects as far as practicable…including by… treating high contaminant generating areas….* but also includes '*by applying integrated stormwater management*' and this is described in policy 1.3.10 as including minimising the generation and discharge of contaminants, treatment as close to source as possible and in consideration of the sensitivity of the receiving environment.

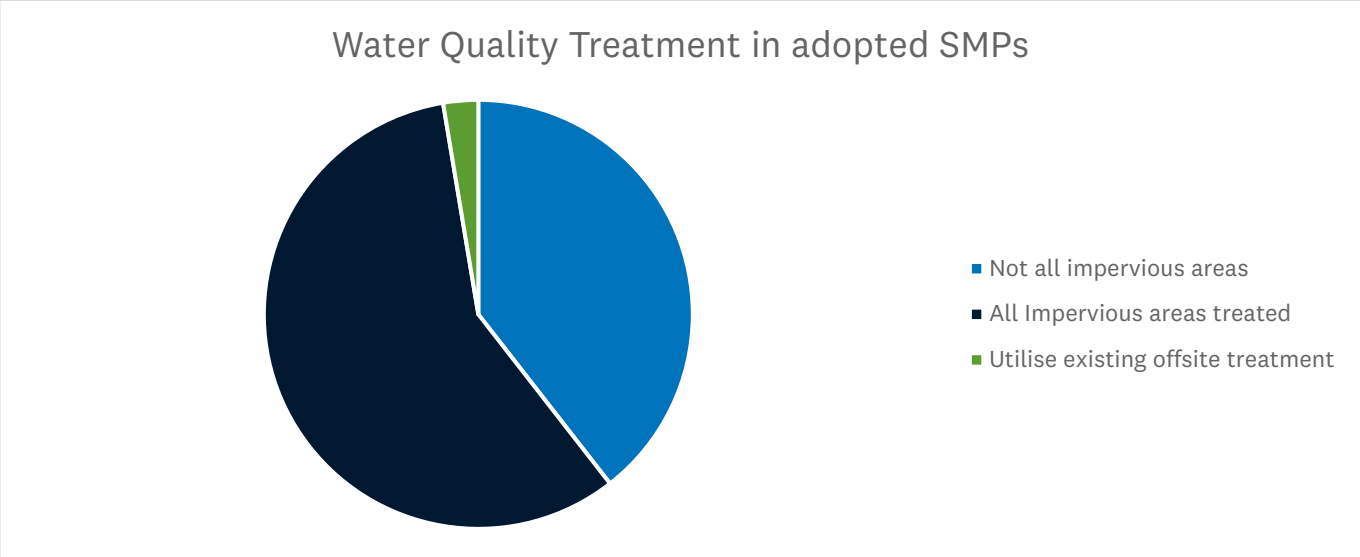


Figure 14. Water quality mitigation included within approved SMPs.

The NDC recognises that the treatment of high contaminant generating areas alone is unlikely to be enough to protect and enhance the health of stream and coastal receiving environments and therefore, requires (through Schedule 4) that *all* impervious areas have water quality treatment for greenfield and large scale brownfield developments or alternative mitigation which is demonstrated to be the best practicable option. Hence, the NDC is not restricted to requiring only management of high contaminant generating areas, remaining purposely inclusive of them and enabling targeted management of any stormwater treatment opportunity. This includes areas of 'lower' contaminant generation including low use roads, roofs and joint accessways/joint access lots. Such a position is frequently a point of contention between Healthy Waters and NDC applicants across both brownfield and greenfield scenarios.

For brownfield areas a principal of 'net contaminant reduction' has been discussed in terms of providing a way in which to help applicants justify that their proposed BPO will contribute towards meeting the NDC objectives. This principle and the associated 'no net contaminant increase' for greenfield need to be further investigated, developed and agreed before they can be implemented. In addition, Healthy Waters needs to further develop the freshwater management tool or a simplified contaminant load model for use at development scale and for this purpose.

Roofs

Healthy Waters is concerned that the use of inert roof materials alone is insufficient to meet NDC objectives of *Healthy and Connected Waterways that provide for te mauri o te wai: Stream*. Reasons for this position, include:

- aging roofs becoming a source of contaminants once any protective coating is removed (e.g. through poor maintenance or lack of renewal)
- airborne contaminants deposited on roofs become entrained in stormwater, with roofs and their associated drains becoming a critical pathway to the receiving environment.

Further investigation and evidence is needed on this before a strong policy position can be taken or any change to the NDC made. Currently approximately a third of SMPs didn't specify any mitigation for roof areas or relied on inert roofs as a best practicable option (figure 15). A basic justification for BPO is typically given that the material is inert therefore there are no contaminants. This is not really sufficient reasoning.

An exception is any roof runoff which is directed to dual use tanks for internal reuse such as toilet flushing. Dual use tanks offer limited treatment by settlement but instead direct initial runoff for treatment in the wastewater system. For residential developments this is the most common form of mitigation for roofs and provides broader benefits beyond water quality including hydrology mitigation (the primary reason it is usually included) and water supply resilience. This is possible because for residential activities there is sufficient water demand from non-potable uses such as toilet flushing to achieve the retention volumes. For other land uses such as large scale commercial or industrial buildings the water demand is much lower and the roof area much bigger, so this practice is not always able to be utilised to the same extent. Therefore, other methods of capturing and treating the roof runoff must be considered.

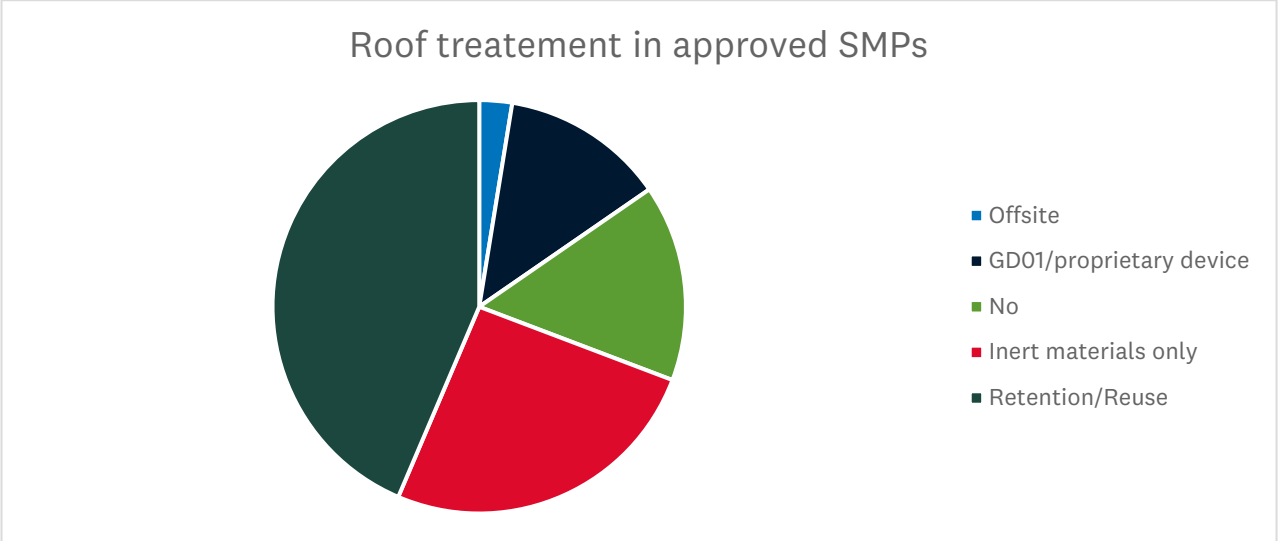


Figure 15. Water quality mitigation provided for roof areas in approved SMPs.

Offsetting for water quality mitigation in brownfields areas

As part of a best practicable option analysis, some applicants have proposed to offset water quality mitigation by providing water quality devices for alternative impervious areas than those which are being redeveloped. For example, instead of providing a treatment device for an accessway within a subdivision, a device is proposed to be constructed to capture runoff from an existing road nearby. The justification given for this has been that the road generates more contaminants than the accessway and therefore more contaminants are being removed overall as a result of the development.

This is an option with limited applicability in terms of development scales and feasible offset locations. Nonetheless, such targeted offsetting decisions can have potential benefit if adopted within integrated catchment planning (e.g. achieving greater contaminant reduction for cost, with focus on cumulative rather than local stormwater effects). Several limitations apply: that by adopting more efficient solutions elsewhere outside of a development, costs of further improvement will fall on later applicants or Healthy Waters (e.g. efficient solutions are taken by developers, leaving inefficient higher cost solutions for additional reduced stormwater discharge effects); offsetting might not align with principles of Te Mana o te Wai (e.g. failing to treat for local effects in favour of cumulative effects might be inappropriate including transferral of contaminant treated water from one catchment to another); that solutions might offer more efficient total acquisitional (initial) but less efficient lifecycle costs (e.g. incur more cost to Healthy Waters through maintenance and renewal costs).

Offsetting water quality management therefore should be able to be considered as part of a best practicable option proposal but with caution. Qualitative assessment alone is insufficient to demonstrate that offsetting is the BPO for a specific SMP. An initial set of principals has been developed but these need to be further advanced and refined:

- any offset BPO must be supported through a contaminant load model (CLM) or FWMT analysis to quantify the net change in contaminants discharging to the receiving environment (inclusive of treatment effects at development and offset sites)
- any offset proposed must be located within the same stormwater sub-catchment or immediate pipe network as the development
- the proposed offset must be agreed in principle with relevant stakeholders early in the design process to ensure that it meets the requirements and operational parameters
- any offset proposed must not already be planned by Healthy Waters as part of its network improvement programme or any other works programme.

Where offsetting of water quality management is proposed Healthy Waters recommends early engagement with relevant stakeholders to ensure that the concept being proposed is appropriate. This is particularly important in relation to Auckland Transport and Healthy Waters who are likely to become the long-term owners and maintainers of the offset assets.

It is recommended that Healthy Waters further develops this as a set of principles relating to water quality offsetting and shares these with industry to ensure that any proposals are robustly supported with sufficient information. Further as discussed above the CLM and FWMT need to be further developed to be able to be used for this purpose at this scale.

2.3.8 Hydrology mitigation

The application of hydrology mitigation or what is generally referred to 'SMAF' (Stormwater management area: flow) is now well accepted as a mitigation measure. For sites which are within the areas of the SMAF controls in the AUP(OP) the NDC does not anticipate any additional hydrology mitigation beyond that which is required by the AUP(OP).

However, in areas which discharge to a stream but are outside the SMAF control, Schedule 4 expects equivalent hydrology mitigation to be implemented. This regularly receives pushback from applicants who argue that the NDC should not or cannot be more stringent than the AUP(OP), similar to the arguments made with relation to water quality.

The reasons that this requirement was included remains the same, large-scale redevelopment offers an opportunity for gradual incremental improvements in environmental outcomes and there is no indication that it is appropriate to recommend the removal of the requirement or that a lesser BPO should be accepted without justification.

For streams where there is existing erosion, instream restoration works to remedy erosion and strengthen the stream bed and banks may be more effective than flow controls. Instream works need to be considered as part of the assessment of best practicable option, especially for large scale developments where a large proportion of the stream may be within the development area. To date instream restoration has not frequently been proposed as part of the mitigation within SMPs.

The application of hydrology mitigation of stormwater through retention/detention, stormwater treatment device use and the use of 'SMAF' controls have been the primary mitigation measure used to manage water quality and quantity for maintaining the environmental health of receiving environments including water quality and erosion management. From a peak flow and erosion risk management perspective, this relies on using hydrology measures as a proxy for stream health and resilience, as opposed to utilising more direct measures associated with the strength and resilience of the natural materials that make up the bed and banks of natural watercourses.

Work currently underway by Healthy Waters aims to develop new tools and methods that better account for natural processes to provide more surety that stormwater mitigation measures are effectively achieving their desired outcomes of protecting/restoring/enhancing the natural capital components of the stormwater network across the entire region. These methods and tools are being developed at a range of different scales from regional models, catchment-based analyses and reach-based mitigation solutions by incorporating more direct measures of stormwater effects on stream channels using geomorphological principles under our geomorphically effective management solutions (GEMS) programme. These tools and methods can be incorporated into the NDC during subsequent reviews once the scientific basis has been peer reviewed and accepted.

Current findings from the GEMS programme indicate that hydrology mitigation alone is unlikely to be sufficient for managing peak flows in natural stream channels and rates of erosion to predevelopment "natural" erosion rates (erosion is a natural and healthy component of natural stream channels), rather it is significantly increased in both rural and urban streams and following a well-recognised stream channel evolution pathway of channel incision followed by lateral widening to adapt to higher flow regimes. While streams will naturally evolve and adjust to altered flows from land use change, this adjustment period can take many decades to occur, during which the stream will be in a degraded state and large quantities of sediment are exported to coastal receiving environments. To assist natural channels through this channel evolution process, additional measures may be required such as restoring and sizing channels to cope with altered hydrology in a manner that enhances both ecological and conveyance values, protecting baseflow

conditions and hydrological diversity, while also providing for improved peak flow channel width management, reinstatement of floodplains, wetlands and other natural hydrology mitigation tools. This would assist the streams with advancing their channel evolution trajectory, while at the same time capturing the excess sediment that would naturally be generated through accelerated erosion and reducing the sediment load delivered to the coasts.

2.3.9 Water sensitive design implementation

Water sensitive design (WSD) seeks to protect and enhance natural freshwater systems, sustainably manage water resources, and mimic natural processes to achieve enhanced outcomes for ecosystems and communities. In the AUP (OP) this is referred to as Integrated Stormwater Management to focus on the stormwater component of WSD, compared to the broader WSD concept that encompasses all waters.

WSD is frequently mentioned within SMPs but is uncommon to then see applied fully. For instance, WSD principles are not often incorporated into the early development of the site layout or as part of the overarching stormwater management proposed. It is still common to see a proposal to include a rain garden or other type of green infrastructure and claim that the proposed development is consistent with water sensitive design. This is a pattern occurring across both brownfield and greenfield development. Overall WSD seems to be a fairly poorly understood concept and the pressure on developers to maximise lot numbers and financial returns frequently takes precedence. Industry engagement identified that although WSD is nice in principle, site constraints usually mean it is not possible.

The Auckland Water Strategy Supplementary Document – Investigation of barriers and opportunities to further implement Water Sensitive Design in Auckland, February 2022, prepared by Koru Environmental provides an overview of challenges and opportunities to WSD implementation in Auckland.

One of the challenges highlighted in the conclusion is that Auckland's plans and polices recognise and reference the value of water sensitive design, integrated stormwater management and green infrastructure to varying degrees but they do not provide a clear mandated framework for the wide-spread implementation of a holistic approach to WSD across Auckland. The Koru (2022) report also highlights a range of intervention opportunities to overcome some of the challenges and barriers identified, including:

- development of a common WSD definition for Auckland which incorporates water sensitive city and mātauranga Māori considerations, acknowledging that WSD for stormwater as described in GD04 is a subset of overarching WSD as internationally recognised
- AUP(OP) plan change to further regulate (mandating or requiring certain WSD principles or practices) and support (incentives for implementation, including reduced consenting requirements) WSD.

In order to improve implementation of WSD for stormwater and to meet the NDC objectives and outcomes, the profile of WSD needs to be raised and overall understanding of the concept across Healthy Waters, the wider council family and the development industry needs to be improved. Internal and external training is needed as well as updates to the existing guidance.

2.3.10 Greenfield development

Urban growth in greenfield areas places significant pressure on freshwater systems and water quality. However, large-scale development is also an opportunity for ensuring that new development minimises its

impacts on water resources. It is particularly important that in areas of greenfield development, all opportunities to achieve integrated stormwater management and water sensitive design are realised.

Implementing the NDC has a number of challenges in greenfield areas. These challenges relate to:

- the relationship of the NDC process Healthy Waters runs to the plan change process and the associated level of detail to be provided for each process
- the lack of rules in the AUP(OP) to require water quality treatment for all roads
- the lack of direction on what the best practicable option is.

The plan change process and NDC

Any private plan change needs to prepare an assessment of environmental effects as part of the plan change request. In greenfield land where there is a land use change from rural to urban the stormwater effects are reasonably anticipated to be significant. As such a stormwater management plan to identify existing catchments and hydrology, natural features, anticipated stormwater effects and how these will be managed should form part of the plan change request. Requests for further information can be made through the plan change process.

Through the NDC hearings process it was identified that greenfield developments establishing new discharges into significant ecological areas (SEAs) could rely on the NDC to authorise their discharges. To manage risks associated with new stormwater discharges on these sensitive receiving environments it was decided that the NDC conditions would require greenfield developments discharging into SEAs to submit their SMP for NDC purposes as part of the plan change process. This is so there is sufficient scrutiny of the stormwater management proposal as part of the assessment of the impacts of the plan change proposal on the environment.

There has been some confusion on what level of detail needs to be presented in the stormwater management plans to meet the requirements. An SMP for a plan change must outline:

- what stormwater management methods are to be applied within the plan change area to achieve the NDC outcomes (which are derived from AUP(OP) Chapter E1)
- a demonstration of why these methods are the best practicable option
- guidance on when each method should be deployed
- how the overall hydrology fits together to meet the outcomes.

Too often a generic high-level toolbox of management methods is described in submitted SMPs with no thought or explanation as to whether these are suitable and effective for the site and how they will be applied on the site to address the contaminants of concern and achieve quality stormwater outcomes.

Healthy Waters considers that the details of an SMP for a plan change needs to be consistent with what should be prepared as an assessment of environmental effects. Failing to articulate how stormwater will be managed means there can be no confidence that stormwater effects will be appropriately managed for sensitive receiving environments.

Information in an SMP should also form the basis of an assessment on whether any precinct provisions are required to support implementation of the stormwater management solution outlined in the SMP.

Clarification as to the role of SMPs within the plan change process needs to be provided. The updates to the SMP template need to address the level of detail which is appropriate at this point in the process reflecting that finer details are not yet known.

2.3.11 Brownfield development and redevelopment

In the time since the NDC was prepared and approved, there have been changes in the way in which development and redevelopment are occurring across the region. As population pressure and the housing crisis increases, more and more redevelopment is occurring at greater intensity. This development pressure will only increase as the changes to the AUP(OP) are implemented as required by the National Policy Statement for Urban Development (NPS-UD) and the Medium Density Residential Standards (MDRS). These changes will mean more development can occur as permitted activities, relieving pressure on the Resource Consent department however increasing pressure on receiving waterbodies and environments as the cumulative effect of stormwater runoff from small developments will be increased. This means more smaller redevelopment sites and more marginal and physically challenging sites are being redeveloped in brownfield areas. Requests for specialist input have increased each year as record numbers of resource consent applications are lodged with the Resource Consents department (figure 9).

There are many challenges with brownfield redevelopment. Small sites and physical constraints reduce the options available for stormwater management both at source as part of redevelopment as well as options for the provision of communal public infrastructure to address existing issues within catchments.

Although brownfield SMPs make up the majority of SMPs submitted for review (figure 16), many of these are only small parcels of land, frequently the trigger for the development to be considered large brownfield, (and therefore need an SMP), is the number of lots (>20) rather than the impervious area which is less than 5000m^2. This means that the overall influence of the stormwater management which is proposed through these SMPs is only over a very small proportion of the catchment even where there are many SMPs.

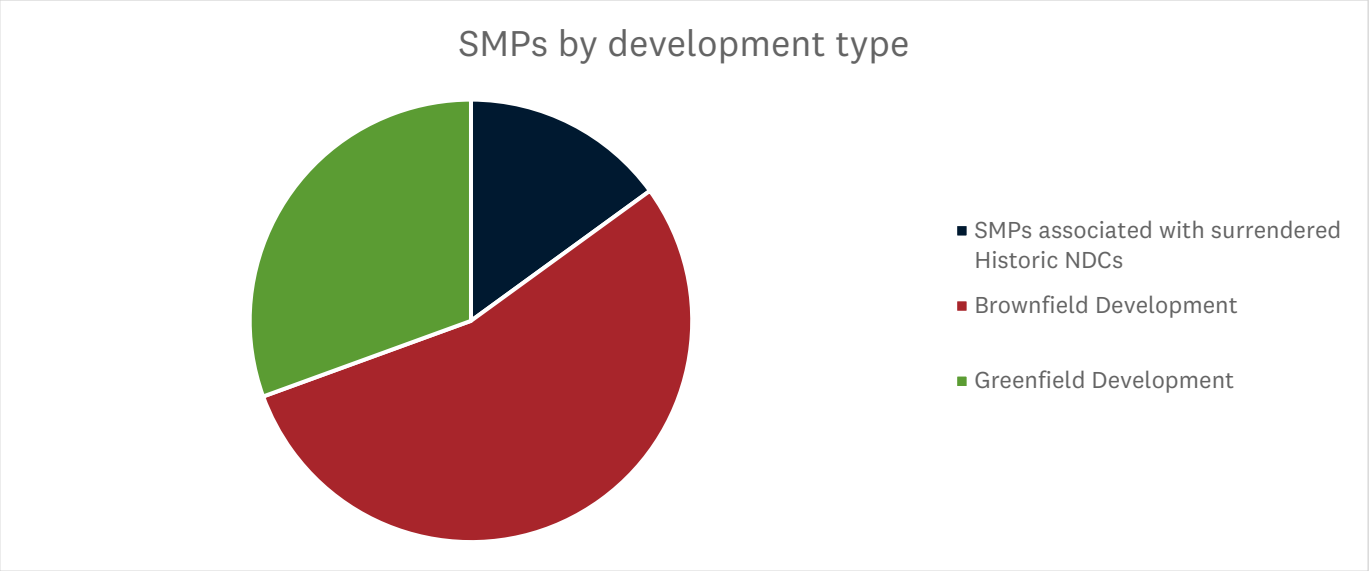


Figure 16. Types of development for SMPs received by Healthy Waters.

An exception to this is SMPs prepared for Kainga Ora developments which typically cover neighbourhood level development; however the requirements typically only apply to land which is owned by Kainga Ora rather than to every site in the neighbourhood.

Another challenge identified is that intensification through large brownfield developments often require small scale communal stormwater management devices which can be privately owned. This creates conflict with the Stormwater Code of Practice (SWCoP) guideline that each individual lot shall be serviced by public stormwater connection due to lack of space and ownership issues.

2.3.12 Cumulative effects of brownfield development

Small scale brownfield redevelopment forms a large part of the development occurring across the region and is set to increase. However currently there are few controls or requirements on stormwater management for small brownfield sites in either the AUP(OP) or NDC. This means that the cumulative effect of the increase in runoff and contaminants from this overall increase in impervious area is not being well managed at source. Relying on improvements in stormwater quality and quantity from large brownfield developments alone will not be sufficient to improve or even maintain the health of these urban receiving environments.

In order to manage the cumulative effects of multiple and increasing small scale development and to meet possible future targets which come from implementation of the National Policy Statement for Freshwater Management, Healthy Waters will need to further reconsider the overall approach to managing stormwater runoff in brownfields areas. This needs to be undertaken in a holistic integrated way that considers all of the possible options and balances the benefits of at source management, the extent of opportunities from redevelopment with scale and distribution of that redevelopment and available opportunities for catchment or sub-catchment scale targeted improvements through publicly funded and communal projects.

Some of the potential options to improve stormwater management in brownfield areas include:

- increasing the amount of mitigation required to be provided at the time of development or redevelopment
- changing the trigger between large and small brownfields so that more sites are required to prepare SMPs and provide at source mitigation
- stronger enforcement of the large brownfields requirements for at source mitigation
- increasing the small brownfields requirements for provision of mitigation and strongly enforcing that
- changing the requirements within the AUP(OP) (requires a plan change) for the provision of stormwater mitigation including:
    - increasing the water quality mitigation requirements
    - extending the SMAF control areas
    - changing the SMAF mitigation requirements
    - increasing catchment or sub catchment scale mitigation
- preparation of catchment scale SMPs for urban catchments to support growth and identify both at source and sub catchment scale interventions

- extending programmes such as the urban contaminant reduction programme which takes a catchment approach to finding possible interventions to improve water quality in existing urban catchments
- undertaking stream enhancement projects to reduce the vulnerability of urban streams to erosion
- completing catchment plans for specific catchments to identify specific management measures
- utilise FWMT to inform prioritisation of interventions
- provision of development contributions to fund catchment scale mitigation options.

It is likely that for any catchment a combination of several of these options will be required which will need to be prioritised. Each comes with a range of benefits and challenges. The NDC and department objectives around efficient business and prioritised investment will need to also be considered. Where the preferred approach(es) requires additional funding, this will need to be sought through the annual plan and long-term plan processes.

Additionally, guidance or practice notes in relation to brownfield development are currently in progress including:

- updates to the SMP template/guidance
- a guidance note on water quality requirements for brownfield redevelopments
- a practice note on pipe capacity and connections in brownfields areas.

2.3.13 Impervious area

The introduction of impervious surfaces into a catchment, unless mitigated, significantly increases stormwater runoff volumes and flowrates and can have a profound effect on the physical structure, ecosystem health and functioning of freshwater systems as well as flooding frequency and magnitude.

Analysis of impervious area cover undertaken using machine learning to analyse aerial photography indicates that the amount of impervious area cover constructed across the urban area of the region may be increasing. In particular it also shows that as the lot size decreases the constructed impervious area increases as a proportion of the parcel size. These results are not unexpected given the growth in Auckland population and intensification of housing developments. However, for the smallest lot the median impervious area is almost 80%. Given that the maximum impervious area for mixed housing urban suburban, and single house zones is 60% this shows a likely large increase in impervious area above this threshold. This has implications for how stormwater needs to be managed in these areas.

2022 aerial photographs are currently being taken and analysed. This analysis will provide understanding of the extent of impervious areas and trends for changes in impervious cover across the region. This data can be used to understand the likely effects and what may be needed to mitigate those effects.

Table 3 Estimated imperviousness of parcel area across the Auckland urban area by parcel size.

Impervious Layer	% imperviousness of parcel area					
	0-300 m²	**200-500 m²**	**400-700 m²**	**600-900 m²**	**800-1100 m²**	**Greater than 1000 m²**
2008 Median	58	53	48	45	43	36
2017 Median	78	72	64	58	55	40

2.3.14 Stormwater management devices

As time passes and technology and knowledge changes, ways of managing stormwater will evolve. Therefore, an important part of the NDC review is to ensure that these changes are acknowledged and that as appropriate the NDC is updated to remain up to date with current best practice.

Stormwater Management Devices in the Auckland Region, Auckland Council Guideline Document 2017/001 (GD01)

GD01 outlines the design guidance for many of the stormwater management devices used in the Auckland region. It was published in 2017 and there are not currently plans to publish further updates in the near future. However there are several sections which do not reflect current best or commonly used practice. This is recognised within Healthy Waters and was also raised by mana whenua, industry and Auckland Transport.

GD01 needs to be kept up to date however this is not within the responsibilities or control of Healthy Waters.

Raingardens

In the mid to late 2010's raingardens were a very popular device for managing both water quality and hydrology, especially within the road corridor. As these devices have now been in the ground for several years, issues with safety, design and operation and maintenance have become apparent.

Both Healthy Waters and Auckland Transport have concerns about these devices and are encouraging applicants to move away from designs which propose multiple small raingardens.

The sizing of raingardens to provide hydrology mitigation results in the need for live storage above the level of the media. This results in a sometimes significant drop between adjacent ground level and the surface of the raingarden. This is a safety hazard for pedestrians, cyclists and vehicles and incidents have occurred where members of the pubic have been badly injured.

A safety bulletin is to be issued by Auckland Transport regarding this safety issue and requiring that raingardens are safely designed. Auckland Transport will not accept unsafe assets to be vested.

Another ongoing issue with designs which include multiple small raingardens is the ongoing maintenance burden of these devices and the ability of Auckland Transport and Heathy Waters to fund it.

Stockholm Tree Pits

Stockholm Tree Pits are not a device for which the design is included in GD01 however the use of this design in the Auckland region is currently being investigated by Healthy Waters. In particular as an alternative to small raingardens within the road corridor.

This work is ongoing with the first trial and pilot examples to be constructed over the 2022/23 earthworks season. Design guidance and additional information is being prepared and will be compiled and communicated in 2023.

Proprietary Device Evaluation Protocol (PDEP)

Proprietary stormwater treatment systems are a common alternative solution to the devices outlined within GD01. Proprietary devices require a separate approval from Auckland Council to ensure that performance and design standards are met. This approval is known as the Proprietary Device Evaluation Protocol (PDEP). The approval process for proprietary devices consists of a two-stage approach:

1) Approval from Auckland Council for a device to be used on private sites as a suitable stormwater treatment device that meets regulatory requirements, on the basis of recognition of performance claims
2) Recognition from Auckland Council for a device to be a potentially suitable option for use as a public vested asset, subject to conditions and case-by-case evaluation.

New devices are considered against the protocol and given an approval. There are several devices which have current approvals.

Best practice

With all stormwater management devices, engineering judgement needs to be applied to the selection of devices for any development. There can be no blanket statement made about any device as to its use in every scenario. The principle of 'the right device in the right place' always needs to be applied in order to determine the best practicable option for the management of stormwater from any site.

2.3.15 Vesting of assets

Significant parts of the stormwater system are installed as part of land development activities and are then vested in council's ownership, where they become the operational responsibility of Healthy Waters. It is expected that vested assets will continue to dominate growth-related asset additions and are anticipated to be as much as 70% of annually built stormwater assets.

Healthy Waters works closely with other parts of council, including Plans and Places, Regulatory Consenting and Regulatory Engineering teams to ensure that vested assets are fit for purpose. Over the last two financial years, Healthy Waters received an average of ~1400 vested asset records (~10km) per month. Ponds and treatment devices require operation and maintenance manuals, with a high percentage of the treatment devices vested to Auckland Transport (mostly raingardens).

Checks and improvements related to the asset vesting process include:

- checks of vested asset data, e.g., the data is surveyed in accordance with the Code of Practice, attribute data is within acceptable parameter ranges, as built attributes comply with engineering design standards
- regular review and update of the vested assets process chart with Regulatory Engineering
- development of new operation and maintenance manuals for ponds and wetlands that will include new check lists for the vesting as well as the operation and maintenance inspections to ensure they are functioning as designed. Raingardens are to follow
- operation and maintenance audits such as 2 in a Ute focus on checking the functioning of the device and regular maintenance as per the schedule or after heavy weather events
- programme to monitor raingardens and other bio-retention devices to see if the current designs achieve the necessary infiltration rates and are designed correctly. Results are shared and improvements suggested around not only the performance of the device but its Health & Safety aspects as well
- for wetlands, bathymetric surveys are undertaken to see if the sediment accumulation rates are in line with the modelling predictions and where they exceed them. There are options to redesign the devices to be more efficient at sediment capture and removal. This includes the installation of gross

pollutant traps as pre-treatment devices, increasing the forebay size and access, or in some instances looking at if the current setup is fit for purpose.

In addition, stormwater management assets associated with new development and redevelopment are not only vested to Healthy Waters. Many are also vested to Auckland Transport (all assets in the road corridor such as roadside raingardens) and with council's Community Facilities department (such as some green infrastructure or dry flood detention in parks). This can cause tension between Healthy Waters and the other asset owners, as Healthy Waters through the NDC is requiring additional stormwater mitigation in order to manage the environmental effects of stormwater discharge, this means that other asset owners are required to take on the ongoing operation and maintenance costs of these assets. As part of the SMP review process Healthy Waters engages with other future asset owners but this could be improved.

2.3.16 Relationship of the NDC with the AUP(OP) and the resource consent process

Establishing an understanding of how the NDC interacts with the resource consent process and establishing the associated approval processes has been a key part of the implementation of the NDC.

Providing Guidance

Training and information sessions to support Healthy Waters Resource Consents specialists (planners, specialists and engineers) as well as industry were held after the commencement of the NDC in 2019 and in early 2020. Information is also published on the Auckland Design Manual website. Despite this, there has over this time been confusion and inconsistences around the place of the NDC in the resource consent application process. A resource consent practice and guidance note has been prepared as collaboration between the Resource Consent department and Healthy Waters which was published in May 2022. This is available on the Auckland Design Manual, available at the below link:

https://www.aucklanddesignmanual.co.nz/content/dam/adm/adm-website/aup-hub/unitary-plan-practice-and-guidance-notes/RC_3.3.24_Stormwater-NDC-Process-for-RC.pdf

This guidance sets out from a resource consent perspective how the NDC fits into the existing processes, attempting to integrate where possible and provide a way for these separate approvals to occur in parallel for the customer. It includes guidance on further information requests, consent conditions, advice notes and on the timing of approvals. Key to this is the division of responsibilities including that applications requiring an SMP must be referred to Healthy Waters and that development engineers will review and approve small brownfield development on behalf of Healthy Waters as part of the other engineering checks they are undertaking.

It is recommended that further guidance is prepared addressing some of the issues identified in this chapter (BPO, water quality, SMP template update) and that internal and external training is offered.

Third Party Approval

As approval under the NDC is a third-party approval in the context of the resource consent application rather than a trigger for consent under the AUP(OP), the processing of a resource consent cannot be stopped to resolve NDC or SMP matters. The resource consent can be granted before the NDC approval from Healthy Waters has been given. This can be both an advantage and a disadvantage. It can allow flexibility for Healthy Waters to continue to work directly with an applicant outside of the constraints and scope of the resource application. However, it also involves a risk to the applicant of delays or the need for

later changes to their proposal or their granted resource consent if these are needed in order to comply with the NDC.

A commonly encountered challenge has been that where there are no relevant consent triggers or matters for discretion relating to stormwater management within the AUP(OP). When consents are being processed by the Resource Consent department, the planner has no scope to ask for further information relating to this. Many applicants are choosing to defer the NDC approval to engineering plan approval (EPA) stage. However by this time all of the key design decisions have been made and there is little opportunity to incorporate water sensitive design or often even to incorporate the bare minimum of conventional stormwater management techniques.

AUP(OP) Chapter E8

Connection to the public stormwater network constitutes joining council's NDC (and therefore the diversion and discharge being authorised by it) so that an additional consent under the stormwater provisions of E8 is not required.

This is provided for in Chapter E8 of the AUP(OP) as permitted activity where the connection is to the existing network (rule E8.4.1(A1)). However, there is a lack of permitted activity standards for connections to the stormwater network associated with this rule. The permitted activity standards in E8.6.2.1 require the prior approval of Watercare Services Limited for connection to the combined network, reference the relevant bylaw and encourage applicants to seek input from Watercare Services Limited early in the design process. The equivalent requirements and guidance are not included in relation to connection to the stormwater network or seeking early design input from Healthy Waters. This is significantly hindering the ability for Healthy Waters to achieve the outcomes sought by the NDC as many applicants perceive and argue that they therefore do not need to comply with the NDC (specifically schedule 4) as their stormwater diversion is permitted.

Healthy Waters is reliant on the Stormwater Bylaw to enforce the requirements of the NDC Schedule 4 on third parties. Although this has been strengthened through the 2022 amendments to the Stormwater Bylaw, this remains an ongoing problem.

The draft s35 review of the AUP(OP) acknowledges this issue, noting that the AUP(OP) predates the NDC and includes a recommendation that the provisions of the stormwater chapters of the AUP(OP) "be reviewed and amended to better reflect and be consistent with the connection requirements of, and outcomes sought by the NDC".

It is recommended that Healthy Waters continue to discuss this with Plans and Places and further that if this issue is not resolved within the scope of the 2024 NPS-FM plan changes then Healthy Waters should investigate alternative methods to improve the ability to require developers to comply with the NDC including progressing changes to the AUP(OP) independently.

Permitted activities

Many activities at a small scale such as subdivision into less than three lots or small increases in impervious area are permitted activities under the AUP(OP). The amount of development which can be undertaken as a permitted activity will increase with the plan changes to implement the MDRS and NPS-UD.

Where there is no resource consent triggered by a development, there will be no application made. Where an existing connection to the network is utilised as part of this small-scale development, frequently no engineering plan approval is required either. In these scenarios the development will therefore not be referred to Healthy Waters for checking against the requirements of Schedule 4.

This is part of the reason that the small brownfields requirements in Schedule 4 reflect the permitted activity standards in the AUP(OP) and very little at source mitigation is required.

If future changes to the Schedule 4 standards, in particular those relating to small brownfields, are considered this will also need to be considered so that those changes are able to be implemented. Additional triggers for engineering plan approval under the bylaw may need to be imposed to ensure that checks can be made. This would need to include process changes as part of the review of EPAs.

Healthy Waters is reliant on the Stormwater Bylaw to enforce the requirements of the NDC Schedule 4 on third parties.

2.3.17 Surrender of historic network consents

At the time of granting of the NDC, Healthy Waters held 120 historic network discharge consents for catchments of various sizes across the region. These varied in age and comprehensiveness.

All of these historic consents have been superseded by the Regionwide NDC and are required to be surrendered to achieve the consistency and regional stormwater management approach that is part of the purpose of the Regionwide NDC and in accordance with condition 17.

In undertaking the surrenders, it remained important to ensure that existing commitments and catchment specific approaches were not lost particularly where those have been determined or agreed recently. The NDC conditions therefore set out a framework for the assessment of the historic NDCs prior to surrender and the ability to incorporate those requirements which are still relevant into the Regionwide NDC. The framework includes different assessment requirements and engagement to be undertaken based on the age of the consent.

Table 4 Historic network consents to be surrendered and status.

NDC granted date	Number of NDCs	NDCs surrendered at September 2022	Further assessment required	Number of catchment plans adopted into Schedule 10
Since 2013	20	14	6	18
2001-2013	30	15	15	5
Before 2001	70	70	0	0
Total	**120**	**99**	**21**	**23**

To date all 70 NDCs granted prior to 2001 have been surrendered and 29 of the more recently granted NDCs have been surrendered through the process set out in condition 17. 23 of the supporting catchment management plans have been adopted into schedule 10, noting that for some of the catchment areas there were several underlying Catchment Management Plans (CMPs) within the same NDC area to be adopted. The locations and extents of adopted SMPs are publicly available on Auckland Council's GeoMaps GIS viewer as shown in figure 13.

The remaining historic NDCs require further assessment and engagement in accordance with the requirements of the condition and this work in ongoing.

2.3.18 Schedule 4

Schedule 4 of the NDC sets out the connection requirements for development where the discharge of stormwater will be to the public network and which will vest assets to Healthy Waters. Overall the approach in Schedule 4 is still heading in the right direction. However as discussed above there are many challenges with implementing the Schedule 4 requirements and determining site specific BPO.

Appendix 6 includes an assessment of the performance of Schedule 4. There are several wording changes that would be beneficial to add clarity or to close loopholes. In particular the section which describes what needs to be considered in determining a BPO. As discussed above the overall approach to brownfields needs reconsideration. Following the outcome of that, changes may be required to the requirements in Schedule 4.

Any changes to Schedule 4 are required to be undertaken through an RMA s127 variation to the conditions of the NDC consent (in accordance with Condition 33) which would likely be a publicly notified process. The scale of the currently required amendments are not sufficient to recommend that a s127 application is made at this time. They will be noted and added to future changes.

2.3.19 Key points and recommendations

The NDC anticipated that growth would be in accordance with the growth strategy and that therefore Healthy Waters would be able to be prioritised following this strategy. Since the NDC commenced growth and intensification has not fully followed this pattern. Instead increasing urban density in brownfields means that a greater proportion of development is small brownfields and this is set to further increase due to the NPS-UD. Out of sequence greenfield growth is also occurring.

In order to manage the cumulative effects of multiple and increasing small scale development and to meet possible future targets which come from implementation of the National Policy Statement for Freshwater Management (NPS-FM), Healthy Waters will need to further review the overall approach to managing stormwater runoff in brownfield areas which can be significantly more complicated than greenfield development. The review will need to consider and balance the benefits of at source management, the extent of opportunities from redevelopment with scale and distribution of that redevelopment and available opportunities for catchment or sub-catchment scale targeted improvements through publicly funded and communal projects.

The implementation of the stormwater management requirements in Schedule 4 is challenging for a number of reasons. To address this a number of recommendations are made to improve the process and to help industry professionals and applicants to provide appropriate information at the right time. Changes may also be needed to the AUP(OP) in order to achieve NDC outcomes

Implementation of water sensitive design (WSD) for stormwater also needs to be improved in order to meet the NDC objectives and outcomes, the profile of WSD needs to be raised and overall understanding of the concept across Healthy Waters, the wider council family and the development industry needs to be improved. Internal and external training is needed as well as updates to the existing guidance.

Table 5 Recommendations, future actions and programmes related to growth.

Reference	Recommendation and future actions
Growth 1	Improvements to SMP review process within Healthy Waters including a) ongoing training with Healthy Waters and relevant council staff to improve consistency of advice to industry practitioners and capture matters such as SMP review practice and changes in industry stormwater management trends. b) Simplification of the process where possible c) Attention to timeframes for review and approval d) Clarity and consistency re BPO and interpretation of NDC schedule 4 e) Clarification as to the role of SMPs within the plan change process. f) Healthy Waters will continue to encourage applicants to engagement with Healthy Waters early in their design processes to resolve matters of difference early and therefore reduce delays alter in the regulatory processes where timeframes become critical.
Growth 2	SMP Template updates a) Given the importance of the template in guiding the content of SMPs and the importance of SMPs in outlining and determining the management of stormwater runoff from development, updates to the template need to be made as a priority. Updates to the template will need to consider all of the feedback received from Healthy Waters teams, industry, mana whenua and other stakeholders. Updates to cover (but not limited to): • review and rationalisation of SMP content • the ability to make the template scalable to tailor differing development scenarios and trends in development typology (e.g. superlots). • Clarity around level of detail required at different stages in the process. • Consideration of separate template for greenfield and brownfield development • Clarity around justification of BPO • Water sensitive design • Incorporation of Te Mana o te Wai principles
Growth 3	Review of overarching stormwater management best practicable option in brownfield areas a) In order to manage the cumulative effects of multiple and increasing small scale development and to meet possible future targets which come from implementation of the National Policy Statement for Freshwater Management (NPS-FM), Healthy Waters will need to further review the overall approach to managing stormwater runoff in brownfield areas which can be significantly more complicated than greenfield development. The review will need to consider and balance the benefits of at source management, the extent of opportunities from redevelopment with scale and distribution of that redevelopment and available opportunities for catchment or sub-catchment scale targeted improvements through publicly funded and communal projects.
Growth 4	Water Quality a) Further develop the freshwater management tool or a simplified contaminant load model for use at development scale for the purpose of comparative analysis of contaminant generation from development proposals. b) Develop a set of principles relating to water quality offsetting and share these with industry to ensure that any proposals for offsetting are robustly supported with sufficient information.

Reference	Recommendation and future actions
Growth 5	Implementation of water sensitive design a) In order to improve implementation of water sensitive design (WSD) for stormwater and to meet the NDC objectives and outcomes, the profile of WSD needs to be raised and overall understanding of the concept across Healthy Waters, the wider council family and the development industry needs to be improved. Support internal and external training as well as updates to the existing guidance. b) Investigate role of GD04 to assist with WSD implementation including defining how it can work with GD01.
Growth 6	Provision of additional guidance information: a) updates to the SMP template/guidance (recommendation Growth 2) b) a guidance note on water quality requirements for brownfield redevelopments c) a practice note on pipe capacity and connections in brownfields areas. d) additional guidance be provided for applicants and their professional team around determining and justifying best practicable option (BPO), and the requirements of NDC Schedule 4. (this may be incorporated into the SMP template updates)
Growth 7	Improve working closely with agencies such as AT, parks, plans and places to address apparent inconsistences in stormwater management approaches, including implementation of WSD in council family land and projects.
Growth 8	Investigate and contribute to updates to GD01 to improve alignment with NDC implementation, including clarifying matters such a water quality treatment for various land use types – work closely with Resilient Land and Coast department. Note that this is not within the control of Healthy Waters.
Growth 9	Continue with ongoing process improvements to asset vesting process
Growth 10	Future changes to the Auckland Unitary Plan Much of the implementation of Schedule 4 and the stormwater management requirements for third parties relies on the Auckland Unitary Plan (AUP) framework. There are several upcoming plan changes to the AUP(OP) as a result of the NPS-FM and as the outcome of the plan effectiveness review of the AUP(OP) currently being undertaken by Auckland Council Plans and Places department (section 35 review). It is recommended that Healthy Waters continue to engage and support the Auckland Council's Plans and Places department, to build and collate a common evidence base to support future plan changes. In particular: a) consider whether increased water quality mitigation requirements should be incorporated into the AUP. The current water quality provisions are focused on high contaminant generating areas but this may need to be expanded to require mitigation for more or all types of impervious areas b) resolving inconsistencies in Chapter E8 of the AUP(OP) which make the integration of the NDC into the resource consent process unnecessarily difficult If the scope of the upcoming changes to the AUP(OP) is not sufficient to address the above matters, then Healthy Waters should investigate alternative methods including progressing changes to the AUP(OP) independently.
Growth 11	Schedule 4 – connection requirements Any changes to Schedule 4 are required to be undertaken through an RMA s127 variation to the conditions of the NDC consent (in accordance with Condition 33) which would likely be a publicly notified process. The scale of the currently identified amendments are not sufficient to recommend that a s127 application is made at this time. They will be noted and added to future changes. a) *Investigate and document evidence base for future changes to Schedule 4 including appropriate consultation with industry practitioners and other interested parties*

2.4 Flooding (Issue 3 under NDC Schedule 2)

2.4.1 Preparing for a changing climate

Flooding occurs when there is too much water to be drained away via streams or the piped network and water collects in low places. The extent and frequency of flood events is influenced by land uses in a catchment area and the amount of rain in a rainfall event, and relies on the capacity of the both the piped network and natural hydrology, such as overland flow paths and streams, to drain away or contain the runoff.

These hazards will be exacerbated by more extreme storms, changing rainfall patterns and sea-rise due to climate change. Tāmaki Makaurau's catchments, coastlines and communities are experiencing the effects of flooding and erosion, both along the coast and inland. Risks will increase to life, property, the environment, infrastructure and the economy. All these climate hazard effects have been acknowledged by Auckland Council joining cities across the world in declaring a Climate Emergency.

At the same time, Tāmaki Makaurau is also experiencing unprecedented growth. There is continuing pressure to develop in areas where flooding and other hazards exist. Council organisations, infrastructure providers and private developers are making decisions to invest in developing land and infrastructure that may be significantly impacted by these hazards in the future.

Improving Auckland's storm-readiness and proactively preparing for changes in rainfall will be critical for reducing risk and exposure to climate change effects. This is reflected in the objective sought for the management of flooding under Schedule 2 of the NDC:

> *Safe Communities: Risk to our communities, including people, property and infrastructure is reduced – ensure that risk to people and property is managed to levels that have been established in consultation with the community, and reduce existing flood risk where it is above these levels.*

This objective is supported by four outcomes:

- avoid the increase of existing flooding or creation of new flooding of habitable floors as a result of urban development and intensification
- reduce existing flood risk by taking the opportunities from redevelopment where they arise
- manage existing flood risk to meet levels of service agreed to keep people and property safe from significant harm from flooding, and minimise disruption to critical social and physical infrastructure connections across the city
- improved community understanding of, and resilience to, flood hazards.

2.4.2 Estimated exposure to flood hazard in Auckland

Of the 510,399 buildings[1] in the Auckland region:

- 56,812 (11%) have been identified as fully or partially within floodplains
- 105,159 (21%) are exposed to at least one type of flooding hazard, being either floodplain, overland flow paths or flood prone areas. Floodplains and overland flow paths account for the majority of these buildings.

The impact of this exposure on buildings will vary – whether or not the building floor is inundated will depend on the relative level of the building floor to flood water.

Of the 506,693 property parcels[1] in the Auckland region:

- 128,083 (25%) are fully or partially within floodplains[2]
- 237,971 (47%) are exposed to at least one type of flooding hazard, being either floodplain, overland flow paths or flood prone areas. Floodplains and overland flow paths account for the majority of these properties.

The impact of these flood hazards on people will vary depending on the location and nature of the hazard. For example, overland flow paths are an intentionally designed part of many properties, safely conveying water through the property and away from buildings.

2.4.3 Roles and responsibilities

Teams across Auckland Council have responsibilities under a range of legislation to manage flooding. Under the Local Government Act 2002 and Local Government (Auckland Council) Act 2009 council must:

- prepare and maintain a long term plan covering key activity groups [s93]. Activity groups include stormwater drainage and flood protection and control works [Schedule 10]
- prepare a financial strategy which must include the expected capital expenditure on network infrastructure, flood protection, and flood control works that is required to maintain existing levels of service currently provided by the local authority [s.101A]
- prepare and maintain 30-year infrastructure strategy which addresses how council will provide for the resilience of infrastructure assets with respect to natural hazards risks. [s.101B]

Auckland Council was also established as a territorial authority with the responsibilities, duties and powers of a regional council through the Local Government Act 2009 s6. As a regional council, the council has a series of responsibilities under the Resource Management Act. Sections 30 and 31 grant to regional councils and territorial authorities the functions of controlling the use of land, or the effects of the use of land, for the purpose of, among other things, the avoidance or mitigation of natural hazards [s.30(1)(e) and s.31(1)(b)]. These functions are implemented through planning documents including regional policy statements and regional and district plans [s.60-62, 65, 67, 68, 73, 75, 76].

Auckland Council also has functions under the Civil Defence and Emergency Management Act 2002 and the Building Act 2004.

These functions are carried out across the council teams, including decisions on land use, the development of regional policy statements and regional plans, design and operation of roads and public spaces, as well as building consents requirements. Most of these functions are not under direct control of Healthy Waters or the NDC and so require collaboration with other parts of council for delivery.

In addition, and most notably, decision making on the final outputs of some these functions, such as land use planning and consenting decisions, are made by others outside of council, e.g. independent commissioners through the hearing process. Other roles and responsibilities for managing and mitigating flood risks also sit outside of council, including central government agencies (e.g CDEM), business, and individuals, and are not always straightforward. For instance, remedying properties with flood risk will

[1] All property parcels. The corresponding numbers for residentially zoned parcels only are 418,825 total parcels, of which 173,328 (41%) are exposed to at least one type of flooding hazard.
[2] Analysis completed in December 2021 – the numbers are likely to have changed slightly since then due to development and council's rolling programme of floodplain updates.

result in private benefit. However, current problems are frequently resulting from past decisions of both councils and property owners. In more severe cases, the scale of both the problem and remediation effort is beyond the means of the landowner, even if they are legally responsible. In these cases, the council may be expected to step in and take action to minimise the risk to human life.

2.4.4 Overview of Healthy Waters programmes related to flooding

Healthy Waters carries out a range of functions and activities which contribute to the NDC outcome of safe communities. Its current focus areas are as follows, with further details provided in the remainder of this section. Not all of the activities are directly in the control of the NDC, however all contribute to reduced flood risk to people and property.

Table 6 Healthy Waters Functions and Activities in Managing Flood Risk.

Programme	Description
Flood hazard identification and risk assessment	Healthy Waters is working to better understand scale and significance of flooding around the region in a changing climate, and identify Auckland's most at-risk areas from storms
Supporting community awareness and resilience	Communities need to have realistic expectations about the likely impacts and be ready to respond to and recover from those events when they occur. Healthy Waters is working to support understanding and preparing for extreme events, including sharing of data and information through flood hazard records and disclosure of flood hazard information
Advocating for flood resilience during development	Healthy Waters is advocating for policy, regulation, and development decisions that avoid and reduce flood risks
Maintaining and upgrading stormwater assets	Healthy Waters is actively maintaining and upgrading its built, natural and green stormwater assets to reduce the risks. For instance, it proactively minimises the risk of flooding ahead of forecast storm events through "hotspot" maintenance
Supporting emergency event response	Healthy Waters supports the response to flooding and other incidents in co-ordination with Auckland Emergency Management

2.4.5 Flood hazard identification and risk assessment

Three types of flood hazards are assessed across the region and displayed in Auckland Council's GeoMaps GIS viewer: overland flow paths, flood prone areas and floodplains:

Overland flow paths are defined in the AUP(OP) as a low point in terrain, excluding a permanent watercourse or intermittent river or stream, where surface runoff will flow, with an upstream contributing catchment exceeding 4,000m².

Flood prone areas are depression areas that have no natural outlet. The extent shows the area water will pond up to in a storm event with a 1% chance of occurring in a given year, assuming the outlet to the

depression is blocked. The current flood prone area layer is generated for the whole of the Auckland region based on ground surface mapping (LiDAR data) from 2016.

Floodplain is defined in the AUP(OP) as the area of land that is inundated by runoff from a specified rainfall event, with an upstream catchment generating 2m^3 /second or greater of above ground flow, taking into account:

- any increases in impervious areas that would arise from changes in land use enabled by the policies and zonings of the Plan
- the effects of climate change over a 100-year timeframe in respect of the frequency and duration of rain fall events and a 1m sea level rise
- assuming that primary drainage is not blocked.

Understanding the level of current and future flood risks to property and infrastructure is the first step to efficient flood risk management. Healthy Waters uses its hydraulic model programme to collect, analyse and verify data to better articulate flood risks, and will continue to provide current and reliable data on natural storm related hazards. This programme requires significant investment in expertise, tools and data. As an example, figure 17 presents an overview of the information used in the modelling of floodplains.

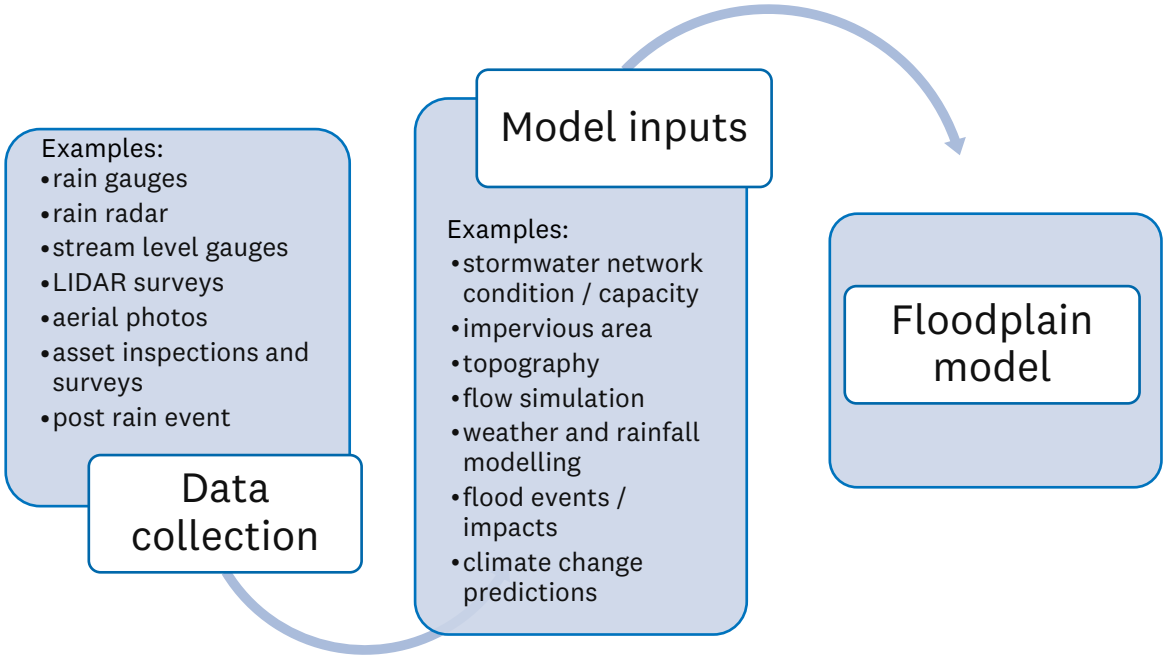


Figure 17. Overview of data and information used for the development of floodplain models.

Hydraulic modelling for these types of flooding is prioritised through a rolling programme to ensure the catchment models are up to date across the entire region, and to support activities including planning and policy, development, catchment management as well as infrastructure design. Floodplains are updated as models are updated, on a catchment by catchment rolling basis.

In terms of assessing flood risk, the NDC targets currently focuses predominantly on the “protection of habitable floors”. However, there are several limitations to the use of this metric:

- in terms of the number of flooding events and the associated number of habitable floors affected, there is no central repository for the collation of such incidents reported to the fire service, insurance industry and council. Reliance on council statistics only to assess this issue will therefore result in an underestimate
- other risks from flooding, such as those posed to vehicles from fast flows over bridges and as a result of overland flow paths along roadways, are currently not proactively assessed. Understanding the different types of flood hazard across the region is key to communicating risk to communities and how these risks can be mitigated
- flooding of habitable floors is influenced by decisions outside of Healthy Waters direct control (e.g. development allowed in flood plains)
- the term "protection" implies the creation of barriers or structures, where as a term such as "reduce the risk" betters reflect the range of methods available to mitigate flood hazard

Healthy Waters has begun a review of the definition of "high flood risk", which is anticipated to inform how flooding is to be assessed more holistically. It also assesses other matters as part of its project scoping and design – as discussed in Section 2.4.8 below.

2.4.6 Supporting community awareness and resilience

Provision of flood hazard records and disclosure of flood hazard information

Publicly available information showing the modelled extent of floodplains affecting specific properties is available on the council's GeoMaps GIS viewer for the 1% annual exceedance probability (AEP) rainfall event (the floodplain maps), as well as the location of overland flow paths and flood prone areas.

Land Information Management (LIM) and Project Information Management (PIM) reports are also automatically populated with information from the three flood hazard layers on GeoMaps. All LIMs include a general statement regarding flooding, as well as a general statement regarding coastal inundation. A map attached to all LIMs entitled "Special Land Features – Natural Hazards – Flooding" shows the three flood hazard layers in relation to the property. There is also a map entitled "Special Land Features – Natural Hazards", which includes the coastal inundation hazard layers in relation to the property.

If the property parcel spatially intersects with a flood plain, flood prone area, overland flow path or coastal inundation area, then an additional specific statement to this effect is included on the LIM, together with a brief definition of the hazard. This is an automated process and for every property within the relevant hazard area this information is added to their LIM report.

Guidance on how to manage flows on private property is also available on the council website, together with information to residents on what initiatives they can take to increase resilience, such as the installation of rain tanks.

However, feedback from the local boards has indicated that further work is needed in this communication. As a result, one of the key recommendations is to improve the communication of flooding risks and their management to council governance. This will need to include the identification of metrics that are to be regularly reported, for instance, number of building exposed to flood hazards, as well as updates on actions being undertaken to mitigate this risk.

Development of strategy for targeted education and flood resilience

Building on the collateral above, Healthy Waters is developing a communications strategy, which will look to target engagement to those who are at high-risk, have experienced flooding, are predicted to be in a

flood zone but haven't experienced flooding yet and may encounter flood hazards (e.g. everyone, people may drive through flood water). The communications strategy will work with landowners to clarify flood risks as well as provide advice on private flood management initiatives and help build resilience and self-reliance.

2.4.7 Advocating for flood protection and resilience during development

Overview

The extent and hazard of floodplains is significantly impacted by land use decisions. As discussed in Section 2.4.3 above, while Healthy Waters has authority to approve stormwater assets that are vested to council, it does not have direct control on the location and nature of development, which is regulated through land development processes set out under the AUP(OP). As a result, Healthy Waters proactively advocates for the reduction of flood risk during development as through the following:

- Avoiding building within and adjacent to the floodplain in greenfield development
- Ensuring greenfield developments do not increase flooding hazards in downstream areas
- Avoiding the up-zoning for more vulnerable activities within and adjacent to the floodplain for brownfield development and redevelopment
- Ensuring brownfield development and redevelopment to reduce existing flooding hazards.

Healthy Waters advocates these positions through a number of legislative vehicles and tools, including through:

- Identifying potential flood hazard areas by comprehensive modelling of catchments and updating models as required
- Publishing the known potential flood hazard area information on the public facing GIS (GeoMaps), including background reports
- Liaising with development consultants providing technical information and assistance as they work through the developments in potential flood hazard areas
- Providing subject matter expertise inputs into consent processing
- Providing subject matter expertise and where required evidence in relation to flooding on private plan changes
- Work with the planners to incorporate relevant flood provisions within the Unitary Plan and any Council run plan Changes
- Work with strategic planning teams to ensure flood hazards are considered in future growth and development scenarios
- Input into the stormwater and flooding related provisions in the Water Strategy
- Work with other departments to update the Stormwater Code of Practice to help clarify the requirements for flood protection
- Provision of associated technical standards and guidance; e.g, SMP templates
- Inputs to council submissions to central government reforms and legislative changes

- Scoping, justification, and delivery of projects to support growth.

These processes are discussed further in section 2.3 above related to the issue of growth, with some additional improvement identified as follows specifically in relation to flooding.

Improving how flooding is managed in the AUP(OP)

In the AUP(OP), floodplain is generally managed by restricting what activities can occur within a floodplain which are set out in AUP(OP) Chapter E36 Natural Hazards. These rules apply to the 1% AEP floodplain.

In applying the AUP(OP) rules, the floodplain map on GeoMaps is indicative only although council's Regulatory department accepts its accuracy with regard to land shown on the floodplain map as being outside the floodplain. Healthy Waters notes that land currently shown as outside of floodplain may in the future be exposed to flood hazard as a result of better information on the impacts of climate change or other factors influencing flooding.

A party may provide council with a site-specific technical report prepared by a suitably qualified and experienced person to establish the extent, depth and flow characteristics of the floodplain. When taking account of impervious areas that would arise from changes in land use enabled by the policies and zonings of the plan, recognition should be given to any existing or planned flood attenuation works either existing or planned in an integrated catchment management plan.

Any subdivision or development consent that is located in a floodplain or overland flow path must carry out a E36.9 assessment to determine the level of hazard associated with that activity. Resource consent is also required for diverting the entry or exit point of an overland flow path and for placing buildings in the overland flow path.

The direction in the objective to reduce risk is stronger than the objectives in the AUP(OP) Regional Policy Statement to not increase risk or create new risks. The outcome was intended to reflect the opportunities that arise from significant brownfield redevelopment such as those happening in Tamaki, Māngere and Ōwairaka. However, reducing risk from flooding will be difficult without stronger AUP(OP) policies and rules to support this.

In addition to risk-based objectives in the AUP(OP), there is also need for objectives to protect the functions of natural systems, including floodplains are protected from inappropriate subdivision, use and development and the conveyance function of overland flow paths is maintained. Floodplains are storage for the secondary stormwater system and engineering cannot be relied on as a solution to manage flooding.

In the context of greenfield developments, avoiding development in floodplains in greenfield environments is the obvious way to avoid creating new flood risk but is surprisingly challenging. The support for this in the planning framework is limited including the lack of recognition of floodplains as infrastructure and lack of zoning options to identify the area as floodplain and land uses suitable for such areas. In addition, the strongest direction to avoid greenfield development in floodplain comes when making a decision to zone land as Future Urban Zone (FUZ).

Once land, including floodplain, is zoned as FUZ there is no regional policy statement directive to avoid greenfield development and so private plan change requests that include floodplain cannot be rejected for that reason alone. Plan changes to zone greenfield land from FUZ to urban uses are also challenging due to the lack of zoning options to apply to floodplain that reflects what the land may be suitable for. There is also no overlay for flood hazards as an alternative tool to zoning to manage risk from development. This is something that should be considered as overlays are considered an appropriate tool to manage section 6 RMA matters (Ministry for the Environment, 2017. National Planning Standards: Zones and overlays – spatial layers in plans: Discussion paper C. Wellington: Ministry for the Environment). [1]

While council has various functions, duties, and enabling powers in relation to the management of flood hazards and risk, the exercise of those powers to reduce existing risk – as distinct from avoiding or mitigating future risk or managing existing risk – is discretionary and tempered by the fact that there is no specific statutory or policy directive or requirement at national or regional levels for council to reduce existing natural hazards risk, and there is no agreed level of service for flood risk in Auckland that would otherwise drive council to actively reduce existing risk levels.

The draft s 35 review of the AUP(OP) identified that the majority of consents granted for activities in floodplains have been in existing brownfield environments. This finding is consistent with general building activity concentrated, as anticipated in the Future Development Strategy, in existing urban areas. The combination of consents in brownfield floodplain, implementation of the National Policy Statement for Urban Development and on-going intensification make more urgent the need for ongoing work to look at how flood risk could be reduced in existing urban areas as flood hazard will likely increase cumulatively in existing floodplain areas.

The concept of reducing risk is challenging to implement in the NDC because a) so much of flood hazard and risk is driven by land use decisions and connections to the stormwater network, via the NDC, is only a part of it. Reducing risk may also mean reducing the risk of harm with a focus on public safety rather than reducing extent of flooding itself. Building a better understanding of the hazard that flood areas pose to communities will enable options and performance measures for reducing flood risk to be developed.

A draft section 35 review of the Auckland Unitary Plan was carried out in 2021 and discusses the effectiveness of the natural hazard and flooding provisions in detail. Amendments to the AUP(OP) that work to ensure the outcome of safe communities is achieved will be supported by Healthy Waters.

Advocating the importance of overland flow paths

Overland flow paths form the secondary stormwater system and yet their role in flood risk is not well articulated in management documents. Overland flow paths are stormwater runoff yet there are not specific performance requirements in the NDC to capture their role in flooding. The Stormwater Code of Practice is also not explicit on overland flow path management. Managing flood risk requires raising awareness of floodplains and overland flow paths and the hazard they present.

The management of overland flow paths becomes more important in existing urban environments and urban infrastructure such as roads and parks may be required to accommodate overland flows to reduce risk to private property. However this role is not well understood within communities and some governance, resulting in particular in the push back of parks to be used for flood management during development proposals.

Updates to the Stormwater Code of Practice

The Stormwater Code of Practice (SWCoP) provides design standards for public stormwater network, including that which is vested, and is periodically updated. The current design standards for the primary stormwater system are reflected in the NDC Schedule 4 requirements under flooding.

Version 2 of the SWCoP was published in 2015, including a 2.1 degree allowance for climate change. This allowance was based on IPCC's Fourth Assessment Report (2007). Since then, there have been a number of changes with respect to climate change:

- updated climate change projections have been released at a global, national, and local level. The latest downscaled projections for Auckland were published in 2020 by NIWA, based on the IPCC's Fifth Assessment Report (2014)
- in 2019 Auckland Council declared a climate emergency
- in 2020 Auckland Council adopted Te-Tāruke-ā-Tāwhiri: Auckland's Climate Plan.

Te-Tāruke-ā-Tāwhiri states that we will prepare for the current emissions pathway, and plan and build resilience so that we are ready when a warmer world does occur. To implement Te-Tāruke-ā-Tāwhiri as well as to incorporate the updated climate change projections, Auckland Council has developed updated rainfall guidance based on designing for a 3.8 degree temperature rise. This includes an increase to design rainfall depth as well as an updated temporal pattern.

These changes to the rainfall guidance were not made in Version 3 of the Stormwater Code of Practice, released in January 2022, due to the need for organisational alignment and further engagement with industry on an appropriate transition pathway and framework for how the new guidance should be applied in practice. The implementation of Te-Tāruke-ā-Tāwhiri within the Auckland Design Manual is being assessed with the view to revising climate change provisions across all codes of practice to ensure consistency. This work will be carried out during 2022, with Healthy Waters intention being to update the climate change allowance in the SWCOP to 3.8 degrees. Together with the update to the climate change provisions, Healthy Waters plans to include guidance on how a risk-based approach can be used to design stormwater infrastructure where the design criteria in the code of practice cannot reasonably be achieved or would result in perverse outcomes.

Version 4 will include some principles/thresholds to enable designers to follow this approach. Following this, more detailed guidance and examples will be provided. An example of the risk-based approach is the Brownfields Practice Note currently being developed in response to the NDC commitment to "develop in conjunction with industry, a code of practice, or engineering guideline for stormwater details in a brownfield development". This tool aims to help designers achieve the best practicable option for stormwater connections where a departure from the SWCoP is necessary to enable development.

Support building resilience in new development and redevelopment

Building consents are and will be a key mechanism for improved resilience to increasing natural hazards events such as flooding and erosion. Healthy Waters, as part of its BAU operations, have identified the following key areas where building consents can play such a role, and for which Healthy Waters will continue to advocate – noting again that Healthy Waters is not the ultimate decision maker on such legislative approvals:

- Aligning and clarifying definitions related to natural hazards between legislative vehicles and incorporating updated climate change predictions in the building code. For instance, legislative alignment is needed in relation to the level of flooding that is considered as a natural hazard between the RMA, which places restrictions on buildings within a 1% AEP (1 in 100 year flood events), and the Building Act, which only requires the floor level of a residential building to be above a flood level, equivalent to a storm event with a 2% AEP (1 in 50 year).
- Installation of onsite stormwater detention and retention devices on properties upstream of flood plains and erosion prone streams
- Provisions that enable council to request inspection and maintenance records for all private onsite devices

- Setting minimum construction standards for housing in floodplains[3], such as appropriate footing design, clearances that allow for top soiling and / or landscaping that may not have been undertaken yet, and appropriate materials capable of resisting damage, deterioration, corrosion or decay. Design must take into account anticipated water velocities, wave action (freeboard), erosion and buoyancy.

2.4.8 Maintaining and upgrading stormwater assets to be storm-ready

Maintenance of the stormwater system is critical for community storm-readiness. Healthy Waters continually monitors the weather forecast and rain radar for upcoming heavy rain events, and proactively prepares for such events beforehand by inspecting and clearing hotpots areas, such as culverts and other infrastructure known to be source of flooding risk.

The flooding issues faced by Aucklanders today are also a result of the way the region grew in the past, with many places having existing infrastructure that may not be able to meet the flood protection demands. The efficiency of the existing stormwater systems will further decrease with time due to changing climate, increasing rain intensity and rising water levels. As a result, Healthy Waters will build or fund the upgrading and extension of stormwater systems to address flood risks where there are wide public benefits or opportunities to improve system resilience.

To identify projects, Healthy Waters uses and analyses a range of information such as flood model predictions, known operational hotspots, past requests for service and flood events, and historical rainfall records. Projects are also identified in collaboration with other infrastructure providers as well as part of urban development.

Project scoping further assesses matters such as risk to life, damage to property, disruption to local communities, potential public health issues, nuisance flooding, flooding of roads to assess whether Healthy Waters will undertake work, or if the matter should remain private property responsibility. It will also assess any impacts from climate change, whether unconsented building works have occurred, and whether there are other options.

Refer Appendix 9 for the list of flooding projects completed or underway by Healthy Waters since 2017.

2.4.9 Supporting emergency event response

Since the NDC commenced in 2019 there have been two major flood events in Auckland – west Auckland in August 2021 and north/central Auckland in March 2022; both of which were larger than a 2% Annual Exceedance Probability (AEP) or 50 year annual reoccurrence interval (ARI). In any given year there may also be more localised flooding as a result of intense rainfall which overwhelms the piped stormwater network in a certain area, however this usually drains away quickly.

Council has statutory civil defence responsibilities to prepare for hazards, including a duty to ensure lifeline infrastructure continues to operate to the fullest extent possible in an emergency. These responsibilities are led by Auckland Civil Defence Emergency Management (CDEM) Group, supported by Healthy Waters, other infrastructure providers and emergency services.

[3] Healthy Waters does not support building within floodplains, however as it is not the ultimate decision makers on land use decisions, recognises the need for building resilience measures.

2.4.10 Assessment of NDC targets for flooding

Healthy Water is on track in meeting the following targets a) (*Council flood hazard GIS layer is maintained so that it is current and publicly available; reviewed on a two-yearly basis*), and g) *Provide updated guidance on the criteria for assets to be vested to council following approval of the NDC*), as well all targets related to collaboration. It has also begun and is progressing h) *Flood resilience strategies are in place for habitable floors that are found to be unfeasible to protect from flooding within 10 years: >50%*

There are three targets that reflect the non-financial performance measures set out by the Department of Internal Affairs, as well as in the council Long-Term Plan:

b) The number of flooding events and the associated number of habitable floors affected: less than 1 per 1000 properties in Auckland per annum

e) Median response time to attend a flooding event, measured from the time that Auckland Council receives notification to the time that service personnel reach site: < 2 hours (LTP)

f) Major flood protection and control structures are maintained, repaired and renewed to a safe operating standard

However, none of these targets are considered measurable for the following reasons:

- With respect to targets b) and e), council is only one of the responders during flood events, with the other being the fire service. There is also no central repository collating incidents reported to the fire service, nor to the insurance industry. Any reporting undertaken based on council statistics alone would therefore only be an underestimate
- With respect to target f), there are no such structures in the urban areas of Auckland. Under the Department of Internal Affairs (DIA) these structures are defined as works that meet two or more of the following criteria:

    a) operating expenditure of more than $250,000 in any one year

    b) capital expenditure of more than $1 million in any one year

    c) scheme asset replacement value of more than $10 million

    d) directly benefiting a population of at least 5,000 people

With respect to the remaining two targets, *c) Proportion of habitable floors protected from flooding in a 1 in 10-year storm: > 99% (AMP) and d) Total habitable floors protected from flooding in a 1 in 100-year storm: > 97.5% (AMP),* these are also not considered measurable for the following reasons.

- There is limited data on the number of habitable floors. While there is data on buildings, data on floor levels is very limited, and would require a high level of extrapolation, which would bring in substantial uncertainty.
- Addressing this issue relies on a number of actions outside the direct control of the NDC, most notably land use decisions.

As a result, it is recommended that these targets, like those from the DIA above, be amended once the Three Water Reforms have progressed further.

2.4.11 Key points and recommendations

The management of and response to flooding relies on a range of organisations, including across council departments as well as central government organisations, the insurance industry and private property owners. Healthy Waters plays a key role as discussed above, including through the maintenance and upgrade of stormwater infrastructure as well as through the provision of flood related information and advice.

However, other key management functions fall outside of Healthy Waters' direct influence, most notably: land use planning, emergency response and the responsibility of private property owners to manage their own risk. Furthermore, responsibilities and tools to manage this risk are currently under review as result of widespread central government reforms (including Three Waters, RMA, building consent and emergency response reforms), as well as from council led reviews of the AUP and other council strategic documents.

As such, in this time of unprecedented urban growth and legislative change, the recommendations below have a strong emphasis in advocating for the need to avoid and reduce flood risk during urban development. There is also the need to wait for the outcomes of these reforms before updating associated NDC flooding targets.

Table 7 Recommendations, future actions and programmes related to flooding.

Reference	Recommendation and future actions
Flooding 1 Schedule 2 Amendments	No proposed amendments to Schedule 2 targets as part of this review. Targets b),c), d), e) and f) will be reviewed as the Three Waters reforms are progressed.
Flooding 2	Flood hazard identification and risk assessment a) Continue to refine the definition of a "high flood risk," as understanding the different types of flood risk across the region is key to communicating to communities and identifying how these risks can be mitigated. b) Improve engagement of flooding risks and their management to council governance. This includes identifying metrics to be regularly reported, for instance, number of buildings exposed to flood hazards, requests for services and updates on actions being undertaken to mitigate this risk. c) Continue to engage with the fire services, other parts of council and insurance companies to collate a more comprehensive picture of flooding events, in particular where habitable floors are impacted.
Flooding 3	Supporting community resilience a) Increase awareness of impacts of impervious areas through existing council sustainability initiatives, as well as working with local community groups, landscape designers and suppliers. b) Advocate the retrofitting of buildings for resilience, e.g, the selection of materials, location of electrical supply and protection of overland flowpaths. c) Continue to develop flooding communications strategy, targeting people such as those who are at high-risk, have experienced flooding, are predicted to be in a flood zone but haven't experienced flooding yet and may encounter flood hazards (e.g. everyone, people may drive through flood water). d) Continue to advocate and raise the awareness of the importance of overland flowpaths and streams in the safe conveyance of water.

Reference	Recommendation and future actions
Flooding 4	Advocating for flood protection and resilience during development a) Advocate for increased building flood resilience in new development and redevelopment, such as through the selection of water resilient materials, location of electrical supply and protection of overland flowpaths. b) Continue to advocate and raise the awareness of the importance of overland flowpaths and streams in in the safe conveyance of water. c) Continue to incorporate flooding risk provisions in the update of SMPs and review of brownfield development controls, as identified in Issue 3 Growth in this review. d) Continue to advocate for flood risk avoidance and reduction provisions during urban development in upcoming AUP(OP) plan changes. Specific recommendations include: • strengthening the Regional Policy Statement to explicitly direct that there is no greenfield development in floodplains to avoid creating new flood risk • a new zone or overlay to denote areas subject to, or contributing to, natural hazards with additional district plan rules to ensure flood risks are not increased • recommendations from the s35 review. e) Continue to advocate for flood risk avoidance and reduction provisions in the review of council strategies and policies, including upcoming updates to Future Development Strategy and Open Space Policy. f) Continue to advocate for flood risk avoidance and reduction provisions in central government reforms, such as RMA reforms, Water Reforms, and Building Act, focusing on incorporating flood protection in primary legislation for greatest weight.

2.5 Stream, coastal and groundwater health (issues 4, 5 and 6 under NDC Schedule 2)

2.5.1 Context

Streams are a fundamental part of the stormwater system to ensure safe conveyance of water as 'natural assets' of the system. Healthy Waters work programmes aim to ensure the integrity and health of streams are maintained and enhanced. NDC's issues 5 and 6 also recognise the concept of the Ki Uta Ki Tai (mountains to sea) and the natural integration of streams with the wider coastal and groundwater environments which form the basis of our regional and catchment planning programmes.

Stream health is affected by intensification of urban areas and impervious surfaces (e.g., roofs, roads, concrete pavements), which leads to increased stormwater volumes and peak flows, and increased stream bank erosion and wash off of sediments and contaminants during rain events. Therefore, the health of the stormwater receiving environments is directly influenced by the way growth is managed and the infrastructure is built and maintained. Adoption of BPO, hydrology mitigation and water sensitive design are examples of practices applied to address those effects. Section 2.3 of the report discuss 'growth' in more detail. Healthy Waters investments in water quality improvements are funded through Water Quality Target Rate and CAPEX programme and include building infrastructure to address water pollution, investing in planning, new infrastructure, retrofitting stormwater treatment and stream erosion control to reduce sediments in urban areas.

In addition, the open nature of the stormwater systems means there are multiple third party influences, and working in collaboration to achieve good water outcomes is essential. Collaborative programmes and initiatives in place are discussed in the section below.

Regarding water quality, a consistent pattern across all contaminants and all places is not apparent in freshwater management tool (FWMT) accounting or state of the environment (SoE) reporting. Reasons for this include differences in legacy land use, new development, and differences in the receiving environment. However, both FWMT and SoE evidence demonstrate degradation of water quality across the urban areas in the Auckland region for ecosystem and human health contaminants (e.g. nutrients, faecal indicator bacteria, heavy metals, sediment). The 'current state' and monitoring and modelling results of the urban waterways are discussed in section 4 of this report.

The NDC identifies the following objective and issues for stream, coastal and groundwater health:

Objective:

Healthy and Connected Waterways that provide for te mauri o te wai: Stream, groundwater and coastal water values are maintained and enhanced and communities are connected with them – utilise streams, aquifers and harbours as integral natural components of Auckland's stormwater system while reducing the adverse effects of stormwater runoff, restoring te mauri o te wai and enhancing our community's connection with its waterways.

Issues:

- *stream health – urbanisation and poor stormwater management adversely affects Auckland's urban streams and can cause a loss of aquatic habitat and biodiversity, resulting in biological degradation and impacts on ecological functioning of streams, on the community and on the mauri of freshwater and Māori customary uses of freshwater resources*
- *coastal health – stormwater contaminants, sourced from urban land use, stream erosion and transport activities, accumulate in low energy marine environments (such as estuaries and enclosed harbours) and in some areas, occur at levels that adversely affect marine life, community, and Māori cultural values, and once diminished, affects Māori customary uses of coastal resources*
- *groundwater health – groundwater aquifers underlying urban areas can be adversely affected by land development and stormwater discharges to ground soakage.*

2.5.2 Programmes and initiatives

A range of programmes and on-the-ground initiatives are implemented by Healthy Waters to understand and manage the complex adverse effects caused by stormwater discharges in the environment.

Programmes managed by Healthy Waters to improve understanding of the region's waterways are a key planning element and are used to inform capital works business cases and priorities for improvement. These programmes include (exclusive of Auckland's SoE monitoring programme operated by RIMU):

- Watercourse Assessment programme – from a total of 233 catchments in the Auckland region, more than 100 have been surveyed, mostly in urban and future urban areas. The watercourse assessment methodology includes both infrastructure and ecological assessment, covering information such as vegetation and riparian cover, stream bank erosion, fish surveys, in-stream assets condition, identification of fish barriers as well as identification of enhancement opportunities.
- Freshwater Management Tool (FWMT) – a predictive water quality modelling tool partially complete and under development to assess contaminant and flow discharge from land activity

(including all impervious surfaces) and feasible options assessment of management strategies to maintain or improve water quality. The FWMT baseline outputs (establishing a benchmark for NDC performance) is complete (modelled, peer-reviewed, reported). Section 3.3 discusses the baseline outputs from the FWMT in more detail.

    - Currently developing the 'options assessment' (due to be completed in FY23) which will bring in predictions of future changes in water quality as a result of Auckland's growth and climate change, and identify detailed, catchment-by-catchment actions required to address water quality issues – modelling all feasible actions to identify the least-cost action plan.

- Geomorphically Effective Management Solutions (GEMS) programme – work currently underway by Healthy Waters aims to develop new tools and methods that better account for natural processes to provide more surety that stormwater mitigation measures are effectively achieving their desired outcomes of protecting/restoring/enhancing the natural capital components of the stormwater network across the entire region. These methods and tools are being developed at a range of different scales from regional models, catchment-based analyses and reach-based mitigation solutions by incorporating more direct measures of stormwater effects on stream channels using geomorphological principles under our GEMS programme. These tools and methods will be incorporated into the NDC during subsequent reviews once the scientific basis has been peer reviewed and accepted.
- Stream Erosion Modelling (part of the GEMS programme) – a region-wide bank stability erosion model which will identify high erosion risk stream reaches. The aim of this model along with watercourse assessment reports is to inform development, identifying the level of hydrological controls and instream stabilisation works required for stream protection. In turn, better specifying where and what degree of flow management is required to achieve water quality objectives linked to erosion (freshwater and coastal). A pilot study was undertaken to confirm the feasibility and the accuracy of predicting streams prone to fluvial erosion using GIS. The methodology outlined in this study tested the stability of the stream channel using the two year ARI peak flow, for the Rangitopuni, Redhills, Wayside, Awaruku, Okura and Omaru catchments. This work was completed, and further works have also been done in South Kaipara stream to identify predicted erosion hotspots.
- Hydraulic Modelling programme – a prioritised rolling programme to ensure the catchment models are up to date across the entire region, to support activities including planning and policy, development, catchment management as well as infrastructure design. The hydraulic modelling programme provides insight into predicted issues in terms of water quantity (i.e., network capacity, flood inundation and hazard information). The hydraulic models also incorporate topographical data of natural streams and rivers, and the modelled outputs are used to confirm and understand stream erosion issues.
- Safeswim – using a combination of modelling validated by monitoring, the programme publishes both current and forecasted bathing risks on the interactive Safeswim website, enabling residents and visitors to make informed decisions about swimming in their favourite locations. In addition, the Safeswim forecasts are automatically overridden if sensors at key points on the wastewater network detect unpredicted overflows, and additional beach-specific warnings are uploaded if Surf Life Saving Northern Region or the Auckland Regional Public Health Service identify other safety hazards.

Programmes led by Healthy Waters to mitigate effects for the stormwater system include:

- Capital Upgrade and Rehabilitation projects – under capital projects, opportunities are identified to generate additional outcomes and increased resilience. One example is naturalising piped streams when the pipes reach the end of their lives.
- Biodiversity Offset Bank – developed as an alternative option for developers to meet offsetting requirements. Under this programme, developers offer to pay the council to deliver the offsetting or compensation projects on public land. This will enable the council to pool funds for the delivery of stream enhancement projects, such as stream naturalising, that would not otherwise attract public funding.
- Urban Contaminant Reduction programme – to assist with improving water quality across the network, Healthy Waters has developed a suite of tools to model contaminant loads at the catchment and sub catchment level that complements the regional FWMT, but works at a finer individual project opportunity scale. These tools are being used to identify where water quality improvement opportunities may be present in our older network areas where water quality treatment was not a priority in the designs. These opportunities can be linked with initiatives like the water quality targeted rate to retrofit and/or renew existing networks with improved stormwater quality treatment functionality. The opportunities identified can also be incorporated into brownfields redevelopment options and associated stormwater management plans to improve water quality outcomes within individual catchments and achieve the greatest benefit from available funding. In summary, the urban contaminant reduction programme identifies, at a catchment scale, locations suitable for implementing stormwater treatment interventions and undertake a cost benefit options assessment to enable prioritisation for further investigation and investment. In urban areas, the focus has been on the capture of gross pollutants such as litter and contaminants from heavily trafficked roads. For example, the stormwater treatment management plan (SWTMP) for the Te Auaunga (Oakley Creek) catchment.
- Resource for Developers – to assist in the education and implementation of guidance on water sensitive design.

Programmes where Healthy Waters is working in collaboration with stakeholders include:

- Fish Passage Improvement programme – the Healthy Waters CAPEX programme focus on remediating existing fish barriers within public assets. The programme uses fish barrier data collated through the watercourse assessments and prioritises structures for remediation based on a rules-based framework.
- Project First Workstreams – water quality device, stream and coastal outfalls, stream channel, pond desilting, pond renewals and planting.
- Community Projects – Auckland Council, and in particular local boards, run a series of programmes to support communities in enhancing streams on both public and private land. This includes stream planting days at local parks, supporting Wai Care and Whitebait Connection programmes, as well as provision of grants for stream restoration, particularly in rural areas.
- WaiCare programme – water quality monitoring, education and action programme for community groups, individuals, businesses and schools across the Auckland region. More information available here.
- Private streams, supporting their enhancement and protection – most streams are located in private land, therefore Healthy Waters is working on supporting property owners who wish to

restore their streams, for instance through the publication of caring for urban streams guides as well as through local boards and other funding projects.

- Waterway Protection Fund – funded by the water quality target rate – investing to restore local waterways across the region, and to support the work of local communities. 76,982 trees have been planted across the South Auckland region to reduce contaminant run off and protect, restore or enhance our streams, waterways, wetlands and riparian margins.
- Closing the Gap programme (formally known as small site sediment compliance–) – is working to improve erosion and sediment controls on small building sites and reduce contaminant loads entering our streams and harbours. The programme is in place to monitor activities in the interim between a building consent being issued and first inspection within the building consenting process, which is considered a significant risk period for erosion and sediment discharge to occur. The targeted rate helps support employment of regional enforcement officers to visit small building sites, which are a source of sediment in waterways.
- Industrial Pollution Prevention programme – working with local boards. This programme is primarily educational and informs industry about the impacts that their activities may be having on local waterways. The programme includes a site inspection and discussion with the business owners about potential issues around pollution as well as waste minimisation techniques and spill training. The programme involves a GIS mapping exercise to ensure that businesses understand the stormwater network connections in relation to local waterways.
- Industrial Trade Activity Proactive programme – (in development) in collaboration with Regulatory Compliance, aimed at reducing the number of non-compliant industrial and trade businesses and their associated discharges of contaminants into Auckland's waterways, either directly or indirectly, by promoting sustainable management practices.
- Operation Clean Sweep: Freight Industry – the freight industry is involved in unloading, storing, and distributing raw materials used by the plastics industry. The handling of plastic pellets (often referred to as nurdles) presents a risk of accidental release into the stormwater network and waterways. In 2021, Healthy Waters embarked on a partnership project with Plastics NZ, Wilkinson Environmental Limited, and the National Road Carriers Association to understand and mitigate the threat of plastic pellet pollution from the freight industry. Eight carriers were audited, with minor to significant changes needed at each site in order to meet best practice.
- Rainwater tank initiative – assisting with AUP(OP) change to help remove unnecessarily restrictive resource consent requirements that might prevent or deter people installing residential rainwater tanks.
- Central Library Living Roof – council recently installed an extensive living roof top layer on the Central City partnering with Ngāti Whātua Ōrākei.

2.5.3 Performance against the targets

Overall Healthy Waters is meeting the targets associated with stream, coastal and groundwater health related to collaboration. Programmes are in place to collaborate with third parties, as this is a vital component of improving water quality and ecosystem health outcomes. This includes targets 4(h-l), 5(f-g) and 6(d-f).

In relation to the objective (healthy and connected waterways that provide for te mauri o te wai), there are significant influences, particularly related to growth, regulations and land-use directions that are outside Healthy Waters direct control on achieving this objective.

Targets in relation to fish passage remediation and some of the operational activities (e.g., contaminants removed from catchpits) have not been met over the last years due to Covid-19 related budget reductions for these programmes. This includes targets 4(a) and 5(a-b).

Target 4(b) "The ratio of the length of watercourse consented to be physically improved versus physically degraded in each year", was not reported on. Although this matter is important to maintaining and enhancing stream health, this target is outside of Healthy Waters control to implement and has been removed from the LTP as a performance indicator.

Further work is needed for target 4(d), as a case study assessment of possible interventions in private streams has not been complete yet. It is recommended this work is progressed.

Target 4(e) refers to the implementation of the '*Green Infrastructure Policy for Heathy Waters*', known as GINA. Although, the principles of the document are embedded in Healthy Waters practices, this specific document is not regularly being referred to. It is recommended to change the document reference to align with current practices. This and similar policies will likely change as a result of Three Waters reform. Review of the policy and the target should be deferred until that time.

Targets 4(g) and 5(d) refer to the FWMT development which is underway.

2.5.4 Key points and recommendations

In order to maintain and improve stream health, Healthy Waters has programmes in place to assess and understand the region's waterways, mitigate the effects of the stormwater system, and collaborate with stakeholders. Work towards improved water outcomes is embedded throughout the department's processes, including planning, prioritisation, capital programmes and operation and maintenance.

The evaluation of the quality and health of receiving environments and monitoring programmes and related recommendations are covered in section 3 of this report.

The health of receiving environments is directly influenced by the way growth is managed and the infrastructure is built and maintained. Implementation of recommendations in other sections will influence the health of receiving environments and go towards achieving the outcome of healthy connected waterways which provide for Te Mauri o te Wai.

Table 8 Recommendations, future actions and programmes related to stream, coastal and groundwater health.

Reference	Recommendation and future actions
Stream Health 1	Continue implementation of the programmes and initiatives currently in place.
Stream Health 2	Continue development and improvement of the Freshwater Management Tool for decision support to prioritise interventions for contaminant management as well as to assess level of benefits in water quality from works completed.
Stream Health 3	Scope stream rehabilitation pilots for selected private streams known to have significant erosion issues, in recognition that such streams provide an important public service in terms of stormwater conveyance. (in line with target 4(d)), noting that the responsibility for caring for urban streams may change following three waters reform.

Reference	Recommendation and future actions
Stream Health 4	Review current practices to assess alignment with Green Infrastructure Policy for Heathy Waters' (GINA), noting that further change may be required following the three waters reform.
Stream Health 5 Schedule 2 Amendments	Proposed amendments to Schedule 2 targets • Remove target 4(b) – "The ratio of the length of watercourse consented to be physically improved versus physically degraded in each year", as although this matter is important to maintaining and enhancing stream health, this target is outside of Healthy Waters control to implement and has been removed from the LTP as a performance indicator. • Reword target 4(f) – "Incorporate the Mauri model into Healthy Waters' capital delivery project assessments", to reflect new Māori Outcomes framework. Other minor proposed changes to reflect works completed to date are detailed in Appendix 1 – Schedule 2 assessment.
Monitoring 1	Review of the Monitoring Strategy to better establish how the programmes are evaluated. See section 3.4
Monitoring 2-5	Additional environmental monitoring. See section 3.4

2.6 Effects on wastewater system (Issue 7 under NDC Schedule 2)

2.6.1 Context

The wastewater network, including areas with combined wastewater and stormwater networks, have separate network discharge consents, held by Watercare Services Limited (Watercare). However, on many occasions there are overlaps and working in collaboration with Watercare for improved outcomes is essential.

The main programmes managed by Healthy Waters related to identifying public health risks related to faecal contamination of our waters are Safeswim and Safe Networks. In addition, collaboration with Watercare on the Western Isthmus and Eastern Isthmus water quality projects is ongoing.

2.6.2 Safeswim

In 2017, Auckland Council relaunched its Safeswim programme by introducing new way of generating, analysing and communicating risks of swimming at Auckland's beaches and waterways. Using a combination of modelling validated by monitoring, the revised programme publishes both current and forecasted bathing risks on the interactive Safeswim website, enabling residents and visitors to make informed decisions about swimming in their favourite locations.

The website covers 119 swimming spots, of which 10 are freshwater lakes and streams. New sites, including many additional freshwater sites, will be added as validation monitoring is completed over the coming years.

2.6.3 Safe networks

The safe networks programme investigates and fixes network issues that contribute to poor water quality that can pose risks to public health. Where contaminants are found, indicating the presence of wastewater,

the team will investigate and track discharges to their point of origin then eliminate the discharge if possible or in some cases, develop solutions if problems are more complex.

Investigation methods include water quality sampling, CCTV, smoke testing and dye testing. Last year the safe networks team screened 86 stormwater outlets across 19 beaches and progressed a further seven network screening investigations. Private property investigations were conducted at 2850 properties to inspect drainage and about 4km of public stormwater networks were inspected using CCTV. Private drainage issues were referred to the compliance team, with 33 issues resolved. The compliance team will continue working with property owners on any remaining private drainage issues.

Titirangi is one example of the success of this programme with the long-term warning being removed from this Safeswim site in December 2021. The safe networks team carried out investigations including initial screening at stormwater outlets, followed by further explorations upstream of the outlets to narrow down the potential sources of the issues and enable targeted inspections in the appropriate part of the stormwater and wastewater networks. The safe network investigations identified 22 public and private drainage issues across the Titirangi catchment which were potentially contributing to poor water quality. Most of these issues have now been resolved, leading to a measurable improvement in the water quality at the beach and reducing the risk to public health when swimming at this beach.

2.6.4 Western isthmus water quality project

This is a major infrastructure programme that will significantly reduce wastewater overflows into the Waitematā Harbour and reduce stormwater volumes going into the Manukau Harbour. Several major infrastructure projects have been completed since the beginning of the programme, with 3,700+ properties now being serviced by upgraded networks, significantly reducing overflows into the inner-city harbour.

Works include:

- St Marys Bay area water quality improvement project – the new 1km stormwater pipeline installed underground between London and New Streets, St Marys Park and Pt Erin is now collecting stormwater flow, screening, and discharging well away from the shore via a 600m long outfall pipe. The project is reducing wet weather overflows from 100% to only 20%
- Ōkahu Bay stormwater and wastewater separation project – 200 private properties are having their drainage systems separated to connect to 3.4km of newly installed public stormwater pipeline. Water quality has been poor in the Ōkahu Bay catchment, and the project will significantly reduce wet weather overflows into the bay
- Freemans Bay stormwater separation project – the major works to improve water quality in the Waitematā Harbour as part of the Freemans Bay stormwater project were completed in autumn 2021. A tunnel for the new stormwater pipeline is in place under Picton Street, with additional tunnelling on Wellington Street, Hepburn Street and Anglesea Street. Drainage connecting private properties to the new public stormwater system was also installed.

2.6.5 Performance against the targets

Targets related to wastewater are being met. Two of the targets refer to ongoing collaboration with Watercare to identify infiltration issues and solutions to reduce overflows, which are being funded through the water quality targeted rate. The strategy for investigation and management of cross contamination has

been developed by the safe networks programme. No changes are recommended to the targets for this issue.

2.6.7 Key points and recommendations

Wastewater overflows and impacts on the environment are a key concern for Auckland residents as raised by local boards and iwi. The wastewater and combined networks are the responsibility of Watercare and are outside the scope of the Regionwide Stormwater Network Discharge Consent. However these networks interact through cross connections. Therefore, Healthy Waters and Watercare are successfully collaborating on investigation and improvement programmes such as Safe Networks to work towards reducing these effects.

No changes are recommended as a result of this review.

2.7 Collaborative outcomes (Issue 8 under NDC Schedule 2)

2.7.1 Context

Collaborative outcomes reflect Healthy Waters' strategic direction and obligation to meaningful work together with mana whenua and maataawaka to improve the mauri of the region's waterways. It also recognises that because stormwater is an open system predominantly owned by others, Healthy Waters must work with the community and other infrastructure providers for improved outcomes.

As stormwater flows do not recognise property boundaries nor the ownership of stormwater networks, Healthy Waters must work closely with other local and central government agencies to achieve improved water outcomes. These agencies include Ports of Auckland, Auckland Council Closed Landfills Team, Kainga Ora, Watercare, Auckland Transport, Waka Kotahi, and Kiwirail.

The objective sought in relation to collaborative outcomes under Schedule 2 of the NDC is:

Stakeholders are engaged to achieve the best stormwater outcomes including for te mauri o te wai for present and future generations.

2.7.2 Mana whenua collaboration

The mana whenua engagement strategy is implemented through regular engagement and a continuous improvement approach. This approach provides the feedback necessary from mana whenua to ensure the strategy addresses the key challenges experienced by the partners over the length of the consent.

Developed in conjunction with mana whenua, the engagement strategy outlines Healthy Waters engagement and partnering objectives as well as channels (figure 18), tools and opportunities to engage on areas of implementation of the network discharge consent and to support mana whenua involvement in the department's work. It identifies key focus areas to improve the relationship and the future initiatives that need to be scoped and implemented to work towards genuine partnerships.

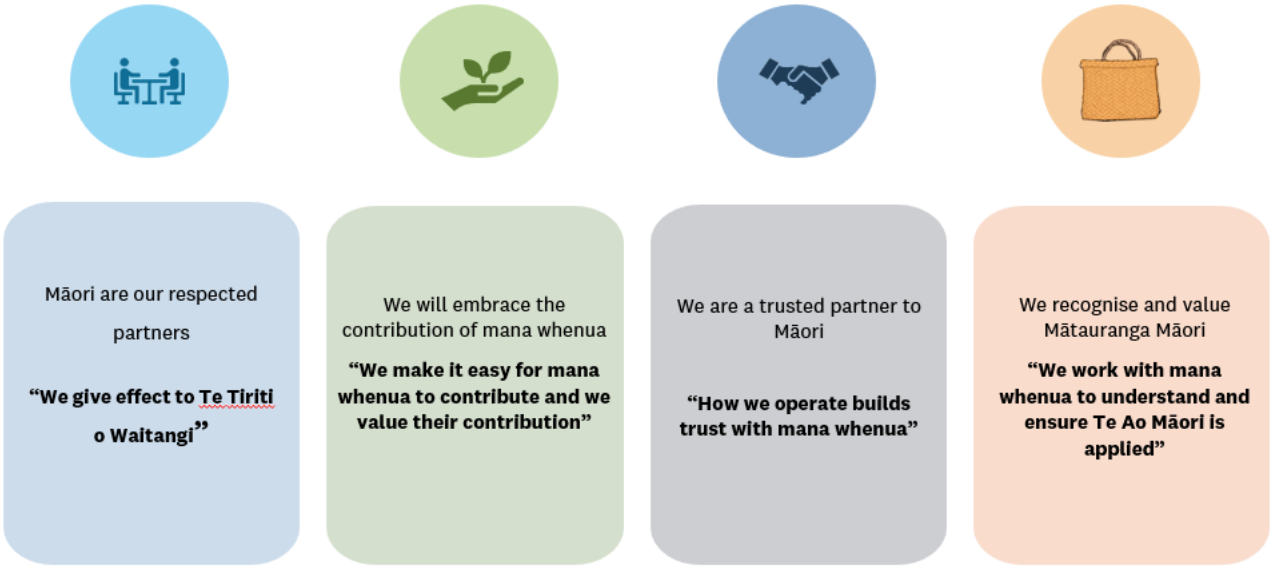


Figure 18. Collaboration channels established within the mana whenua engagement strategy.

2.7.3 Māori outcomes

Auckland Council's Kia Ora Tāmaki Makaurau Framework

The Auckland Council developed Kia Ora Tāmaki Makaurau to respond more effectively to the needs and aspirations of mana whenua and Māori communities. The journey to develop this framework began in 2015 in response to a Treaty of Waitangi Audit recommendation. The document was formally adopted in 2021 and has since been embedded in the council's organisational strategy.

The framework has a strong focus on delivering outcomes for Māori in Tāmaki Makaurau and was developed with mana whenua and Māori communities. It aims to reflect te ao Māori, whilst being informed by mātauranga Māori and Māori centric. It is the first framework that brings together:

- Māori aspirations
- Auckland Council's contribution towards achieving those aspirations
- Performance measurement of our mahi
- Linkages to key plans and budgets created by the Auckland Council.

Under this document, 10 strategic priorities (figure 19) were set to advance Māori identity and well-being. Kia Ora Tāmaki Makaurau aligns these strategic priorities with 10 mana outcomes. These are the outcomes that Māori identified as mattering most to them. The framework provides practical guidance for our staff to improve Māori outcomes. It identifies focus areas where the council can best influence and support. It also provides measures to ensure consistent delivery.

Figure 19. Strategic priorities in Kia Ora Tāmaki Makaurau framework.

Kei hea to Kōmako – where will the bellbird sing? (2022)

Kei hea to Kōmako – where will the bellbird sing? (2022) is the overarching Māori outcomes plan for the Infrastructure and Environmental Services division which Healthy Waters operates within. The newly revised plan is directed by Kia Ora Tāmaki Makaurau – Auckland Council's Māori Outcomes Performance Measurement Framework (2020).

To enhance the wellbeing of mana whenua and Māori communities Healthy Waters aim to do the following:

Kei Hea Te Kōmako Achieving Māori Outcomes Plan 2022	We value the importance of Mana Whenua enacting their katiakitanga responsibiilties to enhance the mauri of te taiao oo Tāmaki Makaurau-waterways and treasured environments
	We will work collboratively with Mana Whenua to contribute to kaitiakitanga aspirations and outcomes
	We will support kaupapa Māori and Mataawaka led intiiatives that contribute to Māori environmental outcomes
	We will contribute to Māori economic and employment aspirations through project procurement processes and increasing participation in funding workshops and grant processes
	We understand our Te Tiriti obligfations and can integrate and achuieve these things in the mahi we do
	We have the capability and capacity to meet Māori engagement obligations and Māori outcomes through Māori leadership and Māori specialist roles

Te Taunga

To build on and effectively operationalise the strategic intent from Kei Hea Te Kōmaki Achieving Māori Outcomes Plan (2022) and the Mana Whenua Engagement Strategy (2020) Healthy Waters have developed and initiated Te Taunga, a pipeline process to:

- connect people and projects across the kaupapa, across the directorate
- share ideas/learning/issues to resolve
- develop consistent guidance/advice for colleagues
- develop a toolkit so that others navigating/working in this space have a foundation to work from – consistent development approaches.

This approach focuses on shifting the value to the needs of Māori Outcomes specialists who provide a Māori lens to how things should be done. As a result, Healthy Waters understands how they can better serve Auckland's Māori communities, creating genuine partnership with mana whenua and enhancing relationships with Māori communities and organisations to achieve shared outcomes.

2.7.4 Collaboration with other agencies

Healthy Waters leads a range of programmes and on-the–ground initiatives to achieve the required network management outcomes.

The detailed list of programmes is found in the monitoring strategy (appendix 5).

Critical to this collaboration is the development of relationship agreements that set out roles and responsibilities as well as outcomes sought. Examples include:

- the development / update of a Three Waters Ways of Working framework with Kainga Ora. On the ground, this means more opportunities for collaborating with Kainga Ora to deliver catchment management plans, flood modelling packages and projects such as Freeland Reserve and other shovel ready projects
- a service level agreement with Auckland Transport that primarily covers maintenance and operational roles and responsibilities, as well as supporting collaborative working partnerships and issues identification. This includes design initiatives such as the Stockholm tree pit concept, as well as precinct development upgrades
- close collaboration with Watercare on the delivery projects reducing wastewater entering the region's waterways, such as the Central Interceptor, Western Isthmus water quality improvement project and safe networks.

Table 9 Examples of collaboration projects.

Project Name	Description
Ports of Auckland Outfall Upgrade	Construction of a 3.3m diameter stormwater pipe from the south side of Quay Street across Ports of Auckland to the Waitemata Harbour, to replace a pipeline in poor condition $35M FY–9 – FY23
Auckland Closed Landfills Team Waitaro Stream, Corban Reserve Culvert	Construction of a new pipeline to divert flows away from the existing Corban Reserve landfill culvert to the Opanuku stream. This will improve flooding issues and minimise leachate and gas infiltration into the existing cracked culvert which will be retired from stormwater purposes. The project will also include relining downstream corrugated pipework which is in poor condition. $22 M FY16 FY23
Auckland Transport Wolverton Street Culverts 1 & 2 Renewal and Upgrade	This is an Auckland Transport project which Healthy Waters is contributing to. Auckland Transport need to renew the culverts urgently and new culverts will be constructed to provide increased stormwater flow capacity. $13M FY19 FY21
Waka Kotahi Southern Motorway upgrade (Culvert upgrades)	To reduce stormwater inflows to the combined sewer network, overflows and contamination in the Waitematā Harbour by separating the stormwater and wastewater network. This project will also construct a significant stormwater network connection at Wellington Street which will provide the stormwater network connection for the wider catchment area. $19M FY19 FY21
Watercare 1) Picton Street 1-27	1) To reduce stormwater inflows to the combined sewer network, overflows and contamination in the Waitemata Harbour by separating the stormwater and wastewater network. This project will also construct a significant stormwater

Project Name	Description
2) Okahu Bay Stormwater Separation	network connection at Wellington Street which will provide the stormwater network connection for the wider catchment area. $19M FY19 FY21 2) To undertake stormwater separation to resolve combined sewer issues and provide network renewal and to resolve flooding as necessary, to provide growth capacity in the catchment. $16M FY2019 FY21
Watercare Joint climate action plan	Healthy Waters collaborated with Watercare in 2022 to develop a joint climate action plan with the purpose of delivering a low carbon, climate resilient water system for Tāmaki Makaurau. See section 4.4.4
Eke Panuku Development Auckland 1) Daldy Street 2) CPT Ecobank: Rawiri Stream Restoration	1) The key objectives that are being sought from this initiative is to mitigate the dark plume and odours from negatively impacting on the receiving environment in the Wynyard Basin. This includes: • Improving dispersion of discharge to improve water quality and reduce negative impacts on the nearby Safeswim site. • Improving the amenity of the Wynyard Basin area for the benefit of both local and international visitors. $32M FY19 FY20 2) Create an accessway for maintenance of the stream. Enhancement of ecological values and amenity for local residents. Create a buffer between residential and industrial areas. Create a connection between the residential area and main transportation network. Honor Council obligations to the four developments. Recover the cost of this project from those projects or developments that are required to provide offset mitigation. $29M FY20 FY21
Kainga Ora 1) CPT AHP: Tonar St, Hillcrest 2) CPT AHP: Freeland Reserve	1. As per the asset management plan, critical assets with identified structural condition grade five (fail) are repaired or renewed within 24 months of identification. The Healthy Waters planning team undertook a CCTV inspection for stormwater network in Northcote in supportive to Northcote Development in 2016. The CCTV results indicate that the stormwater pipelines starting from 37 Fraser Avenue to stormwater outfall in Hillcrest Stream have poor condition with a number of major defects. This involves abandoning the current pipes and installing a new 2.1 metre pipe along a new alignment. $2M FY20 FY22 2. To manage stormwater run-off from new developments and minimise flood risk to downstream properties via a single council-owned asset developed in collaboration with Homes. Land. Community. Known as HLC (a wholly owned subsidiary of Housing New Zealand). $2M FY20 FY22
Community Facilities CPT AHP: Taniwha Reserve Communal Detention Wetland	Enable growth through the provision of the required stormwater detention under the SMAF2 framework Improve water quality and reduce bank erosion downstream on Omaru Creek $2M FY22 FY22

2.7.5 Working with Communities

Healthy Waters collaborates and engages with communities and local boards in a range of initiatives. Examples include community projects for enhancing streams on both public and private land. This includes stream planting days at local parks, supporting Wai Care and Whitebait Connection programmes, as well as provision of grants for stream restoration, particularly in rural areas. Another example is the Industrial Pollution Prevention programme with education focus when engaging with business owners. Refer to Monitoring Strategy for further information.

2.7.6 Performance against the targets

The majority of the targets in this section are being met however there are some that are not measured due to changes in processes and direction. In particular targets in relation to mana whenua participation need to be updated to reflect new ways of working and māori outcomes programmes currently in place.

a) Proportion of mana whenua that are satisfied with Auckland Council's engagement with iwi in relation to stormwater projects: 10/19 or more (LTP)

b) Percentage of projects that contribute to Maori outcomes: at least 95% (AMP)

Stream Health 4 f) Incorporate the Mauri model[1] into Healthy Waters' capital delivery project assessments – model developed, ongoing implementation for all significant projects (DC, Co)

The wording of the amendments to these targets will need to be decided in partnership with mana whenua to ensure that they are appropriate.

2.7.7 Key points and recommendations

A refresh of the mana whenua engagement strategy is needed to reflect new Healthy Waters programmes including the Te Taunga framework and the Māori Outcomes plan: *Kei Hea Te kōmako* as we continue to meet the principles set out in the strategy.

Work is underway to develop a range of initiatives and also address matters identified by iwi through an ongoing collaborative partnership across the Healthy Waters work programme.

More resourcing is needed to implement initiatives supporting Te Mauri O te Wai. This includes improved access to information and independent specialists, and the ongoing learning and development of council and mana whenua representatives.

Table 10 Recommendations, future actions and programmes related to collaborative outcomes.

Reference	Recommendation and future actions
Collaboration 1	Work with local board advisory team to • provide briefing back to local boards at the start of the new term. This will include Healthy Waters projects in their area, key issues in their area, monitoring and other data held by Healthy Waters about their area as well as how Local Boards can advocate for Healthy Waters work and get their communities involved. • ensure that updates about progress on projects of interest to local boards are provided at appropriate times.
Collaboration 2	Improve and continue to work closely with council departments and boarder Council family including Watercare and Auckland Transport.
Collaboration 3 Schedule 2 Amendments	Proposed amendments to Schedule 2 targets: • Amendments are needed to targets 4 f), 8 a), 8b) to ensure that these targets related to māori outcomes and collaboration with mana whenua reflect current programmes and approaches. Targets to be reworded following further engagement. • Remove 8c) as this is a direct duplicate of growth 2 d)
Mana whenua 1	Work together with mana whenua to reword targets recommended to be updated (Collaboration 3).
Mana whenua 2	Update the NDC mana whenua engagement strategy to reflect Te Taunga and other recent initiatives.
Mana whenua 3	Continue to work with mana whenua to scope and co-develop initiatives. This may include: • Resourcing a body of mātauranga knowledge that is led and held by mana whenua that is then used to inform and direct Healthy Waters programmes and initiatives • Resourcing independent specialists to support iwi • Supporting and resourcing Iwi led cultural monitoring and kaitiakitanga initiatives • Access and auditing of information and data • GIS based knowledge portal and engagement tools
Mana whenua 4	Work with mana whenua in relation to central government policy & reforms, Unitary Plan Changes, hearings and Stormwater Management Plans, exploring opportunities to share catchment information and guidance with one another in order to align inputs into policy and plans.
Mana whenua 5	Healthy Waters staff to work with mana whenua to understand and support the implementation of Te Mauri o te Wai
Māori outcomes 1	Council staff to understand Te Tiriti o Waitangi and the practical use of Treaty settlements and statutory acknowledgements in the catchments and cultural protocols.

2.8 Healthy Waters Projects

2.8.1 Capital Projects

Healthy Waters undertakes capital projects across the region to improve the performance and resilience of the stormwater network and the health of receiving environments. We track and record all projects through Auckland Council's Sentient database. A selection of these is shown in Figure 8 in section 2.1.

Each project is developed through the Auckland Council Investment Delivery Framework. By tracking progress, we ensure that all projects are aligned with the wider council priorities. During all project making decisions, the drivers and benefits are identified to ensure that they align with the overarching objectives and outcomes of the NDC. Healthy Waters recently adapted the internal framework into a 'Project First' model, where iwi, consultants, designers, and contractors are brought into Healthy Waters CAPEX delivery programmes right from the start for an extended period. This aims to achieve better efficiency by having all

partners involved on the same table right from the beginning, working on similar projects within a programme.

The planning assessment for all projects includes checks against the relevant section of Schedule 4. including completing of the assessment of changes to catchment discharges.

Every project Healthy Waters undertakes has a single primary driver identified, such as: renewals, growth, flood prevention and water quality improvement. Individual projects may also address several additional drivers: Between July 2017 and July 2022, 405 projects are planned, being designed, under construction or have been completed, which includes:

- renewal: renewing assets to prevent or mitigate asset failure. Renewal may be targeted proactively (to prevent failure of critical assets) or managed reactively (to replace non-critical assets which have run to failure). Asset renewal does not fundamentally alter flood risk profiles unless asset capacity is upgraded. Renewal projects are funded by asset depreciation recovered through general rates
- growth: creating or upgrading stormwater infrastructure to enable new greenfield development and brownfield redevelopment to occur, consistent with Auckland's development strategy. Infrastructure created to enable growth or redevelopment establishes the baseline level of risk for the future development. It may be built directly by council or delivered by developers and subsequently vested in council. Growth projects are funded by development contributions
- flooding: resolving flooding issues affecting existing developed areas, where these issues cannot be resolved through maintenance and are judged to be "council responsibility". The primary objective of flood protection projects is to reduce existing flood risk. Flooding projects are funded through general rates
- water quality improvement and environmental: improving water quality and environmental outcomes. These include environmental restoration initiatives, urban and rural stream rehabilitation, contaminant reduction, and water quality improvements. Environmental improvement projects do not fundamentally alter flood risk profiles unless they alter the flow

profiles and capacity of natural channels or overland flow paths. Some water quality improvement projects are funded through the water quality targeted rate, introduced in 2018.

The full register of projects completed or underway is in appendix 9. Each project is often driven by multiple factors, with a range of benefits that we record and track. For instance, across the capital projects completed or underway, there are at least:

- 70 projects that increased asset life
- 50 projects that reduced flooding
- 40 projects that improved ecosystem health
- 50 projects that enabled growth and development
- 30 projects that improved public safety of our assets, including 10 identified as urgent/emergency
- 10 projects that enhanced local amenity and aesthetics
- 15 projects that reduced wastewater contamination in our waterways

More detailed analysis of the benefits of projects undertaken by Healthy Waters is underway and will be reported in future. Healthy Waters has another 260 projects being scoped or planned with the aim of achieving at least one, and frequently several of the above outcomes.

2.8.2 Projects Supporting Community and Local Boards

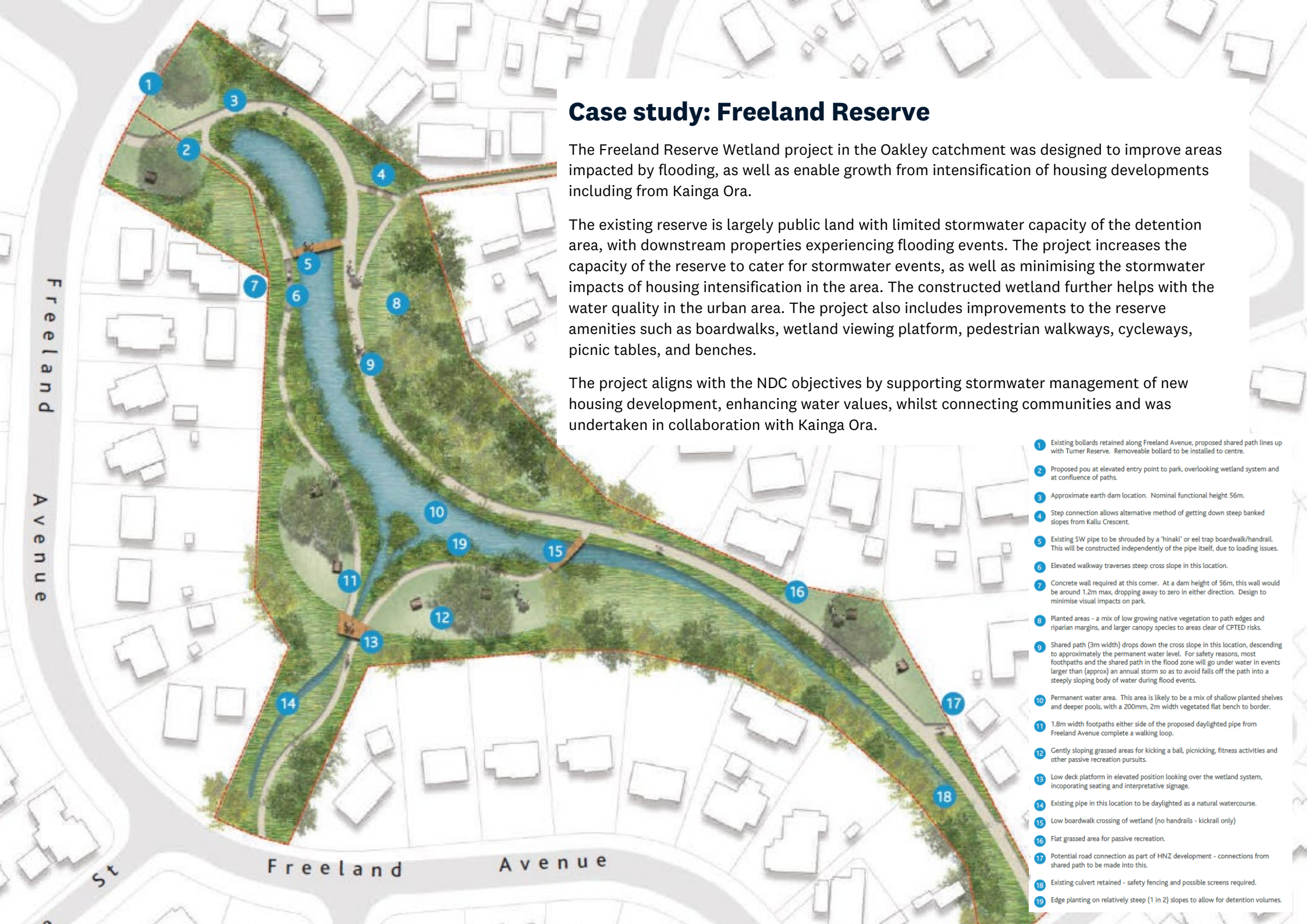
In addition to capital projects, Healthy Waters also supports the delivery of local boards projects, as well as projects run by community organisations. These projects typically focus on community planting and restoration, water sampling and education. They also include supporting local marae. A full register of the 43 projects completed or underway is included in appendix 9.

Case study: Freeland Reserve

The Freeland Reserve Wetland project in the Oakley catchment was designed to improve areas impacted by flooding, as well as enable growth from intensification of housing developments including from Kainga Ora.

The existing reserve is largely public land with limited stormwater capacity of the detention area, with downstream properties experiencing flooding events. The project increases the capacity of the reserve to cater for stormwater events, as well as minimising the stormwater impacts of housing intensification in the area. The constructed wetland further helps with the water quality in the urban area. The project also includes improvements to the reserve amenities such as boardwalks, wetland viewing platform, pedestrian walkways, cycleways, picnic tables, and benches.

The project aligns with the NDC objectives by supporting stormwater management of new housing development, enhancing water values, whilst connecting communities and was undertaken in collaboration with Kainga Ora.



1. Existing bollards retained along Freeland Avenue, proposed shared path lines up with Turner Reserve. Removeable bollard to be installed to centre.
2. Proposed pou at elevated entry point to park, overlooking wetland system and at confluence of paths.
3. Approximate earth dam location. Nominal functional height 56m.
4. Step connection allows alternative method of getting down steep banked slopes from Kallu Crescent.
5. Existing SW pipe to be shrouded by a 'hinaki' or eel trap boardwalk/handrail. This will be constructed independently of the pipe itself, due to loading issues.
6. Elevated walkway traverses steep cross slope in this location.
7. Concrete wall required at this corner. At a dam height of 56m, this wall would be around 1.2m max, dropping away to zero in either direction. Design to minimise visual impacts on park.
8. Planted areas - a mix of low growing native vegetation to path edges and riparian margins, and larger canopy species to areas clear of CPTED risks.
9. Shared path (3m width) drops down the cross slope in this location, descending to approximately the permanent water level. For safety reasons, most foothpaths and the shared path in the flood zone will go under water in events larger than (approx) an annual storm so as to avoid falls off the path into a steeply sloping body of water during flood events.
10. Permanent water area. This area is likely to be a mix of shallow planted shelves and deeper pools, with a 200mm, 2m width vegetated flat bench to border.
11. 1.8m width footpaths either side of the proposed daylighted pipe from Freeland Avenue complete a walking loop.
12. Gently sloping grassed areas for kicking a ball, picnicking, fitness activities and other passive recreation pursuits.
13. Low deck platform in elevated position looking over the wetland system, incoporating seating and interpretative signage.
14. Existing pipe in this location to be daylighted as a natural watercourse.
15. Low boardwalk crossing of wetland (no handrails - kickrail only)
16. Flat grassed area for passive recreation.
17. Potential road connection as part of HNZ development - connections from shared path to be made into this.
18. Existing culvert retained - safety fencing and possible screens required.
19. Edge planting on relatively steep (1 in 2) slopes to allow for detention volumes.

3. Evaluating the health of Auckland's urban waterways

3.1 Overview – Council programmes in place to assess water quality and stream health

Condition 25(c) of the NDC requires a summary of the information from the Stormwater Monitoring Strategy, including analysis of data, comparison against recognised guidelines (including those in the NPS-FM), associated trends of relevance to the stormwater network and the implication of these. The Monitoring Strategy was certified in July 2022 and is included in appendix 5, it includes a range of information as described in section 1.3.4.

This section provides an overview of the monitoring and modelling based assessments available for water quality and stream health for the Auckland regions. These assessments currently include:

- The State of Environment (SOE) monitoring for streams, coastal areas, and groundwater
- The findings of Freshwater Management Tool (FWMT)

Each of these are described below together with the latest available data.

It should be noted that the environmental information generated by both these programmes currently pre-dates the issue of the consent. Therefore, the data presented below could be used a baseline from which to gauge the performance of the NDC moving forward. However, any such evaluation must recognise the following limitations:

- Assessing the effect that urban stormwater discharges have on the environment is a complex task. A large number of urban activities and land uses contribute to the generation of stormwater and the contaminants in it. Effects on the environment are cumulative and may take some time before they are measurable. Therefore, when assessing effects of stormwater discharges, consideration must be given to legacy issues and interventions, as well as new development and water improvement initiatives.
- This is called hysteresis; i.e delayed responses to ongoing and new land use changes and interventions. There can be considerable time lags between the adoption of management practices and the detection of improvement in water quality and stream health, which is associated with the time it takes for a practice to be adopted, the time for that practice to produce an effect, and the time for rivers or coastal waters to respond to that effect. Differences in these processes for different water quality variables can range from years to decades. Long-term monitoring may also show a changing response with climate change.

As a result, a single information source cannot provide a comprehensive view of the effects in the environment and therefore there is a need to rely on a range of information and data sources. For instance, SoE monitoring provides useful information on trends, however it is limited on assessing the effects of stormwater discharges, as it assesses the regional effects from a myriad of additional factors and source of contaminants, including rural, industrial, boats marinas and other point source discharges.

Incorporating modelling as well as working with mana whenua mātauranga Māori cultural indicators will provide a more comprehensive understanding of the environment. The freshwater management tool will be

a key tool to support decision-making and prioritisation of interventions; thus, an important component to inform the performance of implementing and managing the NDC, recognising, like any other model, the tool will need ongoing field sampling and targeted monitoring for continuous improvement.

With respect to Mātauranga Māori cultural indicators, this must be developed, delivered, and maintained by local iwi and marae. The aspiration of Healthy Waters is to enable mātauranga Māori specialists to support this work and recognise that the ownership of this works sits with the iwi and marae. Past and current projects include Oruarangi awa, Hoteo Stream, Mahurangi and Manukau Harbour, which reflect Healthy Waters commitment to incorporate mātauranga Māori in the programmes.

It is noted that other forms of monitoring and assessment are also occurring within the region, most notably citizen science monitoring, such as WaiCare. At this time, the information generated these monitoring frameworks is not included in this review, mainly because how best to meaningfully bring in the findings of these programmes into the evaluation of the NDC is still being explored.

It is also acknowledged that target monitoring programmes need to be developed to assess specifically stormwater discharges effects. These include:

- intervention effectiveness monitoring including stormwater device performance, water sensitive design implementation and impacts of interventions on the receiving environment (as required by condition 37). Therefore, there is a need to establish a monitoring sampling programme in urban areas (e.g., catchment areas with conventional stormwater infrastructure compared to catchments using water sensitive principles) to assess the impacts of the stormwater network in the environment and assess the effectiveness of water sensitive design
- monitoring of the implementation of adopted stormwater management plans which may include stormwater device monitoring as part of intervention effectiveness monitoring (as required by NDC permit, condition 37)
- expanded targeted monitoring of a broader suite of contaminants such as sediment, emerging contaminants, gross pollutants and plastics (as required by NDC permit, condition 37)

One of the key recommendations of the review is therefore the ongoing development of the assessment frameworks discussed above, as well as others that may be identified over time.

3.2 Monitoring data – state of the environment (SoE)

Auckland Council (RIMU) operates a long-term, region-wide coastal, estuarine, groundwater, and freshwater water quality and river ecology monitoring programme, the findings of which are published on the Knowledge Auckland website.

The state of the environment monitoring is designed to collect water quality information over five years or more for the purpose of identifying broader regional patterns and long-term trends. The programmes collect discrete environmental state information at regular intervals that represents the receiving environment at a point in time and in response to often multiple sources of contaminants and other environmental stressors.

As a result, and as discussed above, the purpose of the SoE means it has limitations in assessing short-term stormwater network discharge performance. Despite this, SoE data is valuable to the NDC for:

- informing model-based accounting frameworks such as the FWMT (e.g. calibration-validation purposes)

- informing trend analysis (e.g. tracking changes over long-term [decadal] timeframes in effects of growth, climate change and/or managed interventions)

For the purposes of this review, SoE long-term trends for 2010-2019 as available at Knowledge Auckland are noted. In particular, the following are reviewed:

- summary of changes in land cover (in particular areas of increased urban development)
- river ecology: grades and trends at 32 urban sites for macroinvertebrate community index (MCI) and stream ecological valuation (SEV)
- river water quality: grades and trends at 11 urban sites for *E.coli,* turbidity, soluble copper and soluble zinc
- coastal and estuary health
- groundwater quality

The below sections provide a summary of the key finding related to urban areas only. It is important to recognize the information and data needs to be carefully considered due to multiple factors. This includes, but not limited to: changing of monitoring sites over years, different sites (location and quantity) monitored under each SoE programme and changing of analytical methods and reporting. For a full assessment, considerations and limitations, refer to the respective SoE reports, which are available at Knowledge Auckland.

3.2.1 Summary of changes in land cover

This section has been extracted from the report "Coastal and estuarine water quality state and trends in Tāmaki Makaurau / Auckland 2010-2019". Across the Auckland region, the overall proportion of land cover (based on LCDB 5.0 only - Land Cover Database version 5.0 Landcare Research New Zealand Ltd.) has been relatively consistent over the trend analysis period of summer 2008/09-2018/19. The greatest changes in the last 11 years were associated with urban growth in the Hibiscus Coast, Waitematā, and Tāmaki watersheds (table 11). These include the major urban developments of Orewa and Silverdale (Hibiscus Coast), Flat Bush and Highbrook (Tāmaki), and Hobsonville and Albany in the upper Waitematā.

Table 11 Summary of changes in urban land cover within each major watershed over the 10-year period. (source: "Coastal and estuarine water quality state and trends in Tāmaki Makaurau / Auckland 2010-2019")

Watershed	**Percentage of watershed with urban land cover**	
	2008	**2018**
Islands	2.0%	2.0%
North East	1.9%	1.9%
Mahurangi	4.6%	5.1%
Hibiscus Coast	**22.0%**	**25.4%**
Waitematā	**48.6%**	**49.9%**
Tāmaki	**52.2%**	**55.0%**
Wairoa	0.3%	0.3%
Manukau Harbour	15.6%	16.3%
Kaipara	0.7%	0.8%

In addition, report TR2021/07 (“River Water Quality State and Trends in Tāmaki Makaurau/Auckland 2010-2”19") indicates that: The greatest changes in land cover over this time period were associated with urban growth in the upstream catchments of Otara Creek East (Flat Bush), Omaru Creek (Tamaki), and Vaughan Stream (Long Bay) At Otara Creek East the percentage of urban land cover in the catchment increased from 31 per cent to 47 per cent, while the Vaughan Stream catchment more than doubled in urban land cover from 6 per cent to 13 per cent. Stage 1 of the Flat Bush Structure Plan was released in 2001, and staged development has continued over the period assessed. Construction commenced in 2012 at Long Bay. The Omaru Creek catchment was already highly urbanised but further increased over the last 11 years. Lucas Creek also saw a small increase in urban area.”

3.2.2 Water quality and stream health

River Ecology

The latest state of the environment reporting (TR2021/05) “River Ecology State and Trends in Tāmaki Makaurau/Auckland 2010-2019" reports on macroinvertebrate communities and stream ecological valuation (SEV) assessments. Summary of findings related to urban waterways are presented in table 12

The report reveals decline in river ecology resulting from increased land cover modification and intensification, influenced by in channelization and loss of riparian margin.

Table 12 Summary of findings for river ecology on urban streams from the TR2021/05 state of the environment reporting.

River Ecology State and Trends in Tāmaki Makaurau/Auckland 2010-2019. (TR2021/05).	
Indicator	**Results for 32 urban sites (comprised of greater than seven per cent urban land cover). However, analysis of trends had fewer sites with sufficient data.**
MCI (Macroinvertebrate Community Index)	The overall ecological state of rivers was described using traditional MCI quality classes (Stark & Maxted, 2007): poor <80, fair >80, good >100 and excellent >119. Results: 89% of urban sites were classified as poor quality Minimum 38.1 (Tararata Creek), Median 65.9, Maximum 123.1 Only two sites (7% of all urban sites) - Auckland Domain (median MCI of 108.9) and Parahiku Stream (Upper) (median MCI of 100.8) are located within urban reserves and were classified as being in the good quality class. These sites had higher abundances of more sensitive taxa (i.e. mayfly Zephlebia and caddisfly Polyplectropus), indicating moderate to good habitat and water quality conditions.
MCI Trend (2010-2019)	From nine urban sites analysed for MCI trend (2010-2019): • two showed very likely degrading trends (Lucas Creek and Vaughan Lower) • one is likely degrading (Oteha Stream) • three are indeterminate (Oakley Lower, Otara Creek and Papakura Stream) • one is likely improving (Lucas Creek) • two are very likely improving (Oakley Upper and Papakura Tributary)
Interpretation of MCI score in accordance with NPS-FM NOF MCI attribute bands	MCI score in accordance with NPS-FM attribute bands: A ≥130, B ≥110 and <130, C ≥90 and <110, D <90 (national bottom line) 93% of sites bellow the bottom line (i.e. band D)

River Ecology State and Trends in Tāmaki Makaurau/Auckland 2010-2019. (TR2021/05).	
	Band A – 0% Band B – 0% Band C – 7% of sites Band D – 93% of sites
Interpretation of MCI score in accordance with Auckland Unitary Plan interim guidelines for MCI	MCI score in accordance with AUP(OP) interim guidelines (native forest ≥123, exotic forest ≥111, rural ≥94 and urban ≥68) reported on previous state (2010-2014) and current state (2015-2019) Sites below the urban guidelines (>5 MCI units): previous (23%), current (31%) Sites with changes overtime (> ±5MCI units) - 15% enhanced, 62% maintained, 23% degraded
SEV (Stream Ecological Valuation)	SEV score classification: excellent ≥0.81, good 0.61-0.80, fair 0.41-060, poor <0.40 Results: 38% classified as poor, 45% classified as fair Two sites, Onetangi Stream in Waiheke (median score of 0.81) and Parahiku Stream (Upper) (median score of 0.80), were the exception to this and classified as excellent and good respectively. SEV scores ranging from 0.21 to 0.83 and a median SEV score of 0.48 minimum of 0.21 (Botany Creek)
SEV Trend (2010-2019)	From nine urban sites analysed for SEV trend (2010-2019): • three showed likely degrading trends (Parahiku Stream (Upper), Avondale Stream (Lower) and Otara Creek) • five are indeterminate (Avondale Stream (Mid), Avondale Stream (Upper), Parahiku Stream (Lower), Oakley (Mid 3) and Oakley Creek Lower) • one is likely improving (Oakley (Mid 4))
Extract of report sections related to urban areas	Executive Summary, page ii "…all measures showed a clear pattern of decline with increased land cover modification and intensification. As a result, urban sites were consistently found to be in the worst ecological health. An outcome which is largely influenced by the loss of riparian margin integrity and channel modification, as well as land cover modification within the upstream catchment. Results were comparable to previous regional reporting and show similarity with what is being observed at the national level." Page 44: "Overall, streams in the Auckland region, particularly those of poor quality, are being negatively impacted by loss of vegetation in the upstream catchment and surrounding riparian margins and the loss of habitat through channel modification, fine sediment loading and increased macrophyte growth."

River water quality

The latest state of the environment reporting (TR2021/07) "River Water Quality State and Trends in Tāmaki Makaurau/Auckland 2010-2019" reports on river water quality using a range of physical, chemical, and microbiological variables or attributes. Summary of findings related to urban are presented in table 13 and overall bands are presented in figure 20.

The current state of river water quality at 2019 is based on the median, 95th percentile, or maximum values recorded over the preceding five years (2015-2019 inclusive) in accordance with the national objectives framework under the National Policy Statement for Freshwater Management 2020 (NPS-FM), and proposed draft Auckland specific attributes for metals (Gadd et al., 2019).

Copper and zinc are recognised as indicator pollutants of urban streams and can be toxic to aquatic animals (Gadd et al., 2019). The NPS-FM national objectives framework does not currently include guidelines for metal toxicity. Provisional grading is based on proposed Auckland Attribute Bands (Gadd et al., 2019).

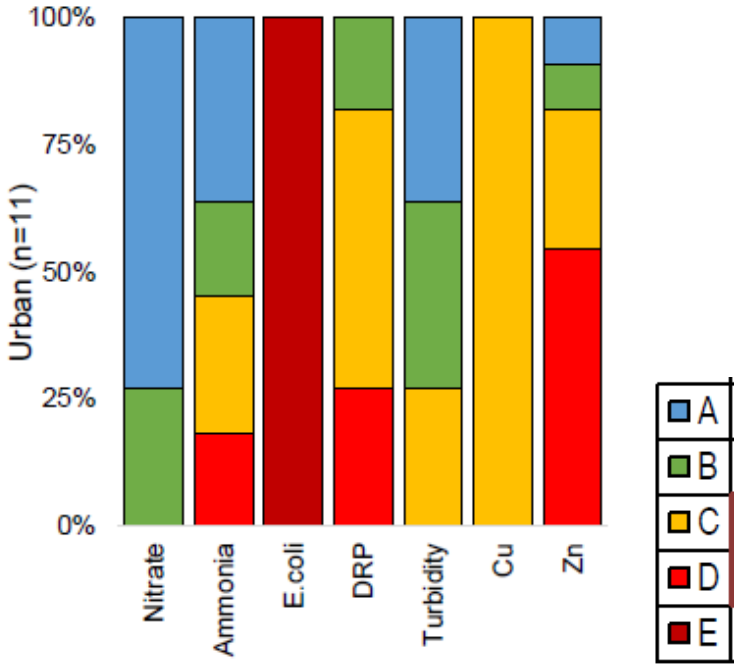


Figure 20. Summary of overall band across NPS-FM 2020 NOF and proposed Auckland specific attributes for copper and zinc (Gadd et al., 2019) (2015-2019) for urban sites (11 sites).

Table 13 Summary of findings for water quality on urban streams from the TR2021/07 state of the environment reporting.

River Water Quality State and Trends in Tāmaki Makaurau/Auckland 2010-2019. (TR2021/07). Link	
Indicator	**Results for the 11 urban sites monitored (when urban cover exceeds 15 per cent)**
Soluble copper (Proposed Auckland Attribute Bands for dissolved metal contaminants (Gadd et al., 2019*))	All urban sites are in band C. Analysis of trend for soluble copper (2010-2019), from 11 urban sites, four are shown as very likely degrading, one likely degrading, four indeterminant results, one is likely improving and one is very likely improving. Note: Higher detection limits were introduced in 2017 which likely induced degrading trends in soluble copper.
Soluble zinc (Proposed Auckland Attribute Bands for dissolved metal contaminants (Gadd et al., 2019*))	Most urban streams have zinc concentrations approaching acute impact levels for sensitive species. However, the majority of these streams were very likely improving over the past 10 years. Analysis of trend for soluble zinc (2015-2019): from 11 urban sites, one is shown as very likely degrading, one likely degrading, one indeterminant results, one is likely improving and seven are very likely improving Note: Higher detection limits were introduced in 2017 which likely induced improving trends in soluble zinc.

River Water Quality State and Trends in Tāmaki Makaurau/Auckland 2010-2019. (TR2021/07). Link	
Suspended fine sediment (turbidity –converted to visual clarity)	The only site that was below the national bottom line for visual clarity (D band) was Okura Creek and this stream also returned a likely degrading trend for turbidity over time. From six urban sites analysed for magnitude of 'very likely" trends (2015-2019): • Three showed as very likely degrading (Omaru Creek, Vaughan Stream and Oteha River) • Three are very likely improving (Otaha Creek (South), Puhinui Stream and Avondale Stream)
E. coli	The assessment undertaken is not in relation to identified primary contact sites or the bathing season. However, the national objectives framework also provides for an assessment of E. coli in relation to potential human contact risk for all lakes and rivers. One site, with a catchment dominated by native forest is in band C (three per cent predicted average infection risk) and another native forest site was in band E. In both instances, more than 10 per cent of the upstream catchment is influenced by anthropogenic land use pressures. Onetangi Stream (band C) has a number of residential properties within the upstream catchment (>10 per cent urban) and Opanuku Stream (band E).
Ammoniacal nitrogen	Risks of ammonia toxicity in almost half of our monitored urban streams.
Extract of report sections related to urban areas	Executive Summary, page i: "Key regional issues were highlighted including instream nutrient enrichment and potential effects of eutrophication, declining visual clarity (based on turbidity), and generally high levels of E. coli. Regionally, there are risks (below the national bottom line) of nitrate toxicity in rural streams in the Franklin area, and risks of ammonia toxicity in almost half of our monitored urban streams, with many of these streams continuing to degrade. Over a third of our monitored streams had moderate impacts of suspended sediment and these impacted streams had a higher proportion of degrading trends. Most monitored urban streams are contaminated with zinc to levels below the proposed regional bottom line, however many were very likely improving. While no streams were below the proposed regional bottom line for copper, many rural and urban streams returned very likely degrading trends in relation to copper."

* Gadd, J., Williamson, B., Mills, G., Hickey, C., Cameron, M., Vigar, N., Buckthought, L., Milne, J. (2019). Developing Auckland-specific ecosystem health attributes for copper and zinc: summary of work to date and identification of future tasks. Prepared by the National Institute of Water and Atmospheric Research, NIWA and Diffuse Sources Ltd for Auckland Council. Auckland Council discussion paper, DP2019/004. Link

Almost all urban streams monitored have a moderate to high risk of toxicity effects from both dissolve copper and zinc (interim bands C and D).

Several site-specific water quality issues were also highlighted where water quality was poor, and/or the rate of degradation was notable relative to other monitored streams including:

- ammonia toxicity and phosphorus enrichment at Pakuranga Creek
- high and degrading E. coli levels, and turbidity, phosphorus enrichment, and metal toxicity at Oteha River.

Some site-specific positive changes in water quality were also noted at two urban streams where water quality was notably improving relative to other monitored streams:

- poor but improving turbidity, dissolved oxygen, and E. coli levels at Avondale Stream
- Puhinui Stream was the only monitored stream with very likely improving trends in soluble copper, this was also the only site that had cooler surface water temperatures over the 10-year period.

The report provides analysis for three urban streams:

Kumeu River	While no major land cover changes were observed within the Kumeu River catchment between 2009 to 2018, the upstream catchment includes a relatively high proportion of horticultural production (>5 per cent of catchment) including viticulture and kiwi fruit. Horticultural sprays (fungicides/pesticides) are a key source of copper contamination and high concentrations of copper have also been found in soils within horticultural areas in Auckland (Curran-Cournane, 2020). It is also noted that the monitoring site is bridged immediately upstream by State Highway 16 and bordered by an industrial complex. Within the past 10 years, annual average daily traffic volumes on SH16 in the vicinity of the monitoring site have increased by 34 to 48 per cent (NZTA, 2019). The wearing of tyres can be a source of zinc and the wearing of vehicle brake pads is a common source of copper contaminants (Kennedy and Sutherland, 2008) and it is possible that high (>20,000 vehicles per day) and increasing volumes of traffic within the area are contributing to increasing copper and zinc contamination at Kumeu River
Omaru Creek	Urban sites in band C and D for zinc toxicity were improving at an estimated rate of 0.00027 to 0.0005 mg/L per annum except at Omaru Creek which was an order of magnitude greater, estimated at 0.0019 mg/L per annum but with wide variability in the rate of change (+0.002, -0.0018). Median concentrations of zinc at Omaru Creek are currently double the regional threshold between bands C and D, and at this estimated rate of change, improvement relative to the attribute band state could take over 10 years. Targeted interventions have been planned, including a new stormwater treatment wetland at Taniwha Reserve.
Vaughan Stream	The area of urban land cover has more than doubled in the Vaughan Stream catchment since 2012. Concentrations of zinc at this site are still currently in band A whilst most streams in older urbanised catchments are in band C or D. Zinc concentrations were very likely improving which suggests that the current state is at least being maintained. Conversely, while median copper concentrations are in band A, occasional high concentrations result in the 95th percentile in band C. Copper concentrations were very likely degrading although the estimated rate of change per annum was less than two per cent of the difference between bands A and B for the median attribute.

The report also provides comment on urban growth and water sensitive design:

Page 54: "A key direction for Auckland is to manage the effects of growth and development on our natural environment. The greatest changes in land cover (and inferred land use) over the past 10 years (summer 2008/09 to 2018/19) within the catchments upstream of our monitoring sites, are associated with urban growth in the upstream catchments of Otara Creek East (Flat Bush) and Vaughan Stream (Long Bay). Both Flat Bush and Long Bay were master planned urban areas developed with water sensitive design principles (van Roon, 2011). The current state of NOF attributes at Otara Creek East was typically one band better than the adjacent Otara Creek South catchment, and Vaughan Stream typically had better water quality than other monitored urban streams and it was the only 'urban' stream that still has low zinc concentrations (band A). Turbidity was found to be poor, and degrading over the last 10 years at Vaughan Stream. Event based sediment monitoring is also undertaken within this catchment and no significant trends were observed in sediment loads in this catchment over 2012 to 2019 (Hicks et al. in press). There were no degrading trends observed across attributes at Otara Creek East, however development commenced prior to the 10-year period assessed here and further assessment of longer-term data may be necessary to provide a better estimate of the pre-development baseline."

3.2.3 Coastal health

Coastal and estuarine water quality, sediments and ecology and associated 10-year (2010-2019) trends were assessed by RIMU. Some of the finding related to urban areas are presented in Table 14 below.

Table 14 Summary of findings of SoE reports related to coastal environment.

Topic	SOE Report	Key Findings related to urban areas
Estuary Water Quality	(TR2021/02) "Coastal and Estuarine Water Quality State and Trends in Tāmaki Makaurau/Auckland 2010-2019"	• From the 31 coastal and estuarine water quality monitoring sites, 15 are related to urban areas. • The greatest changes over the past 10 years (summer 2008/09 to 2018/19) associated with urban growth in the Hibiscus Coast, Waitematā, and Tāmaki watersheds. These include the major urban developments of Orewa and Silverdale (Hibiscus Coast), Flat Bush and Highbrook (Tāmaki), and Hobsonville and Albany in the upper Waitematā. • While several water quality parameters were found to be degrading within the Waitematā Harbour, these trends were not specifically associated with Lucas Creek, or Hobsonville which are the primary receiving catchments for these greenfield growth areas. • Notable improvements in dissolved oxygen saturation and turbidity were observed within the Tāmaki Estuary.
Estuary Sediment	(TR2021/10) "Marine Sediment Contaminant State and Trends in Tāmaki Makaurau/Auckland 2010-2"19"	• Potential effects of contaminants on benthic ecology were assessed principally by comparison with the former Auckland Regional Council's Environmental Response Criteria (ERC). The ERC are conservative thresholds developed specifically for the Auckland region. • 17 sites (14%), directly influenced by intensive urban development or local contamination sources, were contaminants at ERC-red state levels, all of which were in muddy inner estuary sites in the Central Waitematā Harbour and Tāmaki Estuary. • Inner muddy urbanised zones of the Central Waitematā Harbour and Tāmaki Estuary, having Zn (and Pb at one site) at levels where adverse ecological effects would be expected to occur. • Overall, the sediment contaminant data analysed in this project indicate that the spatial patterns of contamination are consistent with those reported previously, and that contaminant concentrations in most areas have not changed greatly since 2004.
Marine Ecology	(TR2021/09) "Marine Ecology State and Trends in Tāmaki Makaurau/Auckland 2010-2"19"	• The benthic health of most harbours and estuaries across the region has been affected by metal contamination. • Closer inspection of species trends, and those in the BHM for metals, often revealed that trends reflected historic rather than ongoing inputs of metals near the urban centres. • No sites in the region have poor benthic health related to metals and most east coast estuaries and harbour sandflats are in good health, but despite some improving trends, health is mostly marginal in the tidal creeks near the city centre.

Topic	SOE Report	Key Findings related to urban areas
		• Sediment input from streams and rivers continues to be the biggest pressure driving change in the benthic ecology and health of Auckland's harbours and estuaries. This is especially so in sheltered tidal creeks, and sedimentation has affected sites in both urban and rural catchments. A lesser but still important pressure is metal contamination, the impact of which seems to be decreasing in tidal creeks close to urban centres but may be increasing in sandflats further downstream, as well as in the rural Kaipara and Mahurangi harbours. • Finally, when assessing benthic health, the state and trends of all indicators should be considered holistically. The importance of improving or degrading trends in one indicator may be determined from the current state of another indicator.

3.2.4 Groundwater health

Report (TR2021/03-2) "Groundwater Quality State and Trends in Tāmaki Makaurau/Auckland 2010-2019" reports on some of region's aquifers as part of its state of the environment programme. In relation to urban areas, it monitors the central isthmus urban site -Three Kings volcanic, which is an unconfined and shallow aquifer. Urban shallow volcanic aquifers are susceptible to stormwater/wastewater infiltration with potentially high metal and microbial concentrations.

In summary:

- the Three Kings volcanic aquifer showed anthropogenic impacts, indicated by >2.5 mg/Litre nitrate and the presence of *E. coli*. All monitored observations for *E. coli* (July 2017-December 2019, due to change in laboratory detection limits), exceeded Maximum Acceptable Values (MAV) and the long-term trend (analysis period 2010-2019) was *likely* degrading. Zinc concentrations exceeded the Australia and New Zealand Environmental Conservation Council (ANZECC) ecosystem health trigger value and were within band C of the Auckland-specific regional zinc ecosystem health attribute (Gadd, et al., 2019). The long-term trend for zinc was *likely* degrading.
- zinc concentrations in the Three Kings volcanic aquifer exceeded the ANZECC ecosystem health trigger value for surface water, suggesting that groundwater baseflow to Motions stream may contribute zinc contamination to the stream. Reporting in 2017 showed no zinc exceedances at this site, suggesting potentially increasing zinc contamination over recent years.

3.2.5 State of the environment – summary of findings related to growth

Adverse effects of urbanisation and increased impervious surfaces are broadly known and a common problem in urban areas around the world. When considering stormwater discharge management, a particular aspect draws attention in the Auckland context, which is the implementation on water sensitive design, including the guidance document GD04, released in 2015 and reference to integrated stormwater management in the AUP(OP) 2016.

Because a stronger directive for water sensitive implementation is relatively recent (dating 2015-2016), the SoE 10-year trends (2010-2019) is the first trend analysis that can provide early indication whether any change is perceived.

The water quality report (TR2021/07) refers to effects of urban growth and appears to indicate that benefits are seen for water sensitive design implementation, particularly in two locations which had significant urban growth upstream monitoring sites - Otara Creek East (Flat Bush) and Vaughan Stream (Long Bay), as per extract below:

"Both Flat Bush and Long Bay were master planned urban areas developed with water sensitive design principles (van Roon, 2011). The current state of NOF attributes at Otara Creek East was typically one band better than the adjacent Otara Creek South catchment, and Vaughan Stream typically had better water quality than other monitored urban streams and it was the only 'urban' stream that still has low zinc concentrations (band A). Turbidity was found to be poor and degrading over the last 10 years at Vaughan Stream. Event based sediment monitoring is also undertaken within this catchment and no significant trends were observed in sediment loads in this catchment over 2012 to 2019 (Hicks et al. in press). There were no degrading trends observed across attributes at Otara Creek East, however development commenced prior to the 10-year period assessed here and further assessment of longer-term data may be necessary to provide a better estimate of the pre-development baseline."

Similarly, urban growth is mentioned at the coastal and estuarine water quality report (TR2021/02). There are indications that the greenfield developments are not further degrading the harbours, as per extract below:

"The greatest changes in land cover (and inferred land use) over the past 10 years (summer 2008/09 to 2018/19) were associated with urban growth in the Hibiscus Coast, Waitematā, and Tāmaki watersheds (Appendix B). These include the major urban developments of Orewa and Silverdale (Hibiscus Coast), Flat Bush and Highbrook (Tāmaki), and Hobsonville and Albany in the upper Waitematā. While several water quality parameters were found to be degrading within the Waitematā Harbour, these trends were not specifically associated with Lucas Creek, or Hobsonville which are the primary receiving catchments for these greenfield growth areas. Notable improvements in dissolved oxygen saturation and turbidity were observed within the Tāmaki Estuary."

In relation to estuary sediments, high level of metals was identified. Of particular interest are the levels of zinc at inner muddy urbanised zones of the Central Waitematā Harbour and Tāmaki Estuary. It is noted that the spatial patterns of contamination are consistent with those reported in previous years. In relation to groundwater, there is a suggestion of potentially increasing zinc contamination over recent years in the Three Kings volcanic aquifer, which need to be further investigated.

3.3 Modelled data – freshwater management tool

The freshwater management tool (FWMT) is a process-based, water quality modelling software tried and tested by the United States Environmental Protection Agency. This software has now been applied to the Auckland region, using local data and knowledge from a team of international and national researchers as well as Healthy Waters specialists.

The freshwater management tool has been built to provide a detailed and representative picture of the baseline (2013-2017) state of water quality throughout Auckland's rivers and streams, enabling a region-wide assessment covering 5,465 catchments and sub-catchments. The tool also enables the assessment of the sources (or causes) of water quality degradation, integrated from mountains to sea.

The FWMT uses a range of information, including weather, geology, topography and land use activities, to predict water quality in streams and rivers across Auckland on a 15-minute basis (figure 21). The outputs generated from the first stage of the FWMT are referred to as a baseline. These outputs provide a detailed regional assessment of the current state of several water quality attributes.

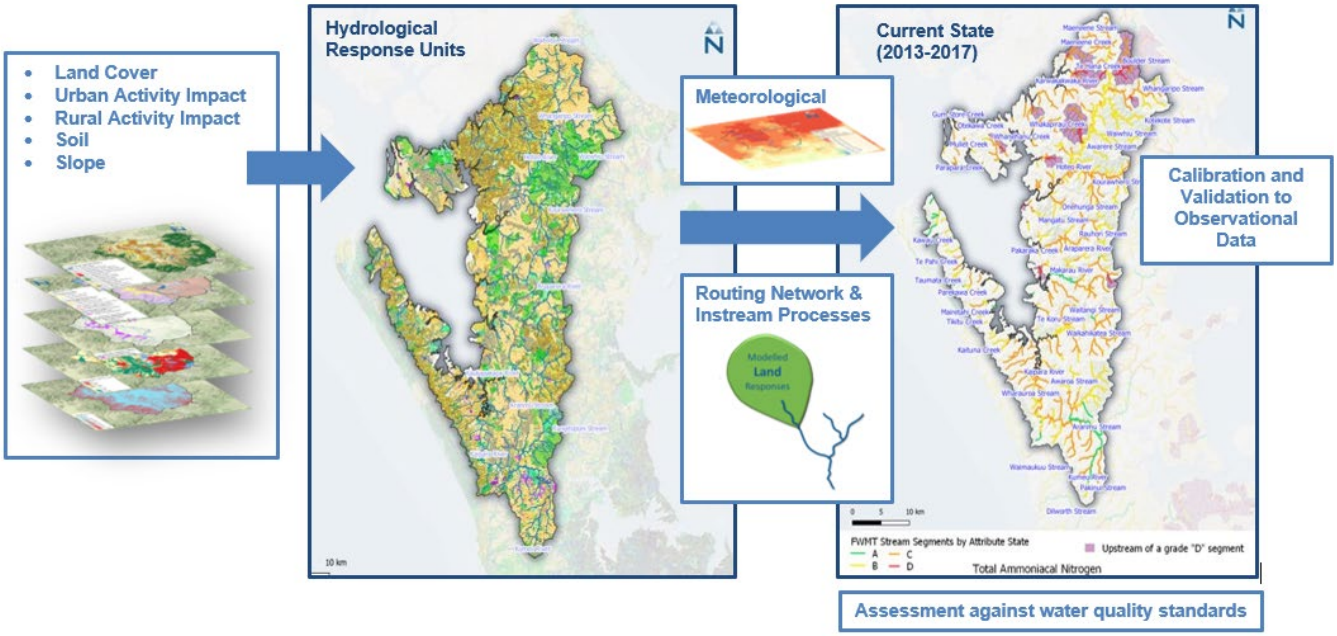


Figure 21. Overview of the derivation the freshwater management tool current state.

Current contaminants analysed by the FWMT include *Escherichia coli* (*E.coli*), an indicator of faecal contamination; dissolved copper and dissolved zinc, indicators of urban contamination; total suspended solids, an indicator of erosion and sediment-bound contaminants; and various forms of nutrients, including nitrates, ammonia, dissolved reactive phosphorus, total nitrogen and total phosphorus (indicators for eutrophication and toxicity of both rural and urban origin).

The initial development phase of the FWMT, called baseline have been completed and externally peer reviewed. The FWMT model outputs provide a regional overview of predicted water quality, and cover the entire Auckland Region, urban and rural. The baseline outputs reveal widespread degradation of water quality in rural and urban streams by *E.coli*, an indicator of faecal contamination. Other widespread contaminants include some forms of nitrogen and phosphorus nutrients. Localised degradation occurs for copper and zinc in urban areas. It also indicates that contaminants originate from a range of rural and urban activities, with contributions varying between catchments in line with differences in intensity of use, climate and natural landscape factors.

With respect to heavy metals, water quality degradation from dissolved copper and zinc concentrations is widespread in highly urbanised areas. Sources of copper vary widely but roads, motorways, and paved urban surfaces are the most intensive sources. Zinc sources are also diverse, with most intense yields derived from roofing, roads and motorways, and paved urban surfaces.

The FWMT can produce a wide range of data, figures and maps assessing water quality and contaminant sources. These outputs can be generated for all contaminants whether at regional, watershed or catchment scales, including local board areas. Examples of these outputs are presented below.

Figure 22 presents an example of a heat map for contaminants, specifically for sediment yields to water. Heat maps are useful in understanding which catchments yield more contaminants relative to others, with information also available from the freshwater management tool on which activities in those catchments are contributing greater amounts of contaminant.

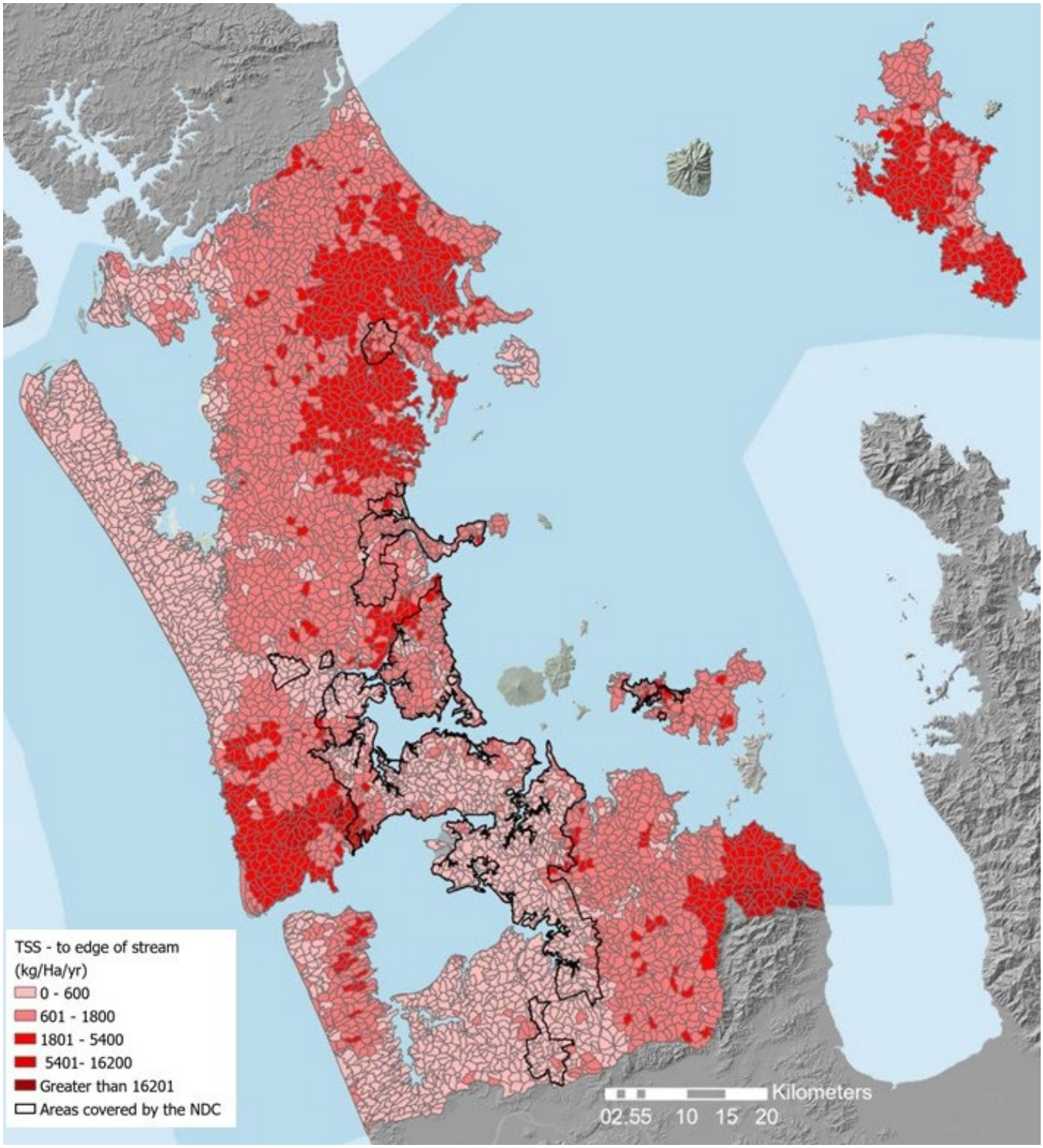


Figure 22. Predicted total suspended sediment yields (kg/Ha/year) to edge-of-stream (2013-2017).

Figure 23 presents contaminant sources by land use, in this case for sediment to stream edge for the Waitematā and Manukau Harbours respectively. As can be seen, stream bank erosion is the dominant source of sediment to streams.

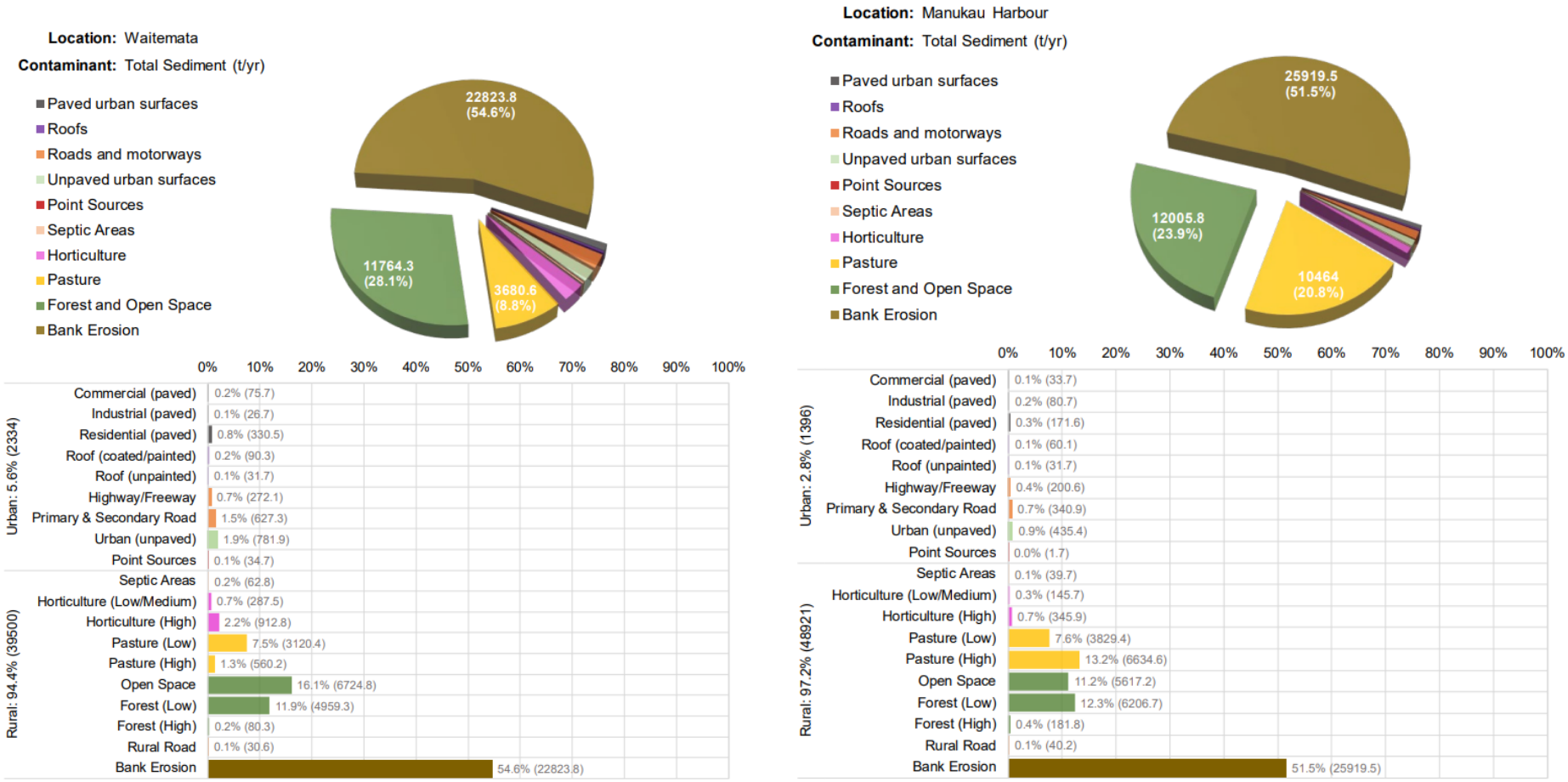


Figure 23. Predicted sources of Total Suspended Sediment (tonnes/year) to edge-of-stream across the Waitematā and Manukau Harbours respectively (2013-2017)

Figure 24 presents a regionwide summary of contaminant grades. These charts provide a good, high-level summary of the key contaminants analysed by the FWMT. As can be seen, the FWMT outputs correspond well with those of SoE monitoring, which are labelled respectively as predicted and observed in the Figure 20. The key exceptions are ammonia and zinc, for which the Freshwater Management Tool reports greater degradation. This difference can be attributed to the lesser monitoring frequency and/or locations for these parameters in the SoE programme.

Attributes Assessed Regionwide		Attribute State Attainment by km of modelled stream length *(Predicted)* or number of monitoring stations *(Observed)*				Percentage of stream length *(Predicted)* or number of stations *(Observed)* attaining attribute state
		A	B	C	D	
E. Coli	*Predicted*	119	257	154	2513	4% 8% 5% 83%
	Observed	1	5	0	30	3% 14% 0% 83%
Dissolved Reactive Phosphorus	*Predicted*	283	326	629	1805	9% 11% 21% 59%
	Observed	0	7	18	11	0% 19% 50% 31%
Total Oxidized Nitrogen	*Predicted*	2496	433	63	51	82% 14% 2% 2%
	Observed	29	5	1	1	81% 14% 3% 3%
Total Ammoniacal Nitrogen	*Predicted*	69	1452	1426	97	2% 48% 47% 3%
	Observed	19	10	6	1	53% 28% 17% 3%
Dissolved Copper	*Predicted*	1545	400	889	210	51% 13% 29% 7%
	Observed	8	3	13	0	33% 13% 54% 0%
Dissolved Zinc	*Predicted*	2609	190	162	82	86% 6% 5% 3%
	Observed	9	4	7	4	38% 17% 29% 17%

Figure 24. Regionwide grading of attribute states derived by the Freshwater Management Tool and from State of the Environment monitoring, assessed using regional and national standards for the period 2013-2017

Figures 25 and 26 present examples of water quality grading maps that can be generated by the FWMT, showing the 95% percentiles and median water quality grades for dissolved copper and zinc respectively (grading based on Gadd et al., 2019). The two sets of maps have been included to demonstrate how the information generated by the tool can be used to inform potential mitigation, as the median grades tend to show more chronic sources of contamination, and the 95th percentile more acute, short-term sources.

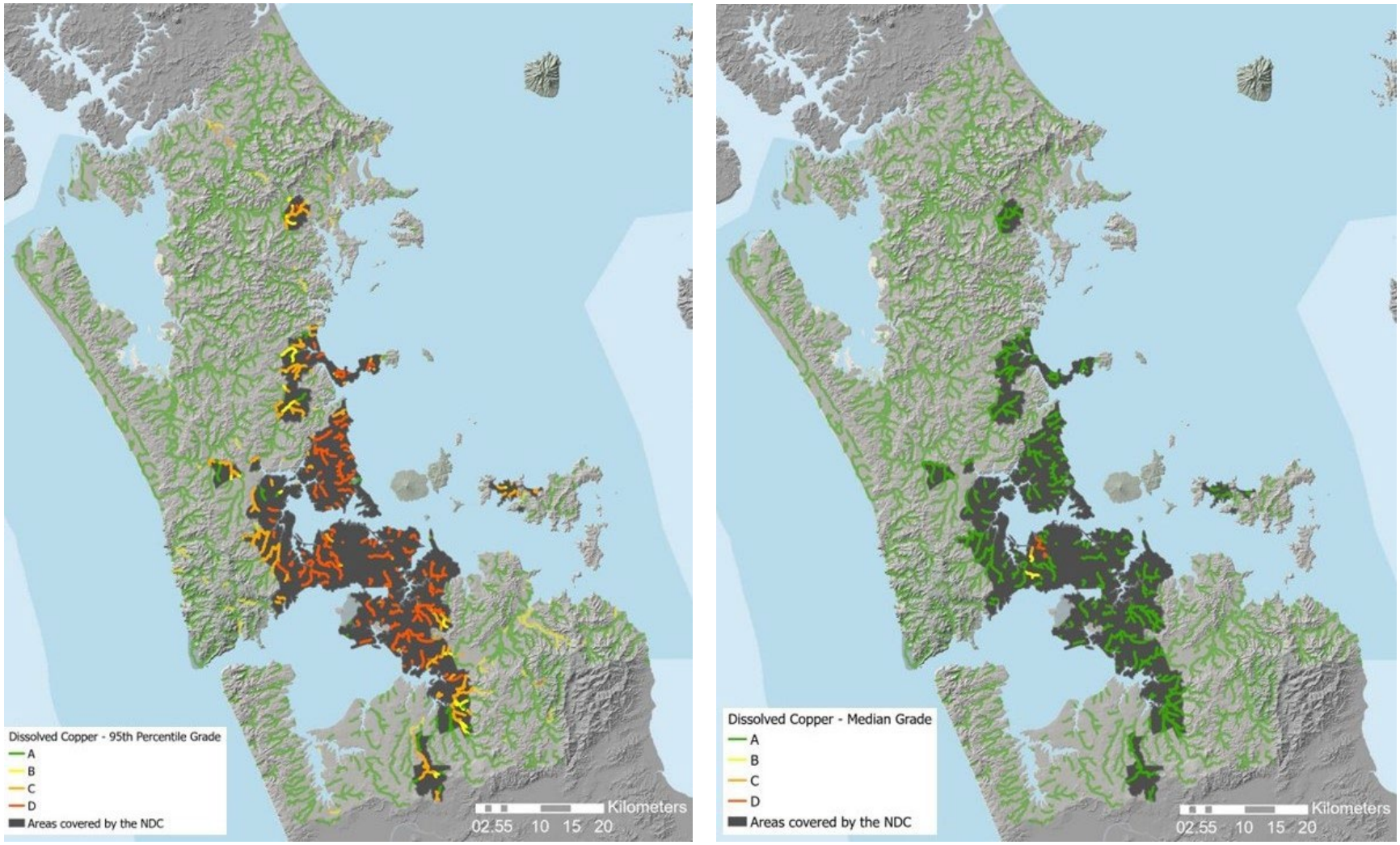


Figure 25. 95th percentile and median grades for dissolved copper in modelled streams (2013-2017).

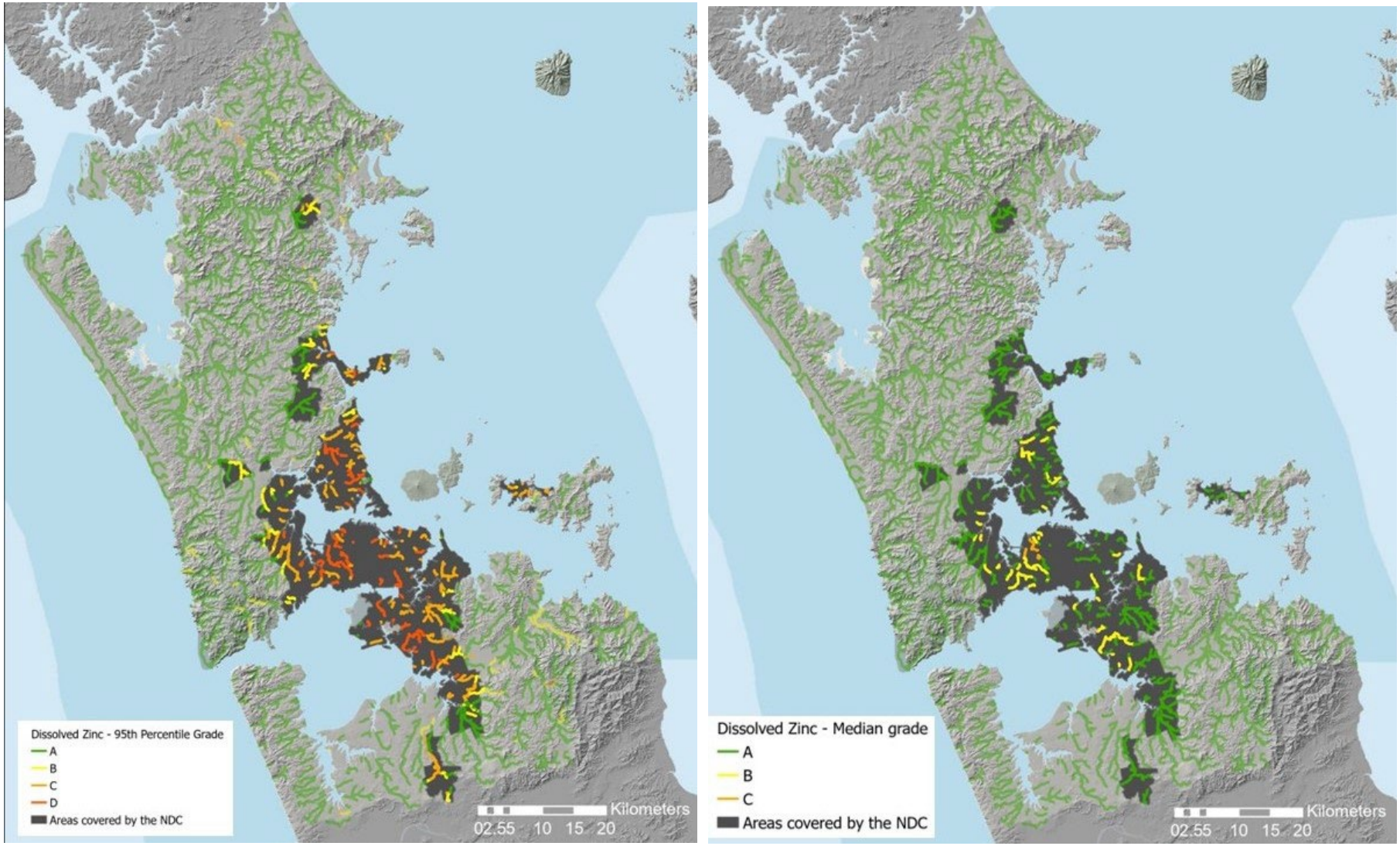


Figure 26. 95th percentile and median grades for dissolved zinc in modelled streams (2013-2017).

3.4 Key points and recommendations

This section sets out the current available SoE monitoring results and modelling outputs that will be used as a baseline for future evaluation. The NDC has been in place for only three years, and therefore, it is too early to identify or measure changes and trends in the receiving environment.

In addition, the NDC discharges are one of many discharges which enters the environment and therefore relying solely in the SoE results to assess the NDC performance would not be appropriate. This together with the complexities of monitoring stormwater discharges (e.g., variability on rainfall, quantity of contaminant build up between rain events, etc) means that a combination of evaluative/qualitative and measurable/quantitative components need to be considered for assessment of NDC performance.

The Monitoring Strategy (required by Condition 37) must acknowledge and incorporate the considerations above, and for that reason renaming the strategy to "NDC Evaluation Strategy" would better capture the intent of the document as a broader evaluation framework. Further, additional monitoring is required to comply with the requirements of the NDC and to better understand its effectiveness including the additional programmes recommended in the table below.

Table 15 Recommendations, future actions and programmes related to monitoring to understand the performance of the stormwater network

Reference	Recommendation and future actions
Monitoring 1	Update of the monitoring strategy to include: • Consideration of renaming to "NDC Evaluation Strategy" to better reflect the content and intent of the strategy. • Further updates and improvements required by the certification letter to be incorporated following and based on the findings of the 6-yearly review. • Recommendations specified below.
Monitoring 2	Continue to develop target monitoring programmes to specifically assess stormwater discharges effects, as required by conditions of consent. These include: • intervention effectiveness monitoring including stormwater device performance, water sensitive design implementation and impacts of interventions on the receiving environment (as required by condition 37). Therefore, there is a need to establish a monitoring sampling programme in urban areas (e.g., catchment areas with conventional stormwater infrastructure compared to catchments using water sensitive principles) to assess the impacts of the stormwater network in the environment and assess the effectiveness of water sensitive design • monitoring of the implementation of adopted stormwater management plans which may include stormwater device monitoring as part of intervention effectiveness monitoring (as required by NDC permit, condition 37) • expanded targeted monitoring of a broader suite of contaminants such as sediment, emerging contaminants, gross pollutants and plastics (as required by NDC permit, condition 37)
Monitoring 3	Explore opportunities to incorporate citizen science monitoring and collaborate with universities (e.g., microplastics monitoring)
Monitoring 4	Iwi led cultural monitoring is required to be incorporated to complement and support the western science monitoring, as part of Healthy Waters partnership with mana whenua and as required by condition 37 of the NDC the monitoring strategy

4. Other influences & upcoming changes

4.1 Overview

This section discusses the outside influences that play a key part in shaping the way stormwater is managed across Auckland and New Zealand. Many of these matters will bring significant change to the way the Healthy Waters operates over the next few years both in terms of organisational structure and priorities.

Both growth and climate change will increase pressures on the stormwater system that will be integral to the management of the stormwater network. In addition, water management across New Zealand is facing significant transformation as a result to the Three Water and Resource Management Reforms, as well as the implementation of the National Policy Statement for Freshwater Management. To this, add the ongoing effects of the COVID-19 pandemic, which has resulted in reduced budgets, the effects of which will be felt for years to come. All of these pressures will result in changes to working practices and spending priorities.

4.2 Climate change

Climate change is a global issue that requires significant and immediate action at a local level. The global climate is already changing at an unprecedented rate, with the main driver being an increase in greenhouse emissions from human activities. The impacts from a changing climate are predicted to be severe, and apply directly to the water cycle through:

- Growing frequency of extreme weather events, including flooding
- More prolonged dry periods
- Rising sea level and increased coastal flooding.

In June 2019 Auckland Council declared a Climate Emergency. Sections 2.4.1, 4.4.3, 4.4.4, and 4.4.7 discuss responses to this in relation the NDC.

4.3 National legislative reforms

4.3.1 Essential freshwater programme

Released in 2020, the essential freshwater programme comprises a range of legislative mechanisms aimed to achieve the following objectives:

- *stop further degradation of our freshwater*
- *start making immediate improvements so water quality improves within five years*
- *reverse past damage to bring our waterways and ecosystems to a healthy state within a generation.*

The programme requires regional councils and unitary authorities to amend their freshwater policy statements and plans, as set out under the National Policy Statement of Freshwater. Auckland Council must give full effect to the National Policy Statement for Freshwater Management (NPS-FM) including notifying plan changes by 31 December 2024. It also puts in place:

- mechanisms to speed up council freshwater planning processes

- new rules to protect wetlands and streams and improve farming practices (through the National Environment Standard for Freshwater and stock exclusion regulations)
- changes to water measuring regulations
- identifying 'at-risk' catchments for prioritised action.

Central to the essential freshwater programme is the concept of Te Mana o te Wai, which refers to the vital importance of water. Te Mana o te Wai prioritises:

- *first, the health and well-being of water bodies and freshwater ecosystems*
- *second, the health needs of people (such as drinking water)*
- *third, the ability of people and communities to provide for their social, economic, and cultural well-being, now and in the future.*

Te Mana o te Wai ensures the health and well-being of the water is protected and human health needs are provided for, before enabling other uses of water. By doing so, we can protect the health and well-being of our people and environments.

The concept of Te Mana o te Wai also expresses the special connection all New Zealanders have with freshwater, which is reflected by six principles relating to the roles of tangata whenua and other New Zealanders in the management of freshwater:

- mana whakahaere: the 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
- kaitiakitanga: the obligation of tangata whenua to preserve, restore, enhance, and sustainably use freshwater for the benefit of present and future generations
- manaakitanga: the process by which tangata whenua show respect, generosity, and care for freshwater and for others
- governance: the 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
- stewardship: the obligation of all New Zealanders to manage freshwater in a way that ensures it sustains present and future generations
- care and respect: the responsibility of all New Zealanders to care for freshwater in providing for the health of the nation

As a result of the essential freshwater programme, Healthy Waters is working to understand how to put Te Mana o te Wai – the life-supporting capacity of freshwater – at the centre of its decision-making, including relating to the NDC. In addition, the NDC will need to be updated following the plan changes as a result of the NPS-FM to ensure it continues to be aligned with the AUP(OP) direction, as specified in Conditions 40A and 40B. While the extent of change that will be required is unknown at this time, it is likely to result in additional targets and milestones and more prescriptive requirements for the new development and re-development. The exact timing of the changes is also unknown but the plan changes are required to be notified by December 2024 so it may be following the next triennial review in 2025 or even the next six year review in 2028.

4.3.2 Three waters reform

Central government is progressing reforms so that three waters services (drinking water, wastewater and stormwater) will be provided by four publicly owned water service entities from July 2024 as shown in Figure 27. The objectives of these reforms are to:

- *improve the safety, quality, and environmental performance of water services*
- *ensure all New Zealanders have access to affordable three waters services*
- *move the supply of three waters services to a more financially sustainable footing, and address the affordability and capability challenges that currently exist in the sector*
- *improve transparency about, and accountability for, the delivery and costs of three waters services*
- *improve the coordination of resources and unlock opportunities to consider New Zealand's water infrastructure needs at a larger scale and alongside wider infrastructure and development needs*
- *increase the resilience of three waters service provision to both short and long-term risks and events, particularly climate change and natural hazards*
- *create mechanisms for enabling iwi/Māori rights and interests.*

Taumata Arowai is the crown entity established to regulate the three water services. From 2023, Taumata Arowai must monitor and report on the environmental performance of wastewater and stormwater networks.

Legislation on the role and responsibilities of the four entities, together with their oversight is currently being drafted and will go through parliament this year. It is anticipated that Taumata Arowai will set national performance standards that all entities must meet. These standards may also be refined and adapted to reflect local conditions and priorities. The detail of the responsibilities of the new entities have also not yet been defined

Although the reform offers many potential opportunities and efficiencies for integrated planning across the sector as well as access to funding, there are risks for the implementation of the NDC. The targets and outcomes of the NDC will need to be reviewed as these organisational changes and new standards come into force.

The detail of the responsibilities of the new entity have not yet been defined, especially for stormwater. There is a key risk to the ability to deliver and comply with the NDC consent conditions if the current scope of the Healthy Waters department is reduced when the new entity is formed. Consideration of the transfer of responsibilities to the new entity and the split of responsibilities between the council and the entity is fundamental when considering the ownership of the NDC and aspects it is responsible and accountable for. This includes the ability of Healthy Waters to do or manage catchment planning, research or flood management. The successful implementation of the NDC relies on an integrated and holistic approach to managing stormwater which includes matters beyond the piped network and asset management. The NDC has a broad scope to acknowledge that the stormwater network is in fact an open, interconnected system that combines constructed infrastructure and natural waterways, as well as aiming to achieve healthy waterways and safe communities. If the scope of stormwater management is reduced, the NDC may need to be changed to significantly limit the scope and the outcomes which can be achieved and the matters for which the consent holder is held responsible. It is even possible that a new consent would need to be applied for.

Internal processes and relationships with Auckland Council departments including Regulatory, Community Facilities, Plans and Places and Auckland Transport will also change as a result of the reforms and rebuilding these relationships will be key to success.

As with any major organisational change the three waters reforms will result in disruption to staff and potential interruptions to work programmes as the implementation is established.

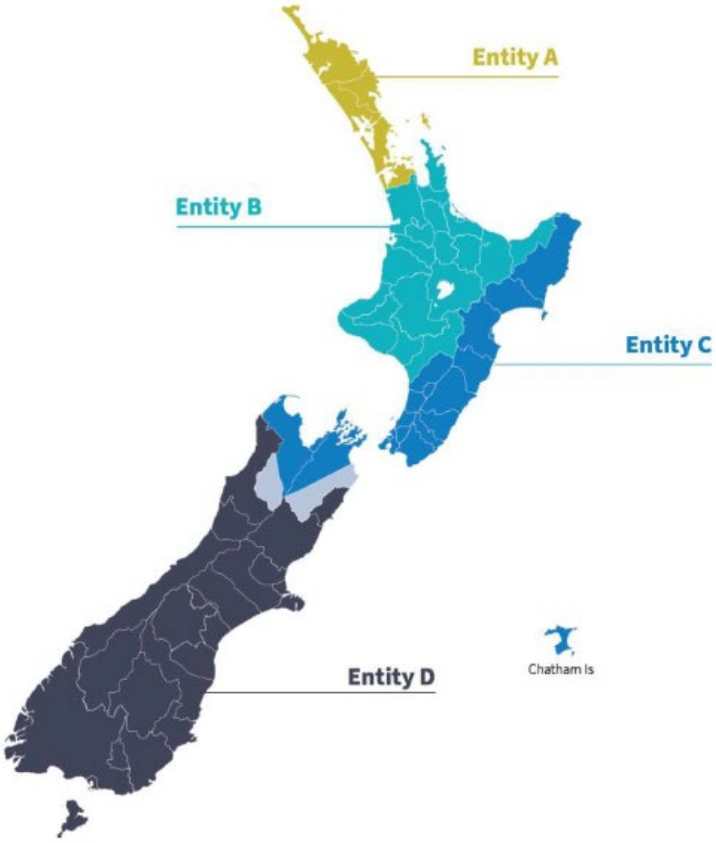


Figure 27. Map of the proposed boundaries for the Three Waters entities. The whole of the Auckland Region is within Entity A.

4.3.3 Resource management act reform

The proposed reforms to the resource management act (RMA) will also have impacts on how we undertake our activities and potentially on the NDC as well. The three proposed acts that will repeal the RMA are:

- natural and built environments act (NBA), to protect and restore the environment while enabling development
- spatial planning act (SPA), requiring the development of long-term regional spatial strategies to help coordinate and integrate decisions made under relevant legislation
- climate adaptation act (CAA) which is to address complex issues associated with managed retreat.

There is not yet any certainty about what this impact will be or what transitional provisions will apply to existing consents issued under the RMA. New plans to replace the AUP(OP) will be required to be prepared under the new acts and this may be an opportunity to resolve some of the challenges with the relationship between the NDC and the AUP(OP) and improve implementation.

The Government intends to introduce the Natural and Built Environments Bill and the Spatial Planning Bill to Parliament in October 2022. The third Bill, the Climate Adaptation Bill, is expected to be introduced in 2023.

4.3.4 National policy statement on urban development and medium density residential standards

There are two significant central government planning reforms that councils are required to implement which relate to urban development:

- the national policy statement on urban development (NPS-UD) was introduced in August 2020. For Tāmaki Makaurau, it requires council to enable greater housing density – with buildings of six storeys or more within walkable distances to the city centre and ten metropolitan centres, and rapid transit stops (train stations and rapid busway stops). Greater building heights and density is also required within and around neighbourhood, local and town centres across Auckland
- the government's medium density residential standards (MDRS) allow three homes of up to three storeys to be built on most residential sites without a resource consent. The MDRS changes are part of the Resource Management (Enabling Housing Supply and Other Matters) Amendment Act 2021. The law requires council to enable a greater supply of housing. The act also requires council to replace design rules for developments, including height-to-boundary ratios and outdoor space provisions.

The changes set out in the NPS-UD and the MDRS are not optional. By law, council must change the Auckland Unitary Plan to put these new rules in place. However, the NPS-UD allows council to make some limited decisions to help shape the future of the city. These include "qualifying matters" that will apply in Auckland, or the characteristics within some areas that may allow council to modify (or limit) required building heights and density. Qualifying matters may include such reasons as protecting special character and public open space. Central government has already identified a number of qualifying matters. The council is also allowed to include other 'qualifying matters' that are important for the city.

Depending on how this is implemented, this increase in urban density and small scale intensification is a risk for achieving NDC objectives relating to the health of the environment and safe communities. Healthy Waters is actively providing specialist input to the proposed plan changes including recommending qualifying matters in relation to areas with stormwater disposal constraints as well as highlighting the risk of increasing density in existing flood plains.

However the final decisions are outside the control of Healthy Waters and have not yet been made as the plan changes must still progress through the relevant approvals processes.

4.3.5 COVID-19 recovery (fast-track consenting) Act 2020

This act provides for a short-term consenting process to fast-track projects that can boost employment and economic recovery and is focussed on supporting the construction sector. The act has a sunset clause and is due to be repealed three years from commencement, in July 2023.

The act allows for applications for resource consents to be lodged with the Ministry for the Environment who assess the application and the Minister for the Environment has authority to refer a project to the Environmental Protection Authority (EPA) to process. The EPA establishes a panel and invites comment

from affected parties, including councils. Decisions on whether to grant the resource consent and conditions are made by the EPA.

Table 16 Breakdown of greenfield fast-track referred projects in Auckland.

Greenfield	Status	Description
Drury Centre precinct	In progress	
Drury East Stage	In progress	32.33 ha of FUZ land into 248 dwellings, 28 residential superlots, neighbourhoods parks and esplanade reserves
Waihoehoe Precinct	In progress	34.65 ha into development of 376 dwellings, 9 residential superlots
Karaka North Village	Suspended	Approximately 78 ha, half rural, half urban zoned to be turned into 837 residential lots

Currently a development in Whenuapai is also intending to lodge a fast-track application and that same land is also going through a plan change process.

There have also been seven brownfield applications approved in Auckland with another one in progress. These will be eligible to manage stormwater effects under the NDC as they already have an urban zoning.

The use of the act by applicants for significant areas of land development that has not yet been zoned for urban use has created unanticipated challenges to the implementation of the NDC. This is due to:

- land in a fast-track consenting application not having an urban zoning so under condition 13 of the NDC the subdivision or development's stormwater discharges cannot be authorised by the NDC. This means applicants are applying for a private discharge consent yet intending to vest assets to council and transfer the consent to council in the future
- applicants are sometimes going through both a usual Schedule 1 private plan change process and fast-track consent process – often concurrently. This has created a significant resource burden for Healthy Waters staff as both processes need engaging with and the differences in scale of information and timing means it is difficult to accurately assess what exactly is being proposed and the best way to affect NDC outcomes.

The scale of some fast-track applications has arguably been beyond what was anticipated by the act. In the example of Drury East, three applicants submitted applications under the act while the land in question was still going through a plan change process and without an agreed stormwater management plan. This has resulted in Healthy Waters staff needing to present evidence and argue for precinct provisions during the plan change process to ensure that NDC outcomes would be delivered through the development process, while also having to provide feedback on a fast-track consent application that did not always align with what applicants stated their intent was during the plan change hearings. The risk that this creates is that sub-optimal stormwater management system is designed that does not meet NDC requirements. Fortunately, the appointed stormwater expert for the fast-track consents also raised concerns about the quality of the stormwater management approach including the lack of demonstration that the proposal

was the best practicable option, the large number of small and private devices where opportunities for communal devices existed, the lack of consideration of ongoing operation and maintenance and the lack of detailed flood modelling to inform building levels. Subsequent expert witness caucusing resulted in a degree of agreement documented in consent conditions and joint witness statements on the use of 3.8C climate change allowance in flood modelling and the need to produce a stormwater management implementation plan certified by Auckland Council Regulatory prior to development.

4.3.6 Other reforms

The reforms discussed above are anticipated to substantially affect Healthy Waters operations, as well as the NDC as they are progressed, in particular in relation to targets. They however reflect only some of the wider reforms being undertaken by central government. While these other reforms are not anticipated to substantially impact Healthy Waters, some align with the outcomes sought by the NDC. These include reforms associated with emergency management, infrastructure strategy, building consents, changes to Land Information Memorandum system, flood reinsurance, biodiversity, conservation, and environmental reporting.

4.4 Local changes

4.4.1 Healthy Waters Strategic Direction 2019- 2022 business plan

Accommodating Tāmaki Makaurau's growth in the right places, protecting and cleaning up Auckland's waters and ensuring future water needs are met while adapting to a changing climate and water future presents challenges of a new scale and complexity.

Healthy Waters department's planning, projects and operations are focused on achieving the vision of future proof waters for a resilient, water sensitive community. The management of stormwater and its effects on the environment contributes to Auckland Council's strategic goals. Figure 28 shows the key principals of Healthy Waters' approach.

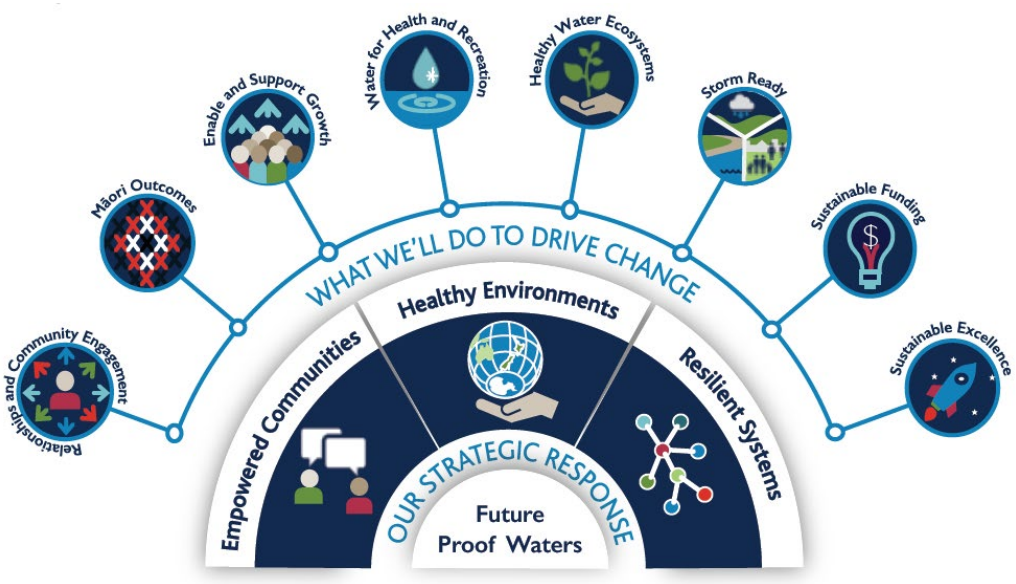


Figure 28. Healthy Waters department strategy key principles

4.4.2 Auckland Council long-term plan

Covid-19 and the 2020/21 Emergency Budget affected our ability to undertake capital projects during this financial year. This has caused delays to some projects.

The 10-year Budget 2021-2031 long-term plan (LTP), also known as council's recovery budget, was open for consultation in March 2021 and formally adopted by council in June 2021. The recovery budget, which sets out the council's spending for the next decade, will:

- support Auckland's recovery from the impacts of Covid-19
- lift investment by $5.6 billion to a record $31.8 billion over ten years
- increase spending on the environment and responding to climate change
- protect key services and renewal of community assets.

The budget increases council's level of capital investment by 21 per cent compared to the previous 10-year Budget adopted in 2018, including a $4 billion boost for water, wastewater and stormwater projects, and $600 million more into transport, which will be part of the record 31 billion investment in transport. It is also focused on tackling the long-term challenge of climate change, with $152 million of new spending over ten years for climate initiatives to reduce emissions and adapt to the impacts of global heating. A part of the budget specifically targets providing infrastructure to high growth areas within the region such as Drury and areas of the Auckland housing programme. The water quality targeted rate (WQTR) introduced in 2018 was set to expire in 2028, so the budget has extended the WQTR to the year 2031. Additionally, it is also increased in the budget in line with the general rate increase to enable more delivery of water quality projects.

While council's budget faces challenges from the impacts of Covid-19, there is still an emphasis on infrastructure growth and water quality within the LTP. Healthy Waters goes through an ongoing prioritisation process to deliver our projects within annual budgetary means, and the LTP funding continue to support Healthy Waters' work in achieving NDC outcomes.

4.4.3 Te Tāruke-ā-Tāwhiri: Auckland's climate plan

Te Tāruke-ā-Tāwhiri: Auckland's climate plan is Auckland Council's long-term approach to climate action. It sets out the priority action areas to deliver our goals to reduce emissions and adapt to the impacts of climate change. The eight priorities within the plan are summarised as:

- healthy and connected natural environment
- a low carbon, resilient built environment that promotes healthy, low impact lifestyles
- low carbon, safe transport system that delivers social, economic and health benefits for all
- resilient, low carbon economy, guided by our kaitiaki values, that supports Aucklanders to thrive
- communities and individuals are prepared for our changing climate and coastline, and carbon footprints of Aucklanders are reduced
- low-carbon, resilient, local food system that provides all Aucklanders with access to fresh and healthy food

- intergenerational whakapapa relationships of taiao, whenua and tāngata are flourishing. The potential and value of Māori is fully realised. Māori communities are resilient, self-sustaining and prosperous.
- clean energy system that supports and provides for a resilient, low carbon Auckland.

The plan aims to help Auckland prepare for our current emissions pathway and the prospect of a 3.5 degrees warmer region. Healthy Waters and stormwater management have big roles to play in relation to Auckland's climate plan. Infrastructure will need to adapt to climate change such as from more severe weather events, or even consider infrastructure retreat. Planning for increased coastal inundation and more severe flooding are examples of areas Healthy Waters works in to build more resilient communities. Healthy Waters also have to contribute to the emission reduction goal of halving emissions by 2030 and reaching net zero emissions by 2050. This has prompted further work around managing embodied carbon for infrastructure, and how emissions can be offset with blue green infrastructure programmes.

The priorities of Auckland's climate plan will shape how decisions and programmes are progressed moving forward. This will include how projects are delivered under the NDC and how climate change priorities are considered for NDC related approvals.

4.4.4 Healthy Waters Watercare Joint Climate Action Plan

Using the directions set Te Tāruke-ā-Tāwhiri: Auckland's climate plan, Healthy Waters collaborated with Watercare in 2022 to develop a joint climate action plan with the purpose of delivering a low carbon, climate resilient water system for Tāmaki Makaurau. This plan includes 14 portfolios that identify and set out actions relating to:

- Adapting to the impacts of climate change
- Mitigating contributions to global warming
- Integrating climate thinking into business so its becomes "business as usual"

The 14 portfolios are listed below, and as can be seen, many also overlap with the requirements of the NDC, particularly in relation to partnerships with Māori, management of flooding as well as the prioritisation of green infrastructure and rehabilitation of streams and wetlands in Healthy Waters projects and programmes.

Table 17 Portfolios associated with Healthy Waters Watercare Joint Climate Action Plan.

Portfolio	Description
Portfolio 1	Māori partnership
Adaptation	
Portfolio 2	Apply a climate change lens to our development and land use planning
Portfolio 3	Update modelling, standards and guidance to integrate climate change projections
Adaptation	
Portfolio 4	Prepare water systems for climate change
Portfolio 5	Monitor the natural environment in a changing climate

Portfolio	Description
Portfolio 6	Partnerships with external organisations
Mitigation	
Portfolio 7	Low carbon infrastructure
Portfolio 8	Operating a low carbon water system
Portfolio 9	Low carbon purchasing and supply chain
Portfolio 10	Minimising waste
Portfolio 11	Remove and sequester carbon
Portfolio 12	Low carbon financial support
Engagement	
Portfolio 13	Empowered communities
Portfolio 14	An engaged, climate change aware and ready workforce
Portfolio 1	Māori partnership
Adaptation	
Portfolio 2	Apply a climate change lens to our development and land use planning
Portfolio 3	Update modelling, standards and guidance to integrate climate change projections
Adaptation	
Portfolio 4	Prepare water systems for climate change
Portfolio 5	Monitor the natural environment in a changing climate
Portfolio 6	Partnerships with external organisations
Mitigation	
Portfolio 7	Low carbon infrastructure
Portfolio 8	Operating a low carbon water system
Portfolio 9	Low carbon purchasing and supply chain
Portfolio 10	Minimising waste
Portfolio 11	Remove and sequester carbon
Portfolio 12	Low carbon financial support
Engagement	
Portfolio 13	Empowered communities
Portfolio 14	An engaged, climate change aware and ready workforce

4.4.5 Te rautaki wai a Tāmaki Makaurau – the Auckland water strategy

Te rautaki wai a Tāmaki Makaurau – the Auckland water strategy was formally adopted by Auckland Council in March 2022 following significant public consultation on the Our Water Future – Tō Tātou Wai Ahu Ake Nei public discussion document in 2019. It is designed to guide the council as a 30 year document, viewed together with the Auckland Plan 2050. The vision for the strategy is: "Te Mauri o te Wai o Tāmaki Makaurau – the life-sustaining capacity of Auckland's water, is protected and enhanced". Aligned with Te Mana o te Wai priorities in other national directions, the strategy places the centre of focus on te mauri o te wai, the life-sustaining capacity of water. The strategy seeks to track Auckland's progress towards a "water sensitive city" with a dual benchmarking approach: water sensitive cities (an international framework) and a mātauranga Māori benchmarking framework (under development).

The framework includes eight overarching strategic shifts:

- te tiriti partnership between council and mana whenua working together in agreed ways on agreed things
- empowering Aucklanders by working with them for better water outcomes
- prioritising mauri when using water, to sustain the environment and people in the long term
- ensuring Auckland's water infrastructure is regenerative, resilient, low carbon, and increases mauri of water
- creating water abundance and security for a growing population through efficient use and diverse sources
- integrating land use and water planning at a regional, catchment and site scale
- taking catchment-based approaches to restoring and enhancing the health of water ecosystems
- fostering a shared understanding enabling better decisions for our water future.

While the strategy sets high level vision and direction for Auckland, it recognises the interconnectedness of water. The NDC aligns with the Water Strategy, for example promoting green infrastructure and water sensitive design, as well as looking at stormwater management through larger catchment areas with stormwater management plans.

4.4.6 Auckland Unitary Plan

Plan changes to the water management sections of the Auckland Unitary Plan are planned to be notified in 2024 to reflect both the required implementation of the National Policy Statement for Freshwater Management 2020 (NPS-FM), as well as addressing issues identified as part of the s35 review of the plan, which is due to be completed in 2022.

National policy statement on urban development and medium density residential standards

Plan Change 78 to implement the requirements of the national policy statement on urban development and medium density residential standards was notified in September 2022. This changes the zones of large areas of the city to allow greater density as required by central government. The plan change has immediate legal effect.

National Policy Statement for Freshwater Management

The NPS-FM requires regional councils to set within their regulatory plans, target grades for a range of water parameters (called attributes), and limits to achieve those targets where current grades are below national bottom lines or not in line with community aspirations. These attributes apply to rivers and/or lakes, and included a range of nutrient related parameters, as well as those related to *E.Coli*, fish, sediment and macroinvertebrate index. As a result, it is anticipated that greater consideration will be given to the management of cumulative effects, particularly on a catchment basis.

At time of writing, the scope of the Auckland Council NPS-FM Plan Change was to be confirmed, with initial public consultation on the values the community holds for water held in July 2022. Many of the required parameters under the NPS-FM will have implications to the NDC, which will need to be incorporated into the consent once in place within the Auckland Unitary Plan. It is unclear at this time however if additional attributes, such as those related to dissolved zinc and copper, will form part of the plan change. There is also concern that some of the national bottom lines set under the NPS-FM, such as macroinvertebrate index, cannot be met in urban areas, for instance due to the impact of impervious areas to stream flows even at low thresholds. This will need to be explored and tested through the plan change process.

Draft Auckland Unitary Plan Section 35 plan effectiveness review

With respect to the draft s35 review, the following AUP(OP) chapters are currently being assessed:

- B7.3 Freshwater systems
- B7.4 Coastal water, freshwater and geothermal water
- B10.2 Natural Hazards and Climate Change

Input to the review process was provided by various Healthy Waters teams to Plans and Places on how effective the Auckland Unitary Plan was with respect stormwater and infrastructure management, particularly during development. Topics covered included the alignment of the outcomes between the NDC and the AUP(OP), allowing development in the flood plain, improvements in the stormwater mitigation of brownfield development and subdivision, improvement in the permitted activity standards for culverts, and modification of offsetting requirements for infrastructure projects aimed at improving stream health. Once the s35 reviews are finalised, ongoing work to identify and support key changes to the AUP(OP) regarding these and other issues will be needed, with the outcomes of this review potentially providing evidential basis.

For instance, with respect to stream, coastal and groundwater health, this review identified recommendations that aligns with the ones identified under the preliminary finding of s35, as per below:

- *extensive improvement in discharge and land use management is needed to ensure that improvements within waterbodies happen more quickly than they have over the last ten years (category: NPS-FM)*
- *maintaining and enhancing water quality will need to be a primary consideration across the AUP(OP) provisions, including those applying in rural and urban areas (category: NPS-FM related)*
- *Issues such as sediment from stream bank erosion require clearer linkages within the AUP(OP) to show that multiple parts of the plan are part of a package to address cumulative effects (category: NPS-FM related)*
- *monitoring (both direct environmental and indirect evaluative) and modelling need to be expanded and enhanced so that clearer linkages can be made between the AUP provisions and the state and trends in environmental values (category: process)*

4.4.7 Ture ā-Rohe Wai Āwhā stormwater bylaw update

The previous stormwater bylaw was adopted by the Auckland Council Governing Body on 30 July 2015 and replaced the operative and draft bylaws from the previous councils. The main purpose of the bylaw is to regulate land drainage through the management of private stormwater systems and protection of public stormwater network from damage, misuse, interference, and nuisance. A statutory review of the stormwater bylaw was undertaken in July 2020 as required under the local government act (LGA). Since the NDC was granted in 2019, the review was an opportunity to review the linkage between the NDC and the bylaw. The bylaw is seen as one of the key tools to assist with the implementation of the NDC, especially when interacting with third parties that we sought to meet NDC requirements.

Following the review, the stormwater bylaw was amended to improve its efficiency and effectiveness using the special consultative procedure as required by the LGA. The amendments were adopted by the Governing Body on 28 April 2022 and commenced on 30 May 2022.

Key changes to the bylaw include:

- climate change and carbon accounting considerations to enable stormwater infrastructure to meet the goals of Te Tāruke-ā-Tāwhiri: Auckland's climate plan
- strengthening the interactions of the bylaw to the NDC and stormwater management plans
- ability to require mana whenua involvement in decisions such as EPA applications
- enabling stormwater network utility operator approval for wastewater engineered overflow points
- including the ability to restrict access to parts of the public stormwater network to protect public safety
- improving some definitions and clarity of enforcement provisions.

During the bylaw review and amendment process, there was much consideration around improving water quality. As contained in many of the NDC outcomes, the health of water bodies is important, and they are impacted by water quality of the stormwater network. However, the bylaw created under the LGA2002 had limited scope to address contaminants and water quality issues, because the Auckland Unitary Plan and the RMA was seen as the more appropriate tool to manage contaminant discharges and effects on the environment.

4.4.8 Stormwater Code of Practice (Version 3)

The Auckland Code of Practice for Land Development and Subdivision – Chapter 4: Stormwater (Stormwater Code of Practice) is used to provide minimum standards for the design and construction of new public stormwater assets and new assets which are to be vested in Auckland Council ownership, which is eventually operated and maintained by Healthy Waters and authorised under the NDC. The Stormwater Code of Practice was updated to version 3.0 in January 2022 and supersedes the November 2015 edition. The summarised changes include:

- new section and references to the NDC
- addressing non-complying designs where the situations where minimum standards are not achievable or alternative designs are more viable
- updated values of Manning's roughness coefficients

- freeboard requirements were updated to include coastal storm inundation areas
- requirements around minimum pipe sizes and connections to public systems were updated
- amended section on connection to the public stormwater system to align with revised pipe ownership rules and associated operational requirements.

As discussed in section 2.4.8 Healthy Waters is currently looking at incorporating the climate change scenario RCP8.5 that was adopted by the Tāruke-ā-Tāwhiri: Auckland's climate plan into the next version of the Stormwater Code of Practice. It is anticipated that this will happen in the 2022-23 financial year.

4.5 Rural discharges

Auckland is the largest urban centre of New Zealand, and yet most of the Auckland region is rural, making up 70% of the land area. As a result, many of Auckland's stormwater catchments have mixed urban and rural land use, as depicted in orange in Figure 29. As rural areas are located at the head of these catchments, rural discharges are already impacting the flow and quality of water before entering urban areas. Similarly, the quality of water entering Auckland's major harbours, such as the Manukau and Waitematā as well as the Hauraki Gulf, is also impacted by both rural and urban land use.

Therefore, to meaningfully improve water outcomes, including within many urban areas of Auckland, work must be undertaken in both rural and urban areas. This has been recognized through Healthy Waters existing work programmes within the rural community. These include, but are not limited to: supporting response to and clean up of rural flooding events, support of rural waterway grants and freshwater farm planning through the Taiwhenua programme, roll out of region-wide flood and water quality models, roll out of region-wide onsite wastewater education and compliance programme, as well as support of sediment reduction initiatives, most notably within the Kaipara and Mahurangi, which both have co-governance structures in place with local iwi.

This holistic management of water is in line with the te ao Māori concept of ki uta i ki tai - from mountain to sea - and is in response to the ongoing direction set by mana whenua and council governance in improving water outcomes.

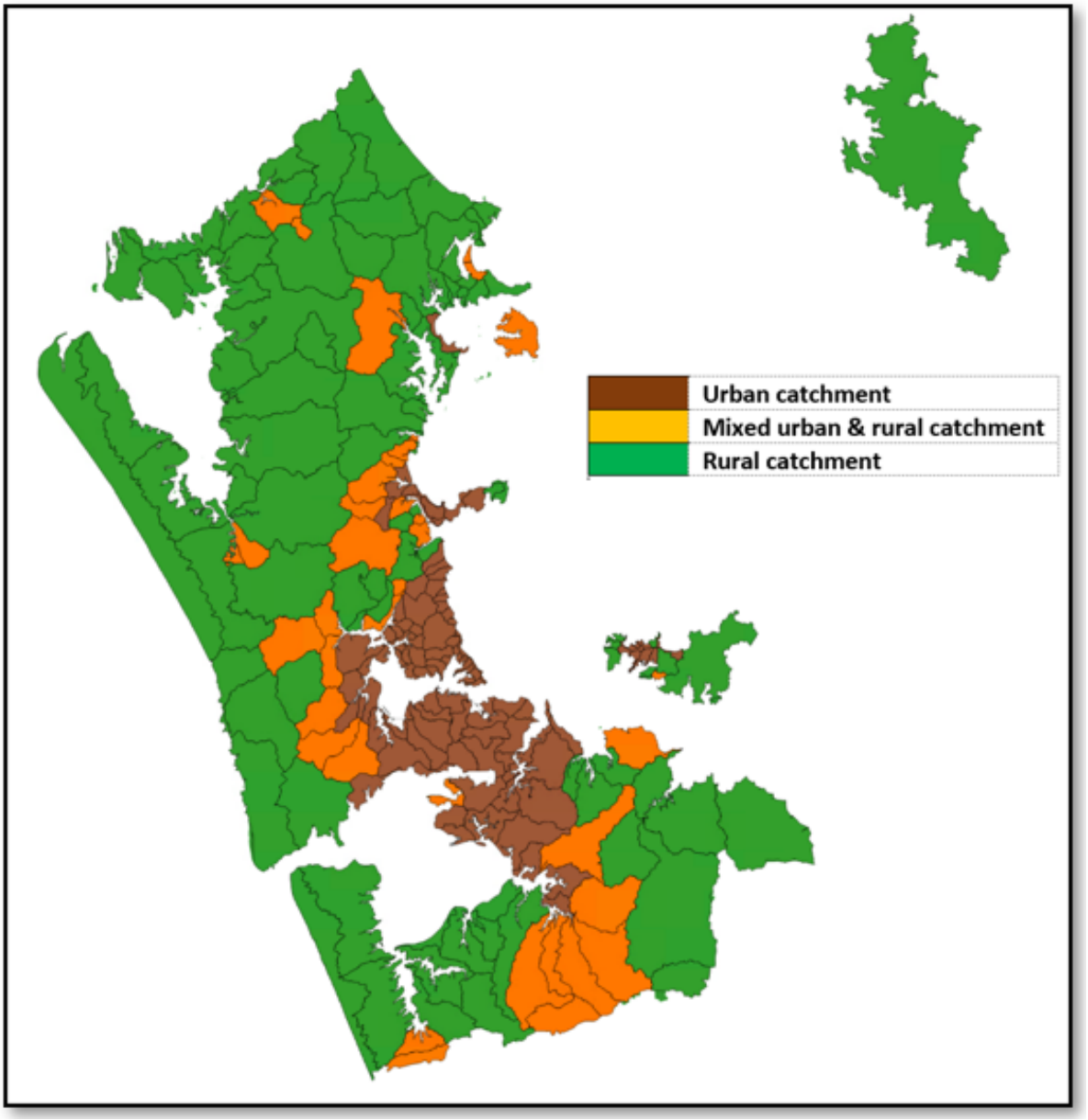


Figure 29. Auckland's stormwater catchments: urban, mixed urban and rural.

4.5 Key points and recommendations

There is significant change coming to the water industry over the next three years and this will require Healthy Waters to review priorities and practices including those within the NDC. This includes changes to the RMA and AUP(OP) as well as organisational reform as a result of the three waters reform. Although the objectives of the NDC should be used to influence and support these changes, it is also likely that the changes will result in the need to update and revise the NDC, possibly significantly, once established.

5. Engagement and feedback

5.1 Overview

Auckland's stormwater network is an open network that is impacted by many external influences. As such Healthy Waters recognise that they must collaborate and engage with others to ensure the system works and the NDC achieves its purpose.

Conditions 29-32 of the NDC set out the minimum requirements for engagement as part of the 6-yearly review, including who must be included and how this must take place. Various engagement tools were utilised including workshops, surveys, hui and email to reach a range of stakeholders such as local boards, mana whenua, industry professionals, interested community groups and the general public.

The full record of engagement undertaken is in appendix 8. Key matters raised are discussed below and recommendations for future actions have been identified.

5.2 Mana whenua

The 6-yearly review was introduced at the Infrastructure and Environmental Services Kaitiaki Forum in February 2022 to:

- enable each mana whenua group an opportunity to provide their feedback on how Healthy Waters was conducting the 6-yearly review
- seek interest in discussing further feedback on the implementation of the NDC.

Several ways of participating in the review were offered. Individual sessions were considered more appropriate by all kaitiaki representatives to each express their priorities and concerns in relation to the way stormwater is managed and impacting waterways within their respective rohe/area. The structure of each of the workshops varied depending on how familiar and involved each group were in the early phases of establishing the NDC.

The purpose of the workshops with mana whenua was to:

- understand how the NDC is performing according to their roles and responsibilities as kaitiaki
- understand the challenges and gaps that need to be addressed
- establish/re-establish relationships with kaitiaki who have and have not been involved in the previous NDC establishment
- initiate conversations about ongoing method for providing their input in following 6-yearly reviews

This was followed up by another session where Te Mātāpuna mō ngā Hapori, a Māori platform that currently exists within council, was used to demonstrate how Healthy Waters data and information could also be shared. This is one of the many tools that will be managed under the Te Taunga framework to enable mana whenua involvement in Healthy Waters processes when and where appropriate.

Overall, the individual sessions were well-received, concerns were raised, and they were satisfied with the efforts of Healthy Waters thinking about iwi involvement in the inception phases of a programme or project.

Some of the high-level themes from the discussions included but were not limited to:

- mana whenua want more access to readily available information/data of the waterways within their rohe. In doing so, this information would support mana whenua when directly dealing with developers for better water outcomes and also to facilitate where their priorities should be focused
- cumulative effects are not considered and treated as a significant matter as it should in the decisions that are made to approve developments especially for infill housing
- better utilise iwi management plans (IMP) that exist and support iwi who are still preparing theirs through existing resources
- explore options to review and co-design stormwater management plan especially around BPO to give effect to mana whenua cultural values
- staff to have better understanding of the environment through the lens of Māori. When environmental issues are discussed, Healthy Waters need to be able to explain the connection between western and Māori paradigms to effectively implement te mauri o te wai
- a gap of what mana whenua should be measuring against was highlighted overall. There are no cultural indicators for mana whenua to give feedback on about how the NDC is managing stormwater in relation to water quality of the waterways. This will also assist Healthy Waters in understanding what mana whenua perceives as 'healthy' rather than what council defines it to be
- mana whenua being involved in co-designing solutions for programmes and projects

Table 18 Summary of key matters which came up through engagement with mana whenua

Theme	Feedback	Healthy Waters feedback
Compliance and Monitoring	• often mana whenua felt there was no certainty of who was undertaking the role of enforcement because of what they were seeing on the ground with illegal discharging activities was more frequent • mana whenua also suggested to build a database of both public and private devices • if Healthy Waters/ council are realistically meeting compliance requirements and if not whether the gaps are known • concerns about old infrastructure and wastewater mixing especially in older parts of the city • mana whenua were aware of the bad environmental ratings in significant awa within their rohe. Whether this been elevated over the years after many projects that had started a few years back. Should inspire for drinkable water • good monitoring is important. Mana whenua should be part of co-designing the standards. Mana whenua want to be involved in monitoring their taonga. • water quality monitoring need to be a priority. All parties want to see what is happening especially the failures and this should be addressed in the data.	There are programmes currently set up for mana whenua to have an active and educational role in exercising their responsibilities in their takiwā. It is also important Healthy Waters co-design the programmes/projects to fully uplift the mana of each iwi and acknowledge they have their own tikanga and protocols in managing freshwater. Projects currently underway. • Proactive Compliance Programme • Industry and Trade Proactive Programme Refer to section 2.5.2 for more information on projects that respond to this feedback This is also acknowledged in the recommendations in section 2.7.6 (mana whenua 2) and section 3.4 (monitoring 4) as an additional required programme of works for cultural monitoring. Recommend similar models such as WaiCare programme for water quality monitoring with iwi.

Theme	Feedback	Healthy Waters feedback
Partnership/ Collaboration	• mana whenua wants to help uplift the minimum requirements as they believe Healthy Waters both hold the same values about the health of wai • the values and passion of iwi is closely aligned to Healthy Waters on water quality however what is different for mana whenua/iwi is how the implementation of *tika and kawa*[4] are practiced- this is what Healthy Waters should understand for better partnership • Healthy Waters can play a vital role in supporting iwi so that they are empowered to make those decisions • information as a result of the reviews can help shape iwi environmental plans so iwi is more inclusive of what their overall involvement will look like in terms of how their values are impacted and the measure associated with those values to determine level of engagement • explore options of co-designing contents of the Stormwater Management Plan Template	Programmes that seek to empower iwi as kaitiaki include. • Waterway Protection Fund • Whakapiki te mauri o pukearuhe Refer to section 2.5.2 and section 2.8 for more information on projects and recommendations that respond to this feedback
Treaty Settlements	• council staff need to be better informed about the practical use of these settlements redress in order to understand the aspirations of each individual iwi in relation to the awa in their rohe • good indications of where awa are located and what each group will focus on identifying as an interest as well as understanding the footprint	Council staff need to have a better understanding of iwi and treaty settlement processes. Where iwi who have not settled versus those who have will significantly impact mana whenua participation in freshwater management. Looking at treaty settlement redress to achieve effectiveness and mauri ora outcomes and what is being done council-wide while more iwi settle Te Taunga framework will assist in building cultural competency and guidance for staff to understand this more in section 2.7.3
Environmental Data	• mana whenua want access to the most up to date western science data in order to provide feedback in the ongoing 6-Yearly Reviews • it is important they have direct access to this information as part of the korero with developers/third parties • accumulative effects can be best understood with trends over time especially for infill housing, data capturing is very important in the water space • all awa have rich korero around it and would be helpful for monitoring data/state of environment to accompany this	Healthy Waters anticipate that sharing of information should be more frequent in a BAU manner. Although mana whenua do hold the mātauranga it is important that council recognises their rights to exercise tino rangatiratanga for managing their taonga in their rohe Section 2.3.12 discusses the impacts of growth in relation to cumulative effects and the recommendations related to SMP (section 2.3.19). Healthy Waters will add recommendation to upskill iwi representatives to understand what the data and information held means and its practicality in freshwater management while exploring how to display layer info of Te Ao Māori with trends

[4] *Tika* means what is true, correct and appropriate and *kawa* means protocol or behaviour depending on the iwi/marae.

Theme	Feedback	Healthy Waters feedback
Cultural indicators	• indicators need to be for Tangata Whenua/ Tangata Te Tiriti • stronger defined in freshwater catchments/marine environments because there is no idea of the actual state of health • what is healthy to mana whenua is different to what Healthy Waters/government thinks is healthy • understanding the natural state of the wai compared to what it is today • an important requirement for this kaupapa is to understand there is a gap of what Healthy Waters should be measuring against because there is nothing for mana whenua to give feedback on- is Healthy Waters measuring the right things- what should they be measuring? • transform the thinking about how each iwi care about their taonga and the values associated with it	While Healthy Waters acknowledge the gaps in what iwi should be feeding back on- once the NPS-FM is operative in the AUP this will have a trickledown effect into the NDC, and its requirements will be further realigned. In the meantime, Healthy Waters is planning to deliver and is delivering. • Manukau Harbour Cultural Monitoring • Kākahi Project: Working with specific iwi in kākahi (freshwater mussels) monitoring. Refer to section 2.5.2 for more information on projects that respond to this feedback Healthy Waters general approach is about projects influencing policy. While various indicators and values are set at a strategic level in council which will take time in conflict with prioritising the health and well-being of water first. Healthy Waters in the meantime will be able to identify very early on what certain indicators are specific to the projects we partner/support iwi on • A freshwater monitoring tool equivalent to the existing FWMT within Healthy Waters that reflects and prioritises the worldview of each iwi in their catchment
Te Ao Māori	• the original Māori names of lakes/awa and other freshwater bodies indicate a lot of the information of how kaitiaki manage the environment • Māori names speak to the place and association • Papatuanuku's face is constantly changing and in effect the vegetation is little to nothing which also impacts Tane which eventually gets blown into Tangaroa. Human activities disrupt the natural order. • when environmental issues are discussed, Healthy Waters need to be able to explain it in this way of Te Ao Māori in order to implement Te Mauri o te Wai effectively. • mana whenua will always request for the most soft engineered option if the natural option is not achievable. It affects the mauri and wairua[5] of the water. Only way to purify it is through Papatuanuku. Does not work through hard-engineered solutions but sometimes it is inevitable today • Western Science and Te Ao Māori/mātauranga Māori looks at it from a different cosmology or metaphysics. Understanding those differences and comparisons reflect whether things flow in a tika way.	There needs to be an understanding that all iwi are different and that includes the fabric of iwi, hapū and marae in the way they manage freshwater or respond to partnering with Healthy Waters in their projects. All iwi, hapū and marae will determine in their respective takiwā what Te mauri o te Wai means. This also means Healthy Waters need to build cultural competency within their staff to truly grasp what that looks like without it being lost in translation. Resourcing a body of mātauranga knowledge that is led and held by mana whenua to better navigate these concepts and inform work programmes

[5] *Wairua* refers to the soul or non physical spirit

Theme	Feedback	Healthy Waters feedback
Infrastructure	• green infrastructure is preferred and if it cannot be used as an option can this change over time • taking it from a Te Ao Māori perspective and Western analogy what flows from a tika way? Comparing the systems Healthy Waters works in to best achieve Te Mauri o te Wai	Acknowledged in section 2.3.9 for more green infrastructure and Water Sensitive Design recommendations, as well as section 2.2 on ensuring all Healthy Waters works assess feasibility of green infrastructure options.
Educational Campaign	• development setbacks is not a practical control to mitigate all of the impervious surfaces because they don't want to use tanks- perspective on reusing this water is seen as waste water rather than a resource	There has been a suite of information about rainwater tanks added to Auckland Councils website about benefits of collecting water. Also created videos and guidance documents on social media to send further messages around 'preparing for water shortages campaign.' https://www.aucklandcouncil.govt.nz/environment/looking-after-aucklands-water/rainwater-tanks/Pages/default.aspx
Legal/RMA	• Healthy Waters should focus on leading plan changes. Mana whenua understand the legal/Auckland Unitary Plan framework. When trying to achieve good environmental outcomes if the rules don't support it then there are loopholes to work around it which work against the values of mana whenua. • Can directly influence mana whenua position on good practice if there is support in the acts/laws.	Plan Change 54 which aimed to provide specific provisions in the AUP and Hauraki Gulf Islands District Plan that enables residential and rural properties to install rainwater tanks without need for resource consent. This could also lead to other Plan Changes that Healthy Waters could independently seek Refer to section 2.3.16 for recommendations and working collaboratively within Council to get these operative in the AUP.

The feedback above has been addressed throughout the review report and referred to in the response column. More co-design of solutions for programmes and projects that achieve intended outcomes in the feedback is needed. Using Te Taunga process will further alleviate any capability and capacity issues that iwi may have.

Overall recommendations can be found in section 6.2.

5.3 Local boards

Local board workshops were held in July and August 2022 to share the information from the review and hear their feedback. Local boards were provided with a copy of the Draft Review and a memo summarising the key points. Overall the workshops were well received and local boards appreciated the opportunity to be involved with the review. A summary of the feedback is in Table 19.

Table 19 Summary of feedback from Local Boards

Theme	Local Board Feedback	Healthy Waters response
General	Support for Healthy Waters work and for the recommendations of the review. Several boards also highlighted specific projects or outcomes achieved in their local areas.	Noted

Theme	Local Board Feedback	Healthy Waters response
General	Questions about local board involvement – • many boards wanted to know how they could assist Healthy Waters to achieve the outcomes of the NDC • many boards also wanted to know more about specific projects or programmes as a one-off or on an ongoing basis.	• Work with local board advisory team to provide briefing to local boards at the start of the new term. This will include Healthy Waters projects in their area, key issues in their area, monitoring and other data held by Healthy Waters about their area. • Work with local board advisory team to ensure that updates about progress on projects of interest to local boards are provided at appropriate times. • Work with local board advisory team to share with local boards how they can get involved with and advocate for Healthy Waters work. Recommendation Collaboration 1
Brownfield Development	Concerns about effects of brownfield development and intensification including: • Cumulative effects of small scale development such as erosion, pollution and flooding • Impact of NPS-UD • Ability of existing infrastructure to cope with intensification • Funding of upgrades	Healthy Waters shares many of these concerns as discussed in section 2.3 of this report. See recommendation Growth 2
Flooding	Concerns about existing and increasing flooding including: • Climate change • Not allowing development in flood plains • How managing existing flooding issues	Healthy Waters shares many of these concerns as discussed in section 2.4 of this report. See recommendations in section 2.4.12
Water Quality	Highlighting that managing pollution should be a priority Concerns about water quality including • Polluted runoff from industrial areas • Lack of water quality treatment prior to discharge from network to streams and coast • How can zinc and other contaminants be managed	Healthy Waters shares many of these concerns as discussed in section 2.3 of this report. See recommendations in section 2.3.19
Greenfield Development	Concerns about greenfield development being allowed in flood plains Effects of greenfield development of surrounding rural areas Important to make sure stormwater managed properly	Healthy Waters shares many of these concerns as discussed in section 2.3 & 2.4 of this report. See recommendations in section 2.3.19 and 2.4.12

Theme	Local Board Feedback	Healthy Waters response
Infrastructure in parks	Concern about stormwater infrastructure in parks including increasing number of stormwater outfalls as a result of development. Conflict between the stormwater functions of assets such as ponds or wetlands in parks and the other functions of parks.	Agree – it is a challenge with small scale intensification. Recommendation Growth 2 Understanding of multiple features/benefits of stormwater features eg ponds and conflicts about how these relate. As above Healthy Waters will work with local board advisory team to share information with local boards
Green Infrastructure as part of Stormwater Management	Would like to see more water sensitive design and more green infrastructure Interest in management of streams Importance of riparian planting and fish passage	Agree – See section 2.3.9 and recommendation growth 5 regarding water sensitive design implementation, as well as section 2.2 on ensuring all Healthy Waters works assess feasibility of green infrastructure options. As noted above – Healthy Waters will work with local board advisory team to ensure this information is shared on a regular basis.
Operation and maintenance	Operation and maintenance -in particular the relationship between Auckland Transport and Healthy Waters for maintenance of catch pits and similar assets. Maintenance of ponds in parks	Healthy Waters and Auckland Transport have service level agreements for Operation and maintenance
Monitoring	Questions about monitoring or sampling undertaken locally and a desire for more to be undertaken and shared with local boards.	Local information was shared as requested. As noted above – Healthy Waters will work with local board advisory team to ensure this information is shared on a regular basis. Section 3.1 of the review discusses the benefits of sampled results and other types of monitoring to understand the environment.
Mana Whenua	Importance of involvement of mana whenua	Agreed. Where requested summaries of the discussions held with local mana whenua were provided to the local board.
Location specific concerns	Location specific concerns such as about specific incident or projects in the local board area	Discussed at the workshop and followed up with relevant Healthy Waters team afterwards where needed.
Other	Other matters were raised which are out of scope of the NDC review including • Sediment runoff from construction sites • Matters related to wastewater overflows or discharges	Although out of scope of the stormwater network discharge consent, these are important issues which affect water quality and the environment. Auckland Council's 'closing the gap' programme aims to address sediment runoff from construction especially building sites through education and enforcement. Healthy Waters works closely with Watercare as discussed in section 2.6

As noted above many of the matters raised have been addressed through this review. Additionally specific recommendations in response to feedback received:

- Work with local board advisory team to provide briefing back to local boards at the start of the new term. This will include Healthy Waters projects in their area, key issues in their area, monitoring and other data held by Healthy Waters about their area as well as how Local Boards can advocate for Healthy Waters work and get their communities involved.
- Work with local board advisory team to ensure that updates about progress on projects of interest to local boards are provided at appropriate times.

5.4 Stormwater and development industry

Feedback from the stormwater and development industry is informally received on a regular basis as Healthy Waters staff interact in relation to development projects and in particular stormwater management plans. Key messages that have been received include concerns about inconsistency or a lack of clarity in applying the requirements in Schedule 4 as well as about the time it can take to receive approval of SMPs, these were key issues raised through the targeted industry engagement undertaken as part of the review also.

Targeted engagement with the stormwater industry in relation to the review included an online workshop with 16 participants as well as an online survey specifically about involvement with stormwater management plans and approval of stormwater management for development. Participants were also made aware of the public opportunity to provide feedback on the draft report via the Auckland Design Manual website.

The following table summarises the key messages from industry feedback. Response to these matters have been incorporated into the recommendations in Section 2.3.17 of this report.

Table 20 Summary of feedback received from stormwater industry

Theme	Feedback	Healthy Waters response
General	• Early engagement with Healthy Waters is valuable	
Best Practicable Option	• Definition of the BPO is problematic and guidance is required on how this is evaluated, including application of water sensitive design/integrated stormwater management. • Application of the BPO or treatment of all impervious surfaces is an equivalent option in Schedule 4. BPO application is difficult with treatment of all impervious surfaces being the Healthy Waters mindset. Not supported by evidence of effects. Practice notes would be helpful for industry practitioners	Healthy Waters to provide Internal and external guidance on BPO.

Theme	Feedback	Healthy Waters response
SMPs	Several matters were raised during the workshop and in subsequent survey feedback about the SMP preparation and approval process. A summary of the key issues is as follows: • Length of time to review and approve SMP documents. • Inconsistent advice from Healthy Waters staff as to the information required for an SMP vs the template requirements. • Lack of clarity on level of information required for an SMP (e.g. plan changes and resource consents). • Scalability of template tailored to development size/complexity. • Different templates required for greenfield/brownfield land use types. • Replication of information supplied as part of a resource consent application. • Accounting for superlots and how development will progress in accordance with SMPs.	Healthy Waters is aware of many of the issues raised. Recommendations to address these are outlined in section 2.3.19 and include • Updates to SMP template to clarify issues raised • Internal and external guidance on BPO • Review of internal SMP process to address consistency and timeframes.
Council Inconsistency	• Internal disagreements when dealing with multiple departments (e.g. Healthy Waters, Auckland Transport, Parks, Community Facilities). • Inconsistent opinions across Healthy Waters regarding stormwater management approaches. • Other council departments not on board with water sensitive design vision, e.g. multi use spaces.	• Healthy Waters work closely with Auckland Transport and Community Facilities and also experience these frustrations. • Review of internal SMP process to address consistency and timeframes.
Guidance Documents	• GD01 seems outdated relative to movement in industry trends and/or council asset preferences. • NDC and GD01 not aligned (e.g. water quality treatment expectations). • Directive language leads to confusion in light of 'guidance document' status.	• Investigate updates to GD01 – noting that this is not within the responsibilities of the Healthy Waters department.
Water Sensitive Design/ Integrated Stormwater Management	• Idealistic view of what WSD means and a barrier in consistency across the council family. • Constrained implementation in brownfield areas.	• As discussed in section 2.3.9

5.5 Stakeholder and community feedback

A list of specific stakeholders who must be engaged with is set out in condition 30. The stakeholders in this list were invited to provide feedback on the draft report. In compiling the final records of engagement, it was discovered that three stakeholders from this list were missed out of the original invitation to provide feedback. These three will be provided with the final report and summary of engagement following the review and invited to provide any further comments.

Condition 31 of the NDC sets out the requirement and mechanism for community groups and the public to provide feedback on the NDC review. The draft report was available on the Auckland Design Manual website from 18 July to 26 August for community feedback. A public notice was also placed in New Zealand Herald newspaper and on the Auckland Council website.

Five responses from stakeholders and members of the community were received and are summarised in table 21.

Although not many responses were received from the community, Auckland Council has undertaken a significant amount of engagement with community recently on similar and related topics. This includes recent changes to the Stormwater Bylaw and on the National Policy Statement for Freshwater Management. The feedback provided through that engagement can also provide insights into community values and concerns which Healthy Waters can utilise and consider as part of the ongoing NDC implementation.

Table 21 summary of feedback from stakeholders and community.

Theme	Feedback	Healthy Waters response
General comments	• Acknowledge recommendations in the review document • Healthy Waters has not met several targets due to funding restrictions – including its targets for maintenance and upgrade of its infrastructure assets and its targets for managing flooding. The major reason for shortfall on targets is said to be lack of funding. Whilst it is understood that council is having to manage many competing demands on a finite budget, as a matter of principle, council should not be cutting budgets where to do so means that it cannot meet consent requirements.	Comments noted.
Water Quality	• Plastic pollutants are a significant issue in Auckland's waterways. NDC must set a goal directly addressing the aspiration and need for a reduction in plastics being discharged by the network, which can be actioned by already existing programmes such as the Urban Contaminant Reduction programme. • Forest & Bird agrees that the Healthy Waters team should consider expanding resources to allow for SMP's to be required for 'less significant' brownfield developments. • support increasing the requirements in the Auckland Unitary Plan (AUP) for the mitigation of stormwater impacts • Acknowledgement of aspirations in relation to water quality and stormwater related provisions in the AUP. • any additional requirements in relation to treatment of impervious surfaces should be carefully considered and early engagement with industry (and stakeholders) on this matter is urged.	• Refer section 2.5.2 regarding plastic pollutants. • Remaining comments are noted.

Theme	Feedback	Healthy Waters response
Flooding	• Support for no new flood risk associated with greenfield development, however any associated revised policy direction in the AUP should also make allowance for development where there is a demonstration flood risk can be mitigated.	• Comment acknowledged.
SMPs	• The mentioned SMP template upgrade must be prioritised and should themselves prioritise natural environmental integration and minimising impacts. These must be easily interpreted to enable environmental protection and enhancement. • This is a clear indication that the NDC must adopt and enforce stricter sediment control guidance and measures when processing Stormwater Management Plans (SMPs).	Refer Section 2.3.19 regarding SMP actions.
WSD	• The profile of water sensitive design needs to be raised and overall understanding of the concept needs to be improved. There is clearly a lack in public knowledge around the range of benefits water sensitive design brings. It must be made clear that water sensitive design and the use of any green infrastructure not only increases flood resilience and water quality, but it can also have significant benefits towards economic, social and environmental health.	Comments acknowledged. Refer Section 2.3.9 regarding WSD implementation.
Assets	• Forest & Bird support the 'naturalising' (and 'daylighting') of piped streams when they reach end of life (and ideally sooner), as well as the conversion of stormwater ponds to wetlands. These are critical restoration actions that should be prioritized. • Concern that Healthy Waters has not updated its asset management plan, particularly to address the impacts of climate change • Whilst it is understood that Council's financial position will be affected by rapidly changing costs, that possibility should not preclude preparation of a plan that includes planning for this volatility. In particular, the critical asset survey/evaluation is seriously behind schedule. • The interaction between public and private assets needs to be monitored and obligations on private owners enforced. Private assets such as detention tanks and stormwater soak pits in soakage areas are not being inspected regularly for necessary and obligatory maintenance.	• Comments regarding daylighting and pond conversion are noted. • Refer Section 2.4.8 of this report regarding proposed amendments to the Stormwater CoP • The ability of the council to inspect and require private device operation and maintenance has been strengthened through the Stormwater Bylaw review process.
Changes to AUP	• Any changes to the Auckland Unitary Plan or associated NDC processes needs to proceed through the appropriate Resource Management channels • Input from Industry should be taken into consideration at the earliest of stages	Agree.
Cooperation between Healthy Waters and Watercare	• Resolution of uncontrolled wastewater overflows such as those observed in the Henderson Creek Wastewater Catchment. Not just focusing on the western isthmus, including use of targeted rate.	Noted.
Waiheke roadside drainage causing flooding issues for downslope properties	• Blocked and/or poorly maintained driveway crossing pipes causing flooding issues for downslope properties. • Request an urgent review be undertaken of the issue of failure to maintain clear drains under driveways, with a view to either (i) council resuming responsibility for keeping driveway drains clear of debris, albeit with a fee for owners, or (ii) annual reminders to property owners of their responsibilities on this matter.	Specific complaint passed on to appropriate Healthy Waters team for investigation.

The review of the Auckland Council Stormwater Bylaw 2015 included seeking feedback from local boards and the wider public. Although the submissions largely focused on bylaw clauses and its associated implementation, some points were raised where the bylaw interacted with the NDC and its associated outcomes and processes. A selection of the relevant points are summarised below:

- concerns regarding the difference between the NDC and AUP requirements
- a perception that stormwater related guideline documents are becoming mandatory standards raising the question of how compliance can be demonstrated
- concern around the ability for council to control private stormwater systems
- discussions around climate change.

Additionally, discussions were held with Watercare and Auckland Transport around the general matters of the NDC review and specific matters of concern.

Table 22 summary of discussions with Auckland Transport and Watercare.

Organisation	Feedback	Healthy Waters response
Auckland Transport	• Concerns about raingardens – safety • Discussed mechanisms to avoid new raingardens and resolve issues with existing ones • Need for greater Auckland Transport input into SMPs – discussed ways to achieve that • Concerns about stormwater assets in roads • Integration with road design – engineering and safety • Disagreement around need or not need for water quality treatment of lower use roads • Provided a copy of the review and no direct feedback received	Acknowledge frustrations. And share concerns regarding raingardens Stockholm tree pit programme, see section 2.3.14 Incorporate more clearly the need for engagement with Auckland Transport in SMP approval process Commitment to working together at all stages of development and operations.
Watercare	• Discussed integration and overlap with engagement on NDC 6-yearly review and Watercare's wastewater network strategy • Regular business as usual collaboration on shared programmes • Regular discussions on upcoming policy changes including three waters reform and collaboration on responses to those • Provided a copy of the review and no direct feedback received	Commitment to ongoing working together and integration of processes where relevant Commitment to ongoing collaboration on existing capital projects and programmes such as Safeswim and safe networks.

5.6 Key points and recommendations

All feedback and resulting recommendations have been incorporated in relevant sections of report as noted.

6. Recommendations and conclusions

6.1 Conclusion

The regionwide NDC authorises the diversion and discharge of stormwater from the current and future public stormwater network. It sets out the outcomes and targets to measure performance as well as design and connection requirements. This is the first comprehensive review of the network discharge consent (NDC) since it was granted in 2019. The review has found that Healthy Waters is on track to meet the majority of the six year targets set out in Schedule 2 of the NDC and overall is making satisfactory progress towards achieving the NDC outcomes and objectives.

The NDC review has considered each of the issues in Schedule 2 and looked at how the NDC is being implemented, the programmes in place and the challenges faced. Recommendations are made for improvements within each issue and in response to feedback received through engagement with mana whenua and other stakeholders.

For growth and development, it is the NDC that informs behaviours and decision making and where the most change has been introduced, including the new processes and connection requirements associated with Schedule 4. While this has been in the most part successful, there are many challenges and further improvements are needed to streamline this process and make it easier for both Healthy Waters staff and industry to successfully enable growth through water sensitive development and provision of quality stormwater infrastructure. This will include providing more guidance information as well as relooking at how to approach the effects of development in brownfield areas.

For assets, flooding, stream and coastal health, there are existing programmes of work which contribute to achieving the objectives and targets of the NDC, though some have been impacted by Covid-19. The recommendations therefore focus on delivery of ongoing work programmes, with some minor changes proposed.

State of the Environment Monitoring and Freshwater Management Tool outputs show existing degradation of water quality across the urban areas in the Auckland region for ecosystem and human health contaminants (e.g., nutrients, faecal indicator bacteria, heavy metals, sediment). With the NDC being operative for only three years, it is too early to identify environmental changes, as interventions take years to decades to be measurable. However, several programmes are in place to improve water quality outcomes, and new processes, such as SMP requirements, seek improved outcomes from new development. Healthy Water's monitoring strategy relies on a range of evaluative and measurable programmes to assess the benefits of HW projects and initiatives, the performance of the NDC and the condition of the receiving environments. Additional environmental monitoring and sampling programmes are required to comply with the requirements of the NDC and to better understand its effectiveness.

There is significant change coming to the water industry over the next three years and this will require Healthy Waters to review priorities and practices including those within the NDC. Changes include organisational reform as a result of the three waters reform as well changes to the RMA and AUP(OP). The objectives of the NDC will be used to influence, support and respond to these changes, and it is also likely that the changes will result in the need to update and revise the NDC, possibly significantly, once established. There is also a current focus on implementing and incorporating te mauri o te wai into all aspects of Healthy Waters work and responding to climate change.

There is particular risk with the three waters reforms as the detail of the responsibilities of the new entity have not yet been defined, especially for stormwater. The successful implementation of the NDC relies on

an integrated and holistic approach to managing stormwater, which includes matters beyond the piped network and asset management. However if the current scope of the Healthy Waters department is reduced when the new entity is formed, there is a risk to the ability to deliver on the outcomes sought by the NDC. For instance, as streams both play both a critical function in the performance of the stormwater network as well as hold old intrinsic biodiversity and ecological values, the roles and responsibilities for managing streams will need be clarified as the reforms progress. There are also opportunities that will come from the reforms including greater collaboration and efficiencies.

A key expected outcome of the review is the identification of changes to the network discharge consent or improvements to management processes. Given the significant changes expected in the next three years, now is not the time to be making major alterations to the conditions or schedules of the NDC. It is recommended that following the next triennial review in 2025 or the next 6-yearly review in 2028, changes to the NDC are undertaken to ensure alignment of NDC requirements with responses to current central government reforms and the NPS-FM.

In the interim, recommended changes to the NDC conditions and schedules are limited to some updates of six-year targets (by managers approval request) in order to reflect progress of current programmes, retain consistency with strategic documents, provide clarity and refine wording. It is noted however that updates of some other targets will also need to be informed by, and so undertaken following, the three water reforms, e.g., current DIA based performance targets.

The recommendations of the review focus on continuing to implement and improve programmes which are already in place, and on changes such as process improvements, additional work programmes and provision of further guidance in order to improve the implementation of the NDC. The full recommendations are in section 6.2.

6.2 Recommendations

The following recommendations are the outcome of the NDC review:

Table 23 Recommendations and future actions from the NDC 6 yearly review.

Reference	Recommendation and future actions	Timeframe
Schedule 2 Amendments	Proposed amendments to Schedule 2 targets: Issue 1 Assets • Target a) Survey 95% of critical assets by 2026 – adding a specific date makes this target easier to measure as part of CCTV contracts. • Target b) 90% of Grade 4 critical assets will be repaired or renewed within 10 years – this reflects that these assets are not deteriorating as quickly as anticipated, and can be managed through increased monitoring. • Target c) 90% of Grade 5 critical assets will be repaired or renewed within 5 years – like Grade 4 assets, these assets are not deteriorating as quickly as anticipated, and can be managed through increased monitoring. In addition, due to a range of factors such as consenting, renewals projects are unlikely to be carried out within 24 months. • Target f) Stormwater manholes that pop open in flood events are made safe within three hours: 90% - this reflects the current LTP target on this matter, which was subject to public consultation processes. Issue 2 Growth • No proposed amendments to Schedule 2 targets as part of this review.	Managers approval sought concurrently with certification (or as stated)

Reference	Recommendation and future actions	Timeframe
	Issue 3 Flooding • No proposed amendments to Schedule 2 targets as part of this review. • Targets b),c), d), e) and f) will be reviewed as the three waters reforms are progressed. Issue 4 Stream Health • Remove target 4(b) - "The ratio of the length of watercourse consented to be physically improved versus physically degraded in each year", as although this matter is important to maintaining and enhancing stream health, this target is outside of Healthy Waters control to implement and has been removed from the LTP as a performance indicator. • Reword target 4(f) – "Incorporate the Mauri model into Healthy Waters' capital delivery project assessments", to reflect new Māori Outcomes framework. (to be changed following mana whenua engagement) Issue 5 Coastal Health • Reword target 5 e) ***Work with mana whenua and other parties to identify areas of safe consumption of kaimoana/mahinga kai and other aspects of coastal health and values (NPSFM –part of watershed implementation plans)*** to incorporate into new Māori Outcomes framework. (to be changed following mana whenua engagement) Issue 6 Groundwater Health • No proposed amendments to Schedule 2 targets as part of this review. Issue 7 Effects on wastewater system • No proposed amendments to Schedule 2 targets as part of this review. Issue 8 Collaborative outcomes • Reword targets 8 a), b) to ensure that these targets relate to current collaboration with mana whenua, reflect current programmes and approaches, and appropriately incorporate the Māori Outcomes framework. (to be changed following mana whenua engagement) • Remove target 8c) ***>$100,000 of other Council departments or CCOs growth projects are supported by the HW capital investment each year (AMP)***as this is a direct duplicate of growth 2 d) Other minor proposed changes to reflect works completed to date and that are now ongoing programmes are detailed in Appendix 1 – Schedule 2 assessment.	
Assets		
Assets 2	The 2015 Condition Monitoring Framework will need to be reviewed. Similarly, the review of the 2016 renewal strategy should continue. These reviews will need to assess coastal outfalls and ponds. Note that these reviews will be subject to the outcomes of the three waters reform.	Leading up to 2024/ Following three water reform
Assets 3	Scope and implement ponds renewal programme, based on a criticality framework under development.	Leading up to 2024
Assets 4	Implement work currently programmed to incorporate improved safety measures in the design and construction of raingardens, as well as to explore how such devices can be retrofitted or replaced in line with the requirements of this consent.	Leading up to 2024

Reference	Recommendation and future actions	Timeframe
Growth		
Growth 1	Improvements to SMP review process within Healthy Waters including • ongoing training with Healthy Waters and relevant council staff to improve consistency of advice to industry practitioners and capture matters such as SMP review practice and changes in industry stormwater management trends. • Simplification of the process where possible • Attention to timeframes for review and approval • Clarity and consistency re BPO and interpretation of NDC schedule 4 • Clarification as to the role of SMPs within the plan change process. • HW will continue to encourage applicants to engagement with HW early in their design processes to resolve matters of difference early and therefore reduce delays alter in the regulatory processes where timeframes become critical.	Immediately following review
Growth 2	SMP Template updates Given the importance of the template in guiding the content of SMPs and the importance of SMPs in outlining and determining the management of stormwater runoff from development, updates to the template need to be made as a priority. Updates to the template will need to consider all of the feedback received from Healthy Waters teams, industry, mana whenua and other stakeholders. Updates to cover (but not limited to): • review and *rationalisation of SMP content* • the ability to make the template scalable to tailor differing development scenarios and trends in development typology (e.g., superlots). • Clarity around level of detail required at different stages in the process. • Consideration of separate template for greenfield and brownfield development • Clarity around justification of BPO • Water sensitive design • Incorporation of Te Mana o te Wai principles	This financial year
Growth 3	Review of overarching stormwater management best practicable option in brownfield areas In order to manage the cumulative effects of multiple and increasing small scale development and to meet possible future targets which come from implementation of the National Policy Statement for Freshwater Management (NPS-FM), Healthy Waters will need to further review the overall approach to managing stormwater runoff in brownfield areas which can be significantly more complicated than greenfield development. The review will need to consider and balance the benefits of at source management, the extent of opportunities from redevelopment with scale and distribution of that redevelopment and available opportunities for catchment or sub-catchment scale targeted improvements through publicly funded and communal projects.	Initiate this financial year
Growth 4	Water Quality a) Further develop the freshwater management tool or a simplified contaminant load model for use at development scale for the purpose of comparative analysis of contaminant generation from development proposals. b) Develop a set of principles relating to water quality offsetting and share these with industry to ensure that any proposals for offsetting are robustly supported with sufficient information.	Leading up to 2024

Reference	Recommendation and future actions	Timeframe
Growth 5	Implementation of water sensitive design a) In order to improve implementation of water sensitive design (WSD) for stormwater and to meet the NDC objectives and outcomes, the profile of WSD needs to be raised and overall understanding of the concept across Healthy Waters, the wider council family and the development industry needs to be improved. Support internal and external training as well as updates to the existing guidance. b) Investigate role of GD04 to assist with WSD implementation including defining how it can work with GD01.	Ongoing
Growth 6	Provision of additional guidance information: a) updates to the SMP template/guidance (recommendation Growth 2) b) a guidance note on water quality requirements for brownfield redevelopments c) a practice note on pipe capacity and connections in brownfields areas. d) additional guidance be provided for applicants and their professional team around determining and justifying best practicable option (BPO), and the requirements of NDC Schedule 4. (this may be incorporated into the SMP template updates)	This financial year
Growth 7	Improve working closely with agencies such as AT, parks, plans and places to address apparent inconsistences in stormwater management approaches, including implementation of WSD in council family land and projects.	Ongoing
Growth 8	Investigate and contribute to updates to GD01 to improve alignment with NDC implementation, including clarifying matters such a water quality treatment for various land use types – work closely with Resilient Land and Coast department. Note that this is not within the control of Healthy Waters.	Ongoing
Growth 9	Continue with ongoing process improvements to asset vesting process	Ongoing
Growth 10	Future changes to the Auckland Unitary Plan Much of the implementation of Schedule 4 and the stormwater management requirements for third parties relies on the Auckland Unitary Plan (AUP) framework. There are several upcoming plan changes to the AUP(OP) as a result of the NPS-FM and as the outcome of the plan effectiveness review of the AUP(OP) currently being undertaken by Auckland Council Plans and Places department (section 35 review). It is recommended that Healthy Waters continue to engage and support the Auckland Council's Plans and Places department, to build and collate a common evidence base to support future plan changes. In particular: • consider whether increased water quality mitigation requirements should be incorporated into the AUP. The current water quality provisions are focused on high contaminant generating areas, but this may need to be expanded to require mitigation for more or all types of impervious areas • resolving inconsistencies in Chapter E8 of the AUP(OP) which make the integration of the NDC into the resource consent process unnecessarily difficult If the scope of the upcoming changes to the AUP(OP) is not sufficient to address the above matters, then Healthy Waters should investigate alternative methods including progressing changes to the AUP(OP) independently.	Leading up to 2024
Growth 11	Schedule 4 - connection requirements a) No proposed amendments to Schedule 2 targets as part of this review. b) Investigate and document evidence base for future changes to Schedule 4 including appropriate consultation with industry practitioners and other interested parties	Ongoing

Reference	Recommendation and future actions	Timeframe
Flooding		
Flooding 2	Flood hazard identification and risk assessment a) Continue to refine the definition of a "high flood risk," as understanding the different types of flood risk across the region is key to communicating to communities and identifying how these risks can be mitigated. b) Improve engagement of flooding risks and their management to council governance. This includes identifying metrics to be regularly reported, for instance, number of buildings exposed to flood hazards, requests for services and updates on actions being undertaken to mitigate this risk. c) Continue to engage with the fire services, other parts of council and insurance companies to collate a more comprehensive picture of flooding events, in particular where habitable floors are impacted.	Ongoing
Flooding 3	Supporting community resilience a) Increase awareness of impacts of impervious areas through existing council sustainability initiatives, as well as working with local community groups, landscape designers and suppliers b) Advocate the retrofitting of buildings for resilience, e.g, the selection of materials, location of electrical supply and protection of overland flowpaths. c) Continue to develop flooding communications strategy, targeting people such as those who are at high-risk, have experienced flooding, are predicted to be in a flood zone but haven't experienced flooding yet and may encounter flood hazards (e.g. everyone, people may drive through flood water). d) Continue to advocate and raise the awareness of the importance of overland flowpaths and streams in the safe conveyance of water.	Ongoing
Flooding 4	Advocating for flood protection and resilience during development a) Advocate for increased building flood resilience in new development and redevelopment, such as through the selection of water resilient materials, location of electrical supply and protection of overland flowpaths. b) Continue to advocate and raise the awareness of the importance of overland flowpaths and streams in in the safe conveyance of water. c) Continue to incorporate flooding risk provisions in the update of SMPs and review of brownfield development controls, as identified in Issue 3 Growth in this review. d) Continue to advocate for flood risk avoidance and reduction provisions during urban development in upcoming AUP(OP) plan changes. Specific recommendations include: • strengthening the Regional Policy Statement to explicitly direct that there is no greenfield development in floodplains to avoid creating new flood risk • a new zone or overlay to denote areas subject to, or contributing to, natural hazards with additional district plan rules to ensure flood risks are not increased • recommendations from the s35 review. e) Continue to advocate for flood risk avoidance and reduction provisions in the review of council strategies and policies, including upcoming updates to Future Development Strategy and Open Space Policy f) Continue to advocate for flood risk avoidance and reduction provisions in central government reforms, such as RMA reforms, Water Reforms, and Building Act, focusing on incorporating flood protection in primary legislation for greatest weight.	Ongoing
Stream Health		
Stream Health 1	Continue implementation of the programmes and initiatives currently in place.	Ongoing

Reference	Recommendation and future actions	Timeframe
Stream Health 2	Continue development and improvement of the Freshwater Management Tool for decision support to prioritise interventions for contaminant management as well as to assess level of benefits in water quality from works completed.	Ongoing
Stream Health 3	Scope stream rehabilitation pilots for selected private streams known to have significant erosion issues, in recognition that such streams provide an important public service in terms of stormwater conveyance (in line with target 4(d)), noting that the responsibility for caring for urban streams may change following three waters reform.	Following three water reform
Stream Health 4	Review current practices to assess alignment with Green Infrastructure Policy for Heathy Waters' (GINA), noting that further change may be required following the three waters reform.	Following three water reform
Monitoring		
Monitoring 1	Update of the monitoring strategy to include: a) Consideration of renaming to "NDC Evaluation Strategy" to better reflect the content and intent of the strategy. b) Further updates and improvements required by the certification letter to be incorporated following and based on the findings of the 6-yearly review. c) Recommendations specified below.	Immediately following Review
Monitoring 2	Continue to develop target monitoring programmes to specifically assess stormwater discharges effects, as required by conditions of consent. These include: a) intervention effectiveness monitoring including stormwater device performance, water sensitive design implementation and impacts of interventions on the receiving environment (as required by condition 37). Therefore, there is a need to establish a monitoring sampling programme in urban areas (e.g., catchment areas with conventional stormwater infrastructure compared to catchments using water sensitive principles) to assess the impacts of the stormwater network in the environment and assess the effectiveness of water sensitive design b) monitoring of the implementation of adopted stormwater management plans which may include stormwater device monitoring as part of intervention effectiveness monitoring (as required by NDC permit, condition 37) c) expanded targeted monitoring of a broader suite of contaminants such as sediment, emerging contaminants, gross pollutants and plastics (as required by NDC permit, condition 37)	Before next review
Monitoring 3	Explore opportunities to incorporate citizen science monitoring and collaborate with universities (e.g., microplastics monitoring)	Ongoing
Monitoring 4	Iwi led cultural monitoring is required to be incorporated to complement and support the western science monitoring, as part of Healthy Waters partnership with mana whenua and as required by condition 37 of the NDC the monitoring strategy	Ongoing
Collaboration		
Collaboration 1	Work with local board advisory team to • provide briefing back to local boards at the start of the new term. This will include Healthy Waters projects in their area, key issues in their area, monitoring and other data held by Healthy Waters about their area as well as how Local Boards can advocate for Healthy Waters work and get their communities involved. • ensure that updates about progress on projects of interest to local boards are provided at appropriate times.	Immediately Ongoing
Collaboration 2	Improve and continue to work closely with council departments and boarder council family including Watercare and Auckland Transport.	Ongoing

Reference	Recommendation and future actions	Timeframe
Mana whenua and Māori outcomes		
Mana whenua 1	Update the NDC mana whenua engagement strategy to reflect Te Taunga and other recent initiatives	Immediately following Review
Mana whenua 2	Continue to work with mana whenua to scope and co-develop initiatives. This may include: • Resourcing a body of mātauranga knowledge that is led and held by mana whenua that is then used to inform and direct HW programmes and initiatives. • Resourcing independent specialists to support iwi • Supporting and resourcing Iwi led cultural monitoring and kaitiakitanga initiatives • Access and auditing of information and data • GIS based knowledge portal and engagement tools	Ongoing
Mana whenua 3	Work with mana whenua in relation to central government policy & reforms, Unitary Plan Changes, hearings and Stormwater Management Plans, exploring opportunities to share catchment information and guidance with one another in order to align into policy and plans.	Ongoing
Mana whenua 4	Healthy Waters staff to work with mana whenua to understand and support the implementation of Te Mauri o te Wai	Ongoing
Mana whenua 5	Work together with mana whenua to reword targets recommended to be updated.	Immediately following Review
Māori outcomes 1	Council staff to understand Te Tiriti o Waitangi and the practical use of Treaty settlements and statutory acknowledgements in the catchments and cultural protocols.	Ongoing

7. References

Auckland Council. Natural environment and water quality targeted rates Report. Highlights 2020/2021

Auckland Plan 2050. Available at: https://www.aucklandcouncil.govt.nz/plans-projects-policies-reports-bylaws/our-plans-strategies/auckland-plan/Pages/default.aspx

Auckland Water Strategy. Available at: https://www.aucklandcouncil.govt.nz/environment/looking-after-aucklands-water/Documents/auckland-water-strategy.pdf

Chaffe, A. (2021). River ecology state and trends in Tāmaki Makaurau / Auckland 2010- 2019. State of the environment reporting. Auckland Council technical report, TR2021/05

Drylie, T P (2021). Marine ecology state and trends in Tāmaki Makaurau / Auckland to 2019. State of the environment reporting. Auckland Council technical report, TR2021/09

Foster, C and K Johnson (2021). Groundwater quality state and trends in Tāmaki Makaurau / Auckland 2010-2019. State of the environment reporting. Revised October 2021 Auckland Council technical report, TR2021/03-2

Ingley, R (2021). Coastal and estuarine water quality state and trends in Tāmaki Makaurau / Auckland 2010-2019. State of the environment reporting. Auckland Council technical report, TR2021/02

Ingley, R (2021). River water quality state and trends in Tāmaki Makaurau / Auckland 2010-2019. State of the environment reporting. Auckland Council technical report, TR2021/07

Ira, S.J.T. 2022. Auckland Water Strategy Supplementary Document: Investigation of barriers and opportunities to further implement Water Sensitive Design in Auckland. Report prepared for Auckland Council.

Ministry for the Environment, 2017. National Planning Standards: Zones and overlays – spatial layers in plans: Discussion paper C. Wellington: Ministry for the Environment). [1]

Mills, G N and H Allen (2021). Marine sediment contaminant state and trends in Tāmaki Makaurau / Auckland 2004-2019. State of the environment reporting. Auckland Council technical report, TR2021/10

8. Appendices

Appendix 1 Full assessment against Schedule 2

Appendix 2 Assessment against full NDC conditions

Appendix 3 Assessment against Conditions 25-32 relating to the 6 year review

Appendix 4 Updated Schedule 1

Appendix 5 Copy of the certified Monitoring Strategy

Appendix 6 Assessment of Schedule 4

Appendix 7 Updated Schedule 10

Appendix 8 Records of engagement undertaken

Appendix 9 Register of capital works and community projects completed or underway