Nelson City Council
Te Kaunihera o Whakatū

# NELSON

## INFRASTRUCTURE STRATEGY

# 2021-51

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# EXECUTIVE SUMMARY

The purpose of an infrastructure strategy is to identify significant infrastructure issues during the period covered by the strategy (which needs to be at least 30 years), the principal options for managing those issues, and the implications of those options.

Part One of this strategy summarises how Council's strategic direction, which is driven by both local and national objectives, influences the provision of infrastructure.

Part Two discusses the specific issues Council needs to address related to water supply, wastewater, stormwater & flood protection, transport and solid waste management, in order to achieve objectives related to:

- managing risks related to natural hazards and climate change
- maintaining, renewing and upgrading infrastructure
- meeting the needs of growth
- maintaining and enhancing public health and safety outcomes, and the environment

Part Two also includes options tables which estimate the cost of alternative options to address the issues. This includes the potential costs of failing to prepare for climate change impacts.

Part Three provides an overview of the financial implications of Council's proposed approach to infrastructure management.

***[To be completed later in 2020 after the financial information is finalised in the AMPs.]***

Public and active transport, solid waste services have been included in this strategy for the first time. This is in addition to the activities which the Local Government Act requires all councils to include — water supply, wastewater, stormwater & flood protection, as well as roads and footpaths.

A separate infrastructure strategy will be prepared for the Regional Landfill Business Unit and Nelson Regional Sewerage Business Unit which manages the Bell Island Wastewater Treatment Plant which processes approximately half of Nelson's wastewater.

## COVID-19

The global pandemic of COVID-19 will have significant and long-lasting impacts on the Infrastructure Strategy work of Council. The Infrastructure Strategy is a "living" document and this information will be updated as new information comes available. The high degree of uncertainty regarding future scenarios for how the pandemic will play out globally and in New Zealand means that Council's response will need to remain agile and adaptive. COVID-19 was first and foremost a health crisis. However the measures put in place globally to minimise this health crisis have resulted in unprecedented disruption to global economic activity, including trade and tourism. New Zealand and the Nelson region have not been immune to this disruption, with Gross Domestic Product (GDP) forecast to contract in 2020 by around 8%, and unemployment rising to just around 9%. While economic activity in New Zealand has largely been able to return to normal under 'Level 1', closure of the borders to tourism and a global economic recession will continue to impact Nelson over the medium term.

The 2020 'Rebuilding Together' central government Budget established a $50 billion COVID-19 Recovery and Response Fund which will increase net core crown debt from 30% to 50% of GDP from now to 2023. A proportion of this budget will be allocated for infrastructure investment such as the "Shovel Ready projects" in addition to the $12 billion upgrades programme announced in January 2020.

It is anticipated that given the inability of many major overseas countries to contain the spread of COVID-19, New Zealand's borders will remain closed to most countries for the foreseeable future. An assumption for the Long Term Plan 2021-31 and the Infrastructure Strategy is that that there will be limited importation of cases of COVID-19 and any community transmission will not require a return to nationwide lockdown. This will enable New Zealand, including Council, to carry out infrastructure work largely as business as usual.

Latest forecasts estimate that Council revenue will be down 3% in 2020/21 year largely due to reduced income from consent fees, and commercial revenue. Council receives a large proportion (67-70%) of revenue from rates. To enable a 0% rates increase for 2020/21, a number of measures were implemented to identify operational savings such as a freeze on staff pay rates and training. A draw down against the Disaster Recovery Fund was made to meet the additional gap in funding still required. This will be debt funded and in combination with decreased revenue will increase the debt to total revenue ratio to approximately 101% as at 30 June 2021.

It will likely take a three to four year period to fully recover from the impacts of COVID-19 which will require ongoing use of the Disaster Recovery Fund to offset lower revenue – for the 2021/22 and 2022/23 financial years. This may require Council to review levels of service. Council is however, cognisant of the importance of maintaining capital spending to support the economic recovery in our region. The financial risks are expected to be manageable due to the strong financial position of the Council and relatively low debt burden as interest rates are forecast to remain low in the short to medium term. Affordability of rates may become an issue if unemployment and business closures increase significantly.

In the medium term (2-5years), it is assumed that a vaccine will be developed which will allow for a gradual re-opening of borders. On-going second waves of infection are likely to continue to be experienced globally, although at this stage with strict border controls, unlikely in New Zealand. The time required to develop, test and distribute a vaccine is expected to exacerbate the global economic downturn which may in turn impact New Zealand's export earnings and supply chains. Job numbers are not expected to return to pre-COVID-19 levels until at least March 2034 with a long-lasting change in distribution of jobs across sectors.

In summary, the main effects of COVID-19 on the Infrastructure Strategy are expected in the first 3-5 years of the strategy. However, so long as community transmission does not occur, or is limited in New Zealand, then levels of service and the infrastructure work programme set out in the Strategy are considered achievable. Council will continue to be agile in its response to changing economic and social conditions and the Strategy will be reviewed in 2023, as part of the development of the 2024 Long Term Plan.

## Strategic direction — overview

Many changes have occurred since the previous infrastructure strategy was adopted in 2018. Additional strategic direction for infrastructure management includes:

- the development of a vision for Nelson
- Council priorities related to a sustainable transport culture, housing intensification and affordability, and enhancement of the Maitai River Precinct
- a new Government Policy Statement for land transport with a strong focus on safety, multi-modal transport options and reducing emissions
- increased national and local commitments to both adapt to climate change and reduce emissions
- stricter freshwater provisions and policy direction from central government
- adoption of the Future Development Strategy to guide where and how new residential and business development should occur

## Transport

Strategic changes related to transport include:

- amendments to the Government Policy Statement on Land Transport
- increasing commitments at a national and local level to climate change adaptation and mitigation
- the upcoming Nelson Future Access Strategy to address capacity constraints on Nelson's transport network that impact on the city's ability to accommodate growth and intensification.

Significant transport issues considered in this infrastructure strategy include:

- The transport network is critical to enable all other utilities to get up and running following natural hazard events, by enabling essential service vehicles to access affected areas
- Incomplete network data
- The current transport system is in a highly constrained geographic environment, with hills on one side and the Tasman Sea on the other. The growing demand for travel is being squeezed through two arterial roads that must function as 'all things to all users'
- When and where to provide increased capacity of the transport network to provide for urban intensification and growth
- Growth in the number of car users, and slow uptake of alternative transport options, has increased the demands on the existing road network.

## Water Supply

Strategic changes related to the water supply include:

- the increasing potential for extended periods of dry weather as a result of climate change, affecting water security
- the need to meet the requirements of the upcoming National Policy Statement for Freshwater Management and National Environmental Standards, and comply with the 2017 and 2019 water supply resource consent conditions
- the outcomes of the Three Waters Review and an increased focus on protection of public health associated with community water supplies
- Nelson's water supply catchments have capacity to meet water demands well into the latter part of the century. However there are constraints in some areas of the city reticulation that impact on the city's ability to accommodate growth and intensification. This is particularly the case in the Maitai Valley, south Nelson and parts of the inner city.

Significant water supply issues considered in this infrastructure strategy include:

- The older piped water reticulation network is at risk of damage during earthquakes and flood events. In 2014 work to duplicate the raw water supply pipe from the Maitai Dam to the Water Treatment Plant was completed
- Water supply assets are starting to show signs of age, resulting in increased failures. Due to a greater proportion of the network reaching the end of its design life, a significant length of watermains will need to be renewed within the next 30-50 years
- Levels of service for water supply will reduce unless assets are maintained, renewed and upgraded in a timely fashion

- 20-25% of water supplied is not able to be accounted for in the water supply network
- Being able to access water from the Maitai Dam increases the resilience of the water supply network. The presence of *Lindavia intermedia* in the Maitai Dam lake is being investigated to ensure that any future impacts on the Water Treatment Plant processing system are managed by the plant operators
- Deposits in cast-iron pipes are discolouring the water supply received by some customers
- The need to improve the quality of water discharges from the Maitai Dam into the Maitai River to avoid impacts on the downstream environment.

### Wastewater

Strategic changes related to wastewater include:

- the need to consider relocation of the Nelson Wastewater Treatment Plant (NWWTP) in future as part of the 2024 resource consent application, taking into account the impacts of climate change and cultural values
- new requirements for wastewater management as a result of the Three Waters Review and the proposed legislative changes arising from the Action for Healthy Waterways programme
- the need to manage, reduce and mitigate wastewater emissions in line with new climate change legislation and targets
- Nelson's wastewater network has capacity constraints that impact on the city's ability to accommodate intensification and growth.

Significant wastewater issues considered in this infrastructure strategy include:

- The impact of climate change and new requirements for wastewater discharges on the long-term viability of the NWWTP's current location and treatment processes/disposal routes
- Planned levels of service for wastewater will not be met unless assets are maintained, renewed and upgraded
- Inflow and infiltration causes overflows from the wastewater network
- Failures of the Atawhai rising main could result in untreated wastewater discharges directly into Nelson Haven
- Nelson's wastewater network has capacity constraints that impact on the city's ability to accommodate growth and intensification.

## Stormwater and flood protection

Strategic changes related to the stormwater and flood protection include:

- the impacts of increased intensity and frequency of significant rainfall events and sea level rise on stormwater & flood management
- Nelson's stormwater network has capacity constraints that impact on the city's ability to accommodate growth and intensification
- the development of a new resource management plan for Nelson, the Whakamahere Whakatū Nelson Plan, and the implementation in that Plan of national freshwater policy which will set higher standards related to the quality of stormwater being discharged into freshwater and coastal environments.

Significant stormwater and flood protection issues considered in this infrastructure strategy include:

- Unless additional capacity is allowed for, the level of service provided by existing stormwater and flood protection assets will progressively reduce over time due to more intense storms and sea level rise projected with climate change
- Damage to the stormwater network from natural hazards and climate change
- Planned levels of service for stormwater and flood protection will not be met unless assets are maintained, renewed and upgraded
- A significant length of stormwater pipelines will need to be renewed as a greater portion of the network will reach the end of its design life beyond the next 30 years
- Management of increased stormwater flows associated with urban intensification and growth
- Meeting new freshwater quality objectives set under the Nelson Plan, as directed by the National Policy Statement for Freshwater Management, and in the upcoming National Environmental Standard for Freshwater Management (NES-FM).

Data gaps regarding the function and effectiveness of the existing stormwater systems currently impact on meeting these objectives.

## Solid waste

Strategic changes related to solid waste include:

- the Climate Change Response (Zero Carbon) Amendment Act and the anticipated increases in the cost of emission units
- increasing local and national commitments to reducing greenhouse gas emissions as part of a transition to a low carbon society

A significant solid waste issue considered in this infrastructure strategy is how to meet Council's obligations under the Climate Change Response (Zero Carbon) Bill to reduce greenhouse gas emissions, as well as cost-effectively diverting waste from landfill, and using these decisions to proactively contribute to a low carbon future.

## Financial implications — most likely scenario

Infrastructure costs for the next 30 years are shown in the graph below. These estimates are based on the likely options outlined in this strategy and the work programmes included in the 2021–2031 activity management plans.

***[To be added following completion of the AMPs.]***

# PART ONE — STRATEGIC DIRECTION

## 1. CONTEXT

### 1.1 Background

Nelson's unique coastal location and its identity as the Smart Little City attracts residents, businesses, investment and visitors. Climate change, ageing infrastructure, development to meet the needs of an increasing population and the need to improve environmental outcomes will require changes to how Council provides infrastructure services. This strategy identifies innovative and effective ways to meet the future needs of the community.

### 1.2 Purpose of an infrastructure strategy

The purpose of an infrastructure strategy is to identify significant infrastructure issues during the period covered by the strategy (which needs to be at least 30 years), the principal options for managing those issues, and the implications of those options.

Section 101B of the Local Government Act requires Council to outline how it intends to manage its infrastructure assets, taking into account the need to:

- renew or replace existing assets
- respond to growth or decline in the demand for services reliant on those assets
- allow for planned increases or decreases in levels of service provided through those assets
- maintain or improve public health and environmental outcomes or mitigate adverse effects on them
- provide for the resilience of infrastructure assets by identifying and managing risks relating to natural hazards and by making appropriate financial provision for those risks

The infrastructure strategy must also outline the most likely scenario for the management of the local authority's infrastructure assets over the period of the strategy.

## 1.3 Structure and scope of this strategy

Part One of this strategy summarises how Council's strategic direction, which is driven by both local and national objectives, influences the provision of infrastructure.

Part Two discusses the specific issues Council needs to address related to water supply, wastewater, stormwater & flood protection, transport and solid waste management, in order to achieve objectives related to:

- managing risks related to natural hazards and climate change
- maintaining, renewing and upgrading infrastructure
- meeting the needs of growth
- maintaining and enhancing public health and safety outcomes, and the environment

Part Two includes options tables which estimate the cost of both preferred and alternative options to address the issues. This includes the potential costs of failing to prepare for climate change impacts.

Part Three provides an overview of the financial implications of Council's proposed approach to infrastructure management.

***[To be completed later in 2020 after the financial information is finalised in the AMPs.]***

Public and active transport and solid waste services are included in this strategy, in addition to the activities which the Local Government Act requires councils to include —water supply, sewerage, stormwater and flood protection as well as roads and footpaths.

The Nelson Tasman Regional Landfill Business Unit and the Nelson Regional Sewerage Business Unit manage core infrastructure on behalf of both the Tasman and Nelson councils (York Valley Landfill and Bell Island). Due to the different reporting structure for these business units (to their own boards and to both councils) a separate infrastructure strategy will be prepared for these services.

## 1.4 Implementation of the strategy

Effective implementation of this infrastructure strategy relies on good information flow and alignment between three different levels:

- strategic documents (10-30 years) including the Infrastructure, Financial Strategy, Future Development Strategy, and the Nelson Plan
- tactical plans (1-10 years) including the Long Term Plan, activity management plans, the Intensification Action Plan, the Nelson Plan,

- operational activities (year to year) including work programmes and service delivery contracts

Good levels of service statements and effective performance monitoring are key to aligning outcomes at each of these levels.

Infrastructure projects are spread over three to five years, depending on their complexity. Over time, it is anticipated that Council will be able to increase the number of projects it delivers, as there is a commitment to month on month, year on year improvements on the delivery of capital projects. This reflects that the level of project management maturity is increasing, and that Council's delivery model has the majority of work delivered by consultants who can take on more work. As Council's project managers become increasingly skilled, they can increase the number of projects they deliver. Council's processes and procedures are also improving and becoming more streamlined, which also increases delivery capacity.

# 2. STRATEGIC DIRECTION

- Overview
- The Vision: Nelson is a Smart Little City
- Council priorities
- Iwi partnership
- Council's approach to community engagement
- Financial Strategy
- Climate change
- Future development (including intensification)
- Resource management
- Legislative changes, Government Policy Statements and proposals

## 2.1 Overview

Many changes have occurred since the previous infrastructure strategy was adopted in 2018. This section of the infrastructure strategy outlines how the following changes affect infrastructure management in Nelson.

Additional strategic direction at a government level that affects infrastructure management includes:

- changes to the Local Government Act 2002 to delete references to good quality (effective and efficient) infrastructure, and reinstating promotion of the social, economic, environmental and cultural well-being of communities in the present and for the future
- a Climate Change Response (Zero Carbon) Amendment Act with a target of zero net emissions by 2050 (excluding methane)
- a new Government Policy Statement on Land Transport has been adopted with a strong focus on safety, multi modal transport systems and emission reductions
- a new National Policy Statement on Urban Development with new requirements to enable greater supply including in the form and locations that meet the needs of communities and encourage well-functioning, liveable urban environments.
- the Three Waters Review has led to a decision to establish a new agency to administer and enforce a new drinking water regulatory system and improve the environmental performance of wastewater and stormwater networks
- changes to the National Policy Statement for Freshwater Management to include higher freshwater quality standards
- a new National Environmental Standard (NES) for wastewater and amendments to the Drinking Water NES, and requirements for wastewater and stormwater network operators to prepare risk management plans
- a proposed increase to the landfill levy has been confirmed.

In addition, new Nelson City Council strategies and plans include:

- the Nelson Tasman Future Development Strategy
- the development of the Draft Whakatū Whakamahere Nelson Plan which includes new infrastructure, freshwater, climate change and natural hazards provisions.

## 2.2 The Vision: Nelson is a Smart Little City

### Vision

*Nelson - A Smart Little City: He Tāone Tōrire a Whakatū*

Nelson is a vibrant place where we are deeply connected with, and committed to, our natural, social and cultural environment. Clever business and innovation help us thrive. We enjoy living fulfilled lives in smart, sustainable communities.

### Mission

*We shape an exceptional place to live, work and play.*

The financial and infrastructure strategies have a shared goal:

*Make transformational steps towards achieving the vision of a Smart Little City, that prioritises walking and cycling, is an affordable place to live, and embraces (our harbour and riverside). Achieve this while ensuring rates are affordable, including for an ageing population; debt levels are manageable for future generations; risks and challenges are met, including the impacts of climate change.*

Specific examples of how the Vision relates to infrastructure management include:

- encouraging the shift towards a more active and sustainable transport culture
- investing in infrastructure to support intensification of residential areas
- increasing research and preparedness to adapt new methodologies and materials which deliver innovative solutions
- choosing carbon neutral and low carbon options where practicable
- consideration of climate change impacts in the location, design and operation of our infrastructure

## 2.3 Council priorities

In implementing the following top four priorities for the 2018–28 period, Council will be paying particular attention to projects that deliver multiple benefits. Projects in one area can bring significant gains for another priority. For example, the accelerated programme to reduce inflow and infiltration into the wastewater system aims to reduce the risk of wastewater overflows into our waterways and Tasman Bay. Fewer overflows mean significant benefits for our environment and contribute to the smart development of our city.

## Infrastructure

Our city, community and environment all depend on our core infrastructure networks to provide safe and smart transport, water, wastewater, stormwater, and flood protection. Key city assets need ongoing maintenance and replacement so we can depend on these essential utilities. This work also enables and protects investment in our city and removes constraints on our growth. Council is putting essential infrastructure at the forefront to future-proof our city.

## Environment

Kia Whakatū tika te tai ao me te tai ao tiaki te tai ao — if the environment is kept well and strong it will look after itself and us. Council recognises investing in the environment is essential for our future. A healthy environment underpins the health of our community, the way people enjoy Nelson, supports the economy and means we have functioning ecosystems to support our treasured species. Responding to climate change and growing our community's resilience to the more extreme weather events it will bring is a top priority.

## City Centre Development

Our aim for Nelson's central business district is for it to be attractive to businesses, residents and visitors, with an exceptional mix of events, civic facilities and retail. We are working to build an environment that supports commerce, encourages inner city living and is a catalyst for private sector investment. The top of the South, Te Tau Ihu o Te Waka a Mauī, needs a strong commercial centre to thrive. We want our city centre to enrich and build our local culture — the bustling meeting place for everyone who lives, works and visits here.

## Lift Council Performance

To achieve our vision of a Smart Little City, we need a Council team that enables things to happen. It needs to provide solutions to cut through the red tape so that real value can be delivered to our community. Nelson deserves a Council that is strategic, achieves excellence in delivery and asset management, is business-friendly and has a strong culture of engagement with its community. The projects in this strategy seek to follow best practice principles, while always seeking to improve how we partner with our community.

### Focus areas for 2019–2022

In addition, the new council elected in 2019 has three areas it is particularly interested in progressing during this election cycle:

- a sustainable transport culture
- housing intensification and affordability
- enhancement of the Maitai River precinct

## 2.4 Iwi partnership

The Council recognises Ngāti Koata, Ngāti Rārua, Ngāti Tama, Te Ātiawa, Ngāti Toa and Ngāti Kuia as Tangata Whenua. The Council also recognises the traditional customary association and statutory acknowledgements of Ngāti Apa ki te Rā Tō and Rangitāne ki Wairau within the Whakatū region, as acknowledged through Treaty Settlements.

The Council respects the Crown's responsibility to take into account the principles of the Treaty of Waitangi, as outlined in government legislation such as the Resource Management Act 1991 and the Heritage New Zealand Pouhere Taonga Act 2014. Under the Local Government Act 2002, Council has duties to facilitate participation by Māori in its decision-making processes.

The Council values working in partnership with iwi to advance the wellbeing of our community and protect the natural and physical taonga of our district. It recognises the distinct identity iwi have within the Whakatū region, and the wealth of knowledge they contribute about the cultural, natural, physical and social landscape inherent through whakapapa (genealogy).

Iwi resource managers will be involved in the development of Council's Activity Management Plans (including those related to infrastructure) — providing a Māori lens on these plans and advising how they affect the community. Iwi representatives on the Nelson Regional Sewerage Business Unit and the Nelson Tasman Regional Landfill Business Unit will also be involved in infrastructure management in Nelson through their input into these Units' plans.

Council is committed to working with iwi based on the following relationship principles:

- Kotahitanga | Partnership
- Whai Wāhi | Participation
- Kaitiakitanga| Protection
- Manaakitanga | Mutual Respect
- Kia Tika, Kia Pono | Honesty of Purpose
- Whitiwhiti Kōrero | Open Communication.

## 2.5 Council's approach to community engagement

Council is continuing its focus on working closely with the community when planning, designing and implementing projects. This means staff will take a proactive, best practice approach to engagement, including the development of communications and engagement plans during the initiation stage of new projects. An engagement team has been established to assist infrastructure project managers with this work.

Council's digital engagement tool, Shape Nelson, will also enable members of the community to engage with Council about upcoming and current infrastructure projects.

Council recognises not everyone wants to use digital communication methods. Multiple communication channels will be used including Our Nelson, door knocking, public meetings and mail outs. Engagement will be included in all stages of projects and in the follow up at the end of a project — which will provide feedback for future projects.

More consultation and engagement results in slower progress initially, but once agreements are made the projects are more robust. It enables Council to identify the right solution at the right time and right place, with support from the majority of the community.

### Key stakeholders

Council works alongside a variety of stakeholders and partners to share knowledge and views, make the most of resources, and achieve shared goals. This includes organisations focused on community development, arts, sport, recreation, environment and transport, other territorial authorities (particularly Tasman District Council), health bodies, NMIT, central government agencies, businesses and residents' associations.

## 2.6 Financial Strategy

The Infrastructure Strategy is aligned with the Financial Strategy. The Financial Strategy 2021–2031 demonstrates how Council will:

- ensure that the level of rates and borrowing are financially sustainable and are kept within pre-set limits
- be accountable for maintaining the assets that it owns on behalf of the community
- fund network infrastructure and maintain levels of service.

The most significant financial implication for infrastructure is whether Council retains the current debt cap of 150% of revenue (currently approximately $187 million) or decides to extend this debt cap to invest in infrastructure. This is not a decision to take lightly, but it could be considered as a way to smooth the expenditure required to renew some of Council's existing infrastructure assets. Borrowing more now would enable Council to bring forward some of its investment in renewal of existing infrastructure, rather than needing to do it all at once in later years.

***[To be updated once a decision is made]***

Two other important financial considerations related to infrastructure are Council's approach to development contributions and to funding recovery from significant natural hazard events.

*Development Contributions*

Up until now, Council has charged a standard rate per household unit to cover the costs of stormwater, wastewater, transport and community infrastructure.. However, Council is proposing a new approach to more accurately reflect the actual costs associated with different types of urban growth.

Reduced costs for intensification is the biggest incentive Council can offer landowners and developers. A review of the Development Contributions policy has been undertaken to ensure that it better reflects the costs associated with different types and locations of growth.

*Council's Disaster Recovery Fund*

The Disaster Recovery Fund is currently carrying debt from the December 2011 rainfall event, and the COVID-19 emergency March 2020.

| **Disaster Recovery Fund - Loan Movements** | |
|---|---|
| Loan Balance 1 July 2011 | - |
| **Emergency Response - 2011 Storm Event** | 10,848,061 |
| **Emergency Response - April 2013 Event** | 705,883 |
| **Emergency Response - April 2014 Event** | 224,235 |
| **Emergency Response - Days Track** | 473,936 |
| **Emergency Response - 1 February King Tide** | 701,052 |
| **Contributions to Fund** | (12,009,738) |
| Loan Balance 30 June 2020 | **943,429** |
| **Emergency Response - Seaview Terrace** | 815,700 |
| **COVID-19 Response – 2020/21** | 2,568,210 |
| Loan Balance 30 June 2021 (Projected) | **4,327,339** |

Indications are that we will need to make more use of this fund in years to come due to the higher level and frequency of events expected with climate

change. Insurance availability for councils may be expected to become more expensive and less available over time in areas assessed as high risk.

## 2.7 Planning for climate change

Climate change is a significant and urgent international, national, and local issue. At a local level, Nelson City Council has a key role to work with the community towards creating a resilient and low emissions future and implementing adaptive measures to manage and minimise risk.

Research by the Intergovernmental Panel on Climate Change shows that significant global emissions reductions ("mitigation") are required in a relatively short timeframe to avoid the most damaging effects of climate change. Even with successful mitigation in place, there will be a need to adapt to the effects of climate change ("adaptation"). The direct effects include warmer temperatures, more variable weather conditions (e.g., more intense storms/droughts and changes in rainfall patterns) as well as sea level rise. All of these changes will pose challenges for our infrastructure. Adapting to these effects requires increasing community readiness and resilience given some effects from climate change are now unavoidable.

In 2017 Nelson City Council signalled its commitment to a holistic approach to climate change through its participation in the Local Government Position Statement on Climate Change and the Local Government Leaders Climate Change Declaration. In 2019 Council declared a climate emergency. This committed Council to examine how its plans, policies and work programmes can address the climate emergency and to ensure that climate change is embedded in all future Council strategic plans. How Council delivers its services will play a key role in building community resilience and meeting emissions reduction targets. A wide range of mitigation (i.e., emissions reduction) work across Council has commenced, including emissions measurement and reporting, adding electric vehicles to the fleet, commencing energy audit and management programmes, identifying mitigation opportunities in Activity Management Plans, and improving processes for considering climate change in procurement and business case development. For adaptation (i.e., preparing for the impacts of climate change) Council has incorporated larger stormwater pipe sizes into its design standards to cope with increased rainfall, and developed new flood modelling to identify at-risk areas and inform city-wide strategic adaptation responses, including the development of the Nelson Plan.

### 2.7.1 The impact climate change will have on infrastructure

The key effects that will impact on Nelson is sea level rise, heavy rainfall, flooding events, drought and extreme temperatures. The impact to infrastructure will vary as will responses. A summary of the key impacts climate change will have on infrastructure is summarised in this section. Further information on specific impacts is detailed within the various 2021-31 Activity Management Plans within Infrastructure.

***Sea level rise***

Sea level rise is one of the biggest climate challenges for Nelson as a large proportion of our urban infrastructure is coastal or low lying. These areas will become more vulnerable to coastal inundation (flooding) as tides and storm surges extend further inland over time.

In 2019, LGNZ released two reports 'Vulnerable: the quantum of local government infrastructure exposed to sea level rise' and 'Exposed: Climate change and infrastructure'. These reports are based on information LGNZ requested in 2018 from the majority of councils within New Zealand. This information included asset type, quantity, and replacement value of infrastructure assets that could be exposed to the impacts of varying sea level rise. These reports highlight that for 1.0m sea level rise (above Mean High Water Spring (MHWS)), approximately $56m of Nelson infrastructure (three water and roads) could be effected.

For the Nelson community, the main impacts will be the more regular inundation of areas around The Wood, the CBD (including Halifax, St Vincent, Vanguard, Gloucester and Rutherford Streets). Areas on the open coast that are more exposed to coastal swell such as the Glen, Wakefield Quay/ Rocks Road, Tahunanui and Monaco will be subject to increasing coastal inundation and coastal erosion hazard associated with sea level rise. Some of the key impacts this will have on infrastructure activities is as follows:

- Roads in low lying areas will not be accessible at all times. Diverting traffic to alternative routes will increase congestion on residential and arterial routes
- Coastal erosion has the potential to damage roads, water, wastewater and stormwater assets located in vulnerable coastal areas
- Over the long term, coastal inundation has the potential to affect the wastewater network and the Nelson Wastewater Treatment Plant, (NWWTP) potentially resulting in wastewater overflows and contaminants discharging in to the receiving environment
- The hydraulic flow capacity of the stormwater network is anticipated to reduce within low lying areas as the pipe outlets will be submerged more often

- The stormwater network has the potential to act as a conduit for sea level rise resulting in high tides potentially flooding larger areas of the city

- Sea level rise has the potential to effect the Atawhai (closed) landfill in the long term resulting in contaminants potentially discharging into the coastal marine environment

- Increased risk of liquefaction to Council assets and urban areas generally due to higher water table in coastal areas

***Heavy rainfall and flooding events***

Higher intensity rainfall events will result in an increase in surface water, stormwater and stream flows. The implications for the community is that without mitigation of these effects, they may experience more regular and extensive flooding from streams, rivers and stormwater overflows. The impacts this will have on infrastructure activities is as follows:

- Roads affected by flooding will not be accessible at all times. Diverting traffic to alternative routes will increase congestion on residential and potentially arterial routes

- Water, wastewater pipelines, bridges and culverts that cross streams and rivers are at risk of being damaged during high flow events

- Increase rainfall intensity has the potential to increase the likelihood of sewer overflows due to the effects from inflow and infiltration

- Flooding has the potential to affect the wastewater network and the NWWTP potentially resulting in wastewater overflows and contaminants discharging in to the receiving environment

- The increase in storm rainfall intensity will result in higher sediment volumes entering the rivers, streams and stormwater network which is expected to increase maintenance requirements as well as risks associated with blockages

- Refuse and recycling materials is at a greater risk of entering the freshwater/coastal marine environment due to the effects from flooding/storm events

***Drought and extreme temperatures***

With a warmer climate, the community will be exposed to more extreme temperatures and longer and more severe droughts. This will also have a negative impact on the environment, particularly with our streams and rivers. The impact this will have on infrastructure activities is as follows:

- Increase in water supply abstraction from the rivers and reservoir due to increased demand. This will have an impact on the flows within the rivers and increase the likelihood of moving to water restrictions

- Droughts are expected to become more regular and potentially more severe. This may result in the water restriction requirements for residential and commercial use becoming more severe than those at present

- Droughts will increase the likelihood of forest fires within the water supply catchment. This will have an effect on water quality, increased operational costs, and potential damage to key lifeline assets (i.e. Maitai raw pipeline)

- The temperature of the wastewater within our network will increase, which could lead to an increase in the gas, hydrogen sulphide. This would result in greater issues with odour and corrosion of susceptible assets (particularly those made of concrete)

- An increase in river temperature and a reduction of flow will have a negative impact on the stream health and biodiversity. Potential increase in aquatic weeds and algae as well as the emergence of new pest plants that are better adapted to warmer temperatures. This has the potential to further reduce stream health, biodiversity and hydraulic capacity

### 2.7.2 Climate change mitigation

Infrastructure is part of the wider community commitment to reducing greenhouse gases, which are measured and monitored through the Council's Certified Emissions Measurement and Reduction Scheme (CEMARS – now called Toitū Envirocare) Action Plan.

In August 2020 Council committed to adopting the 5 year emissions reduction budgets to be developed and confirmed by Central Government at a national level in 2021. This commitment is to ensure that by 2025, Council realises measureable positive change towards achieving carbon zero status. Longer term the Council has also adopted the Government targets for Council's own greenhouse gas emissions (GHGs) reductions (i.e., net zero emissions of all GHGs other than biogenic methane by 2050, and a 24% to 47% reduction below 2017 biogenic methane emissions by 2050, including 10% reduction below 2017 biogenic methane emissions by 2030). These targets are intended to be achieved through the development and implementation of a Council-wide 'Emissions Reduction Action Plan'.

Infrastructure accounts for 6.9% of Councils overall emissions. Within this 6.9%, electricity consumption represents 47% and GHG emissions represents 53% (The GHG emissions is a result from the biological treatment process at the Nelson Wastewater Treatment Plant).

***Figure 1- Infrastructure Carbon Emissions as percentage vs Rest of Council***

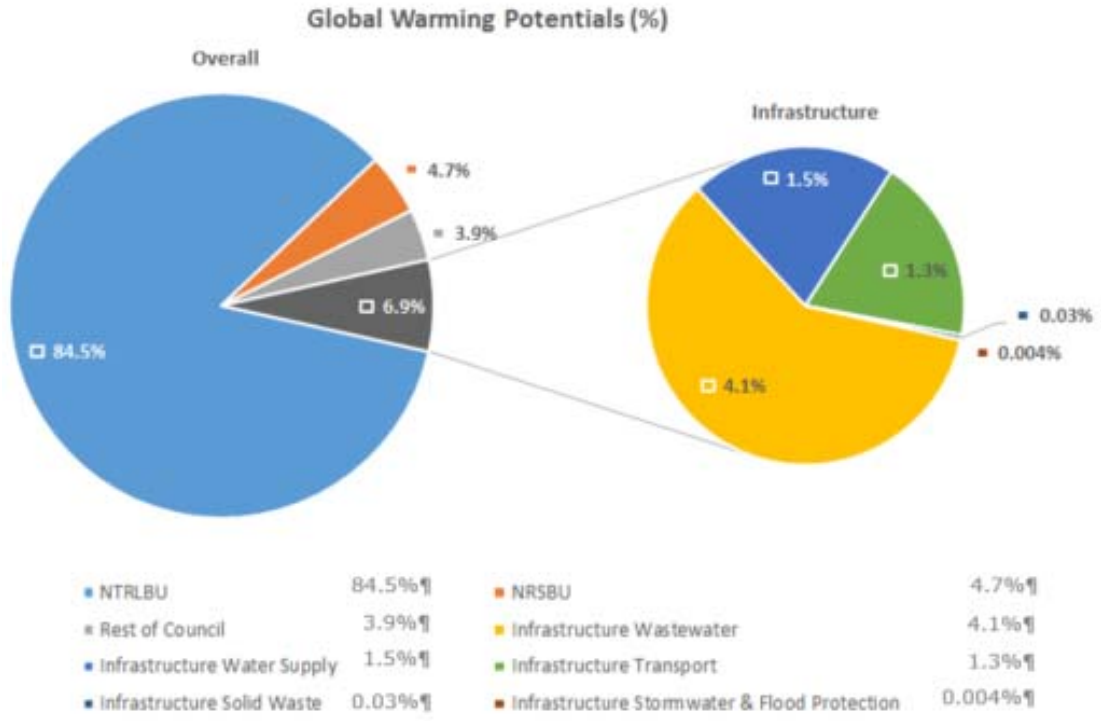
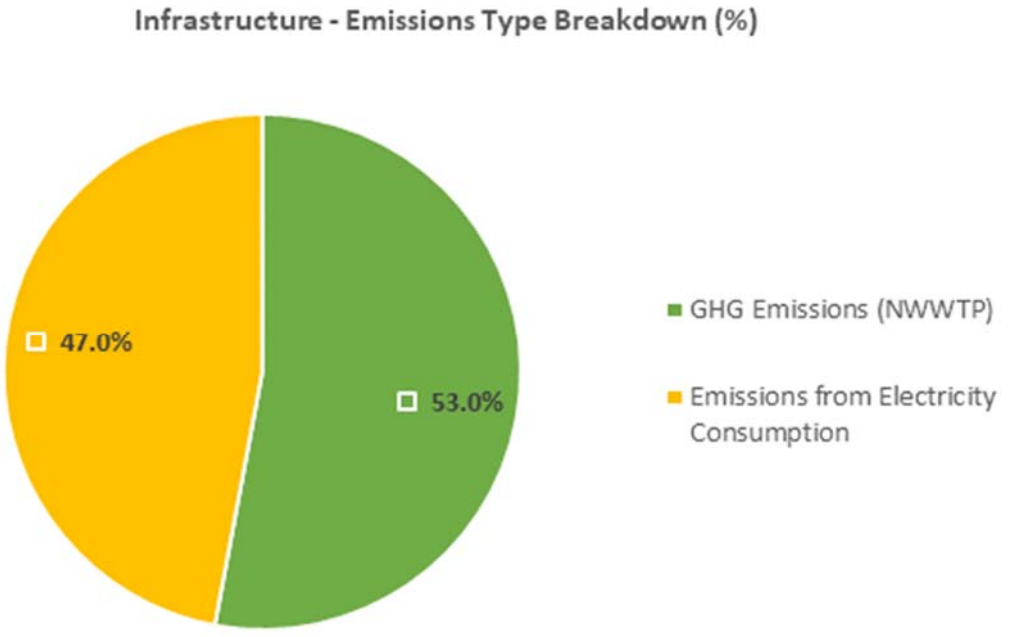



***Figure 2 - Infrastructure Emissions Breakdown***



**Mitigation Actions:**

Key projects that are featured within the Infrastructure Activity Management Plans that will contribute to the Council wide 'Emissions Reduction Action Plan' are:

- **Emissions Reduction Strategies** – For water and stormwater activity, this will focus on Energy Audits. For wastewater, this will focus on both energy audits and mitigating gas emissions

- **Wastewater Network Heat mapping** – This is investigating the possibility of utilising residual heat within the wastewater network to help offset power consumption in Council owned buildings

It is anticipated that future projects will be identified following the conclusion of these strategies and a placeholder for capital expenditure has been included within the 2021-31 Activity Management Plans.

Most of the emissions related to Solid Waste and Waste Minimisation are not Council-produced emissions but rather emissions produced by contractors (through the use of vehicles) or by disposal choices made by Nelson residents and small industry.

Solid waste, through the application of the Joint Waste Management and Minimisation Plan, is developing procedures to reduce the production of waste and to create disposal options which align with climate change policies.

Reducing the production of waste through better purchasing decisions and increased recyclability or compost ability is the first stage in a reduction of emissions by each individual.

These procedures include maximising composting and the diversion of organic materials from landfills, the establishment of reuse facilities for recyclables and other methane producing materials such as demolition waste, and to use contractual controls to move all contractor vehicles to zero emission vehicles.

### 2.7.3 Climate change adaptation – responding to the effects of climate change

The effects from climate change will vary depending on the activity, and so will the adaptation response. The LGNZ 2019 report 'Exposed: Climate Change and infrastructure' provides guidance for Council particularly on the gathering of relevant, accurate and up to date information. This is to lead the way to better informed decisions around improving the long term resilience of infrastructure.

Accurate data collection is critical to better understanding the exposure of infrastructure to climate changes hazards and to plan for impacts caused by climate change. These include both long term gradual impacts (stressors), as well as event-based changes/hazards, such as extreme weather events.

Figure 3 describes a 5-step process councils should follow for climate adaptation. This is based on the Ministry of Environment's 2017 publication 'Coastal Hazards and Climate Change: Guidance for Local Government'. This process can be applied to a range of climate-related effects including sea level rise, flooding, and extreme temperatures.

***Figure 3 - Climate Change Adaptation Process***


Two key strategies that infrastructure activities will be implementing in their relevant activity management plans are:

- Vulnerability Assessment Strategies – This considers combination of step 1 & 2 of the LGNZ climate change adaptation process. This involves:
    - Data gathering (Environmental/topographical and infrastructure),
    - Establishing a collaborative process to explore values & objectives to guide the adaptive decision making process
    - Assessing the vulnerability and risk (potential likelihood and consequences)

- Adaptation strategies - This considers combination of step 3 & 4 of the LGNZ climate change adaptation process. This involves:
    - Developing and understanding options/pathways for adaptation over the short, medium and long term.
    - Developing adaptation plans, including options, timeframes, funding sources and responsibilities.

It is anticipated that future projects will be identified following the conclusion of these strategies and a placeholder for capital expenditure has been included within the 2021-31 Activity Management Plans for adaptation projects.

The Stormwater & Flood Projection Activity Management Plan is an activity that is critical to providing protection to Nelson City from the impacts of heavy rain and flooding. These particular strategies have not been included at an activity level and instead considered through a variety of stormwater and flood protection strategies. Key projects included within the stormwater & flood projection activity that will provide protection to Councils infrastructure from the effects of heavy rain and flooding include:

- Saxton Creek Upgrade
- Orphanage Stream Upgrade
- Little Go Stream Upgrade (Rutherford Stages 1 and 2)
- York Stream Upgrade
- Maitai Flood Mitigation Project
- Jenkins Creek Upgrade
- Poorman Valley Stream Upgrade

These projects will form part of the Council-wide climate change adaptation framework as detailed in section 2.7.4.

Further information on specific projects relating to adaptation projects is detailed within the various 2021-31 Activity Management Plans.

### 2.7.4 Council-wide climate change adaptation framework

Over coming years, Council will need to consider its approach to adaptation. A critical part of this work will be engaging the Nelson community to both understand views and priorities for this work and to share existing and emerging information. This engagement with the community will need to be a frank conversation about the changes expected and different options for response. For example in relation to rivers and flooding the community will need to weigh up the importance of protecting property and infrastructure through measures like stop banks against the importance of protecting the natural environment.

As information on likely effects and preferred response options is developed and the community priorities are better understood, Council will develop this into a framework to guide its response planning. The framework will be an iterative document, constantly evolving as more is known about the range and severity of impacts.

The intention of the adaptation framework is to provide for truly long-term planning (50 to 100+ years) and a transition toward 'adaptive planning' that allows for increasing flexibility in at-risk areas (or areas that may become exposed to risk in the future). Better understanding of trigger points, retreat locations, and adaptation options is expected to provide greater certainty for communities, and allow for longer term infrastructure planning and investment.

The adaptation responses for coastal inundation will form part of this framework. The delivery of this significant piece of work sits outside the Infrastructure Strategy but will be critical to inform future infrastructure decisions.

### 2.7.5 Climate change planning assumptions

In order to frame the response to climate change, the following assumptions have been made:

- Mitigation: The contribution of renewable energy sources to the national grid will progressively increase over time (currently targeting 90% renewable energy by 2025). This is expected to contribute to a steady reduction in the carbon footprint of Council assets that draw on mains power

- Mitigation: Construction materials and techniques will be available that meet net zero GHG emissions by 2050

- Mitigation: Where emissions cannot be reduced, a Council wide offsetting approach will be developed

- Adaptation: Temperature warming, which contributes to increased storm rainfall intensity will follow the RCP 8.5 scenario, and sea level rise will follow RCP 8.5 M (mid-range) projections. Projected temperature increase and sea level rise at 2090 are 2.6$^{o}$C and 0.67m respectively (relative to 1986-2005 baseline). Use of the RCP 8.5 scenario is based on stormwater design standards contained in the LDM 2019

- Defend, Retreat or Accommodate: For the purpose of planning the 30 year programme, it is assumed at this stage that asset renewals and upgrades will continue in low-lying areas that are subject to flooding and coastal inundation. Following notification of the Whakamahere Whakatū Nelson Plan it is anticipated that new development in these areas will be designed to be resilient to flooding out to 2130. Wider community engagement (as detailed in section 2.7.4) is required to inform adaptation responses for existing development in these areas

- Finance Assumptions: Council will seek co-financing where available from Central Government towards implementation of adaptation projects

### 2.7.6 Community engagement

Climate change is a significant issue facing Council. In order for the Council to respond to the future challenges, wide community engagement is called for. This is expected to come from a number of Council activities as follows:

- Statutory consultation for the Long Term Plan and Annual Plans
- Whakamahere Whakatū Nelson Plan consultation on natural hazards overlays (including flood maps) and provisions (Objectives, Policies, Rules and Methods)

- Maitai Flood Management Options: Consultation is to be undertaken in 2021 to inform a risk based approach to identification and prioritisation of response options. This will happen alongside the Nelson Plan and will form part of the Council-wide adaptation framework.

- Flood Protection Strategies: Consultation on flood protection in other catchments will be undertaken in subsequent years, starting with the Jenkins Creek and Poorman Valley Stream. These catchments have been prioritised based on the extent of flooding predicted, and the number of affected properties and structures

- Notification of resource consents where required, including the NWWTP Resource consent renewal

- Coastal Hazard Adaptation: Consultation is to be undertaken with the wider community on this significant issue

### 2.7.7 Knowledge gaps

The following knowledge gaps have been identified. Further information on specific knowledge gaps is detailed within the various 2021-31 Activity Management Plans within Infrastructure.

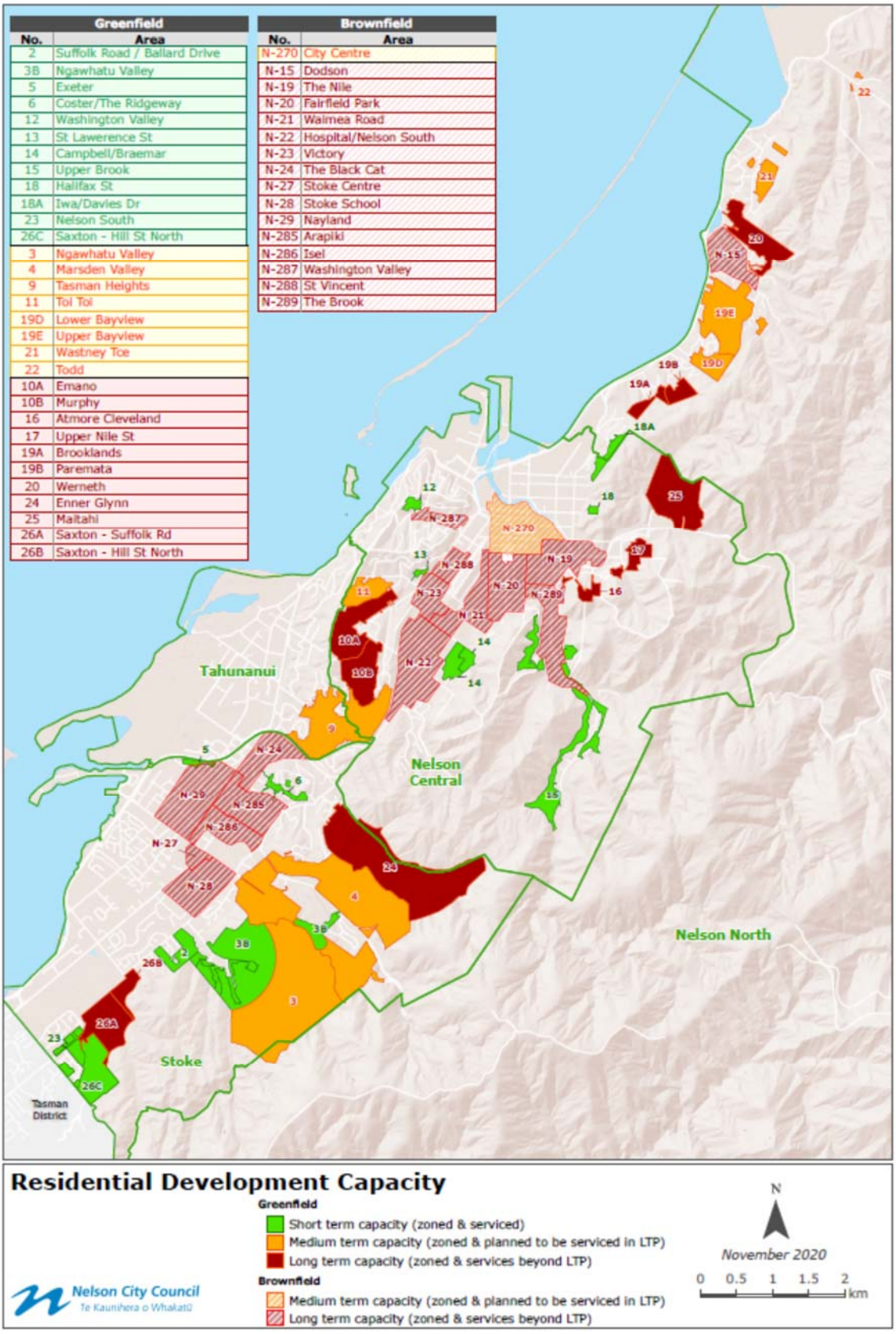
- A comprehensive vulnerability assessment of the impacts climate change will have on infrastructure assets

- A better understanding of adaptation responses required and community priorities is needed to drive development of adaptation options

- Data collection equipment and data visibility
  - River flow gauge stations
  - Stormwater network flows
  - Groundwater levels
  - Comprehensive measuring of Councils emissions

## 2.8 Future development

***Figure 4***



The Future Development Strategy (FDS) sets out where future housing is likely to be located within the next 30 years, and the likely timing of these developments.

The FDS identifies space for 8,166 extra dwellings in the Nelson Urban Area (which includes Richmond), and states that about 60% of this growth can be achieved by adding new housing into existing urban areas[1]. Council has identified six intensification areas that will be focussed on in the provision of infrastructure over the next twenty years. The focus for the first 10 years is the City Centre and Victory, although Washington Valley will also have additional capacity during this time as it is also programmed for an upgrade. The six intensification areas are:

- City Centre
- Victory
- Hospital/Nelson South
- Waimea Road
- Stoke School
- The Brook

An additional 1300 extra dwellings could be constructed in the Wood, Vanguard, Gloucester Street and Tahunanui in 20–30 years' time, but Council will not be providing for intensification in these areas unless the effects of climate change (particularly sea level rise) can be addressed in these areas.

Two areas within Nelson which have been identified as being suitable for new urban development in the short term are Maitahi and Saxton.

Community feedback on the FDS supported growth through intensification of existing urban areas with limited expansion onto rural land. Council also considers intensification to be an advantage (other than in areas vulnerable to sea level rise) because it results in:

- better use of existing infrastructure (including reserves) and less need to extend the network (such as constructing new pipelines and roads)
- more opportunity to develop a wider variety of housing types including housing that is more affordable

Implementation of intensification projects is more complex than traditional expansion, which is why an Intensification Action Plan has been developed to support the intensification of brownfield by:

[1]For more details on the specific number of additional dwellings that could be accommodated in particular areas see the FDS i.

- Providing a coherent and coordinated work programme across different parts of the Council and in key documents
- Support intensified development including development by private landowners, social housing providers and/or large developers
- Add to urban amenity through quality design
- Provide certainty of intensification capacity in agreed areas

Council does not have control over the location or level of uptake of intensification or urban expansion opportunities, as this is largely dependent on decisions by individual landowners and/or developers. Council can however, set enabling rules and policies, initiate the right infrastructure at the right time and support the perception of medium density living through high quality design, actions that are supported through its Intensification Action Plan.

Infrastructure underpins all development and having high-quality, reliable infrastructure provides certainty to developers that there is sufficient capacity in each intensification areas and encourages development by achieving a coordinated plan for high-quality intensification asset development and upgrades. The key methods in the Intensification Action Plan that relates to the infrastructure programming is the:

- Bulk programming of infrastructure investment to enable sufficient capacity for intensification development in agreed areas, development of neighbourhood asset upgrade plans and refinement of infrastructure investment through the Long Term Plan process for the next thirty years

## 2.9 The role of high quality public transport, safe walking and cycling options and access to suitable greenspaces also become more important in intensified neighbourhoods. Resource management

The Draft Whakamahere Whakatū Nelson Plan (the Draft Nelson Plan) will replace the Nelson Regional Policy Statement, Nelson Resource Management Plan and the Nelson Air Quality Plan, and will include transport and infrastructure, natural hazards, coastal and freshwater provisions. Engagement on the Draft Nelson Plan is being carried out in 2020 and a Proposed Plan will be formally notified in 2022.

Note that the Nelson Plan is in a draft phase and is likely to change over the course of engagement with stakeholders and the public so any specific reference to Nelson Plan rules in the Infrastructure Strategy contain some level of uncertainty (particularly around freshwater provisions).

## Infrastructure provisions

The definition of regionally significant infrastructure in the Draft Nelson Plan includes the wastewater, stormwater and water supply networks, and arterial roads. The Draft Nelson Plan provides for the ongoing operation of regionally significant infrastructure.

It also supports the development of commercial scale renewable energy generation, particularly solar and micro-hydro generation. It identifies opportunities for niche micro-hydro (including at the Maitai Dam).

The Draft Nelson Plan reflects the FDS by explicitly stating where new urban expansion can occur (Development Areas) and enables intensification through zoning (the Medium Density Residential Zone) and rules relating to residential density. It also reflects national direction under the NPS-UD by removing car parking requirements.

## Freshwater provisions

Draft Nelson Plan freshwater provisions give effect to national direction. They provide for the progressive meeting of water quality and quantity targets by 2030, which has the following implications for infrastructure management:

- New water quality limits relate to nutrient levels, sediments, algae, bacteria and macroinvertebrates, and are much more stringent than those in the Nelson Resource Management Plan
- Review of existing water permits may be required to reverse over-allocation in some of Nelson's water bodies. In future, all applications for water permits will need to include a water conservation plan
- Discharges of untreated wastewater as overflows will require consent as a discretionary activity, and will ultimately need to be phased out for the requirements of national direction to be met
- Monitoring of water quality from wastewater and stormwater will be required, particularly to fill current data gaps
- Where the health of streams and rivers in the region is known to be degraded, Council will need to take action. This includes improvements to stormwater and wastewater management, where they may be contributing to the loss of health of those rivers and streams.

### *Stormwater quality*

Stormwater discharges from Council's existing stormwater network will be a permitted activity if they comply with the water quality limits, and will be a controlled activity where water quality limits are exceeded. All new stormwater discharge outlets will be a discretionary activity.

Stormwater runoff from individual sites onto roads and into Council's reticulated system will also be required to meet quantifiable limits (to achieve water quality limits in the freshwater receiving environment at the end of the reticulated network). The rationale is that if receiving environment attribute limits are met for run-off from an individual site, that site would not cause receiving environment limits to be exceeded. An option for achieving this is for stormwater sampling to be undertaken to support consent applications where stormwater is to be 'diverted' into the stormwater network. Compliance with these freshwater provisions is likely to be an extra cost that needs to be factored in to future budgets.

It is likely that Council will need to intervene to get the contaminant levels to acceptable levels, particularly in relation to stormwater generated from road run-off. Measures such as first flush treatment for high contaminant generating surfaces may not be sufficient on their own to improve stormwater quality to the extent that receiving environment attribute limits are no longer exceeded.

This is a complex area and there are a number of significant data gaps, specifically the function and effectiveness of existing stormwater systems, which affect how this issue should be considered. Whole of Council input, will be required. Matters to consider include:

- the status of stormwater quality discharges relative to receiving environment attribute targets across a range of flows, as well as over time
- where receiving environment limits are exceeded, the extent to which stormwater discharges contribute to this, and for which particular attributes, as well as what the other contributors are
- establishing where stormwater discharges are a significant contributor to receiving environment limits being exceeded, so that catchment management plans for those catchments can be prioritised.

### *Works in and near streams and rivers*

The Draft Nelson Plan provides for works in the beds of rivers as a permitted activity if the minimum standards in the Code of Practice are met. Council may choose to apply for a consent for specific situations where it is not feasible to meet these minimum standards.

## Climate change and natural hazard provisions

### *Climate change*

The Draft Nelson Plan recognises the potentially significant effects of climate change on Whakatū Nelson's natural and physical resources and aims to increase the resilience of the community, including its regionally significant infrastructure.

The Draft Nelson Plan encourages providers of regionally significant infrastructure located in areas subject to climate change to reduce or mitigate the level of, and exposure to, risk for the community and the environment. This includes increasing resilience to those risks.

### *Natural hazards*

There is recognition within the Draft Nelson Plan that some of Whakatū Nelson's regionally significant infrastructure is located in areas subject to natural hazards. The high level approach of the Draft Nelson Plan is to provide for the operation, maintenance and upgrading of regionally significant infrastructure that is located in areas subject to natural hazards. Construction of new infrastructure in hazard areas should generally only occur if it is functionally or operationally required to locate in a hazard area, or there is no reasonable alternative. The infrastructure should also be designed, maintained and managed to be resilient to the hazard event, and to avoid, remedy or mitigate any potential adverse effects.

Flood maps produced for the Nelson Plan take into consideration climate warming and sea level rise out to 2130. The effects of climate change that are shown in this mapping include the extent to which significant areas of the city would be more regularly and severely impacted by river and coastal flooding in future, particularly low lying areas exposed to tidal inundation. Sea level rise projections have been taken from the latest Ministry for the Environment guidance for Local Government[2]. Allowances for future temperature warming, and the associated increases in storm rainfall intensity, are based on NIWA projections and statistical analysis of rainfall data.[3]

### *Coastal hazards*

The high-level direction in the Draft Nelson Plan is that there should be no increased risk from coastal hazards, and that Council will follow the Dynamic Adaptive Pathway Planning approach (DAPP) to managing coastal hazards, as recommended by the Ministry for the Environment in its 2017 publication called 'Coastal hazards and climate change: Guidance for local government'.

Detailed provisions are being developed together with the community and will be included in the Proposed Nelson Plan when it is notified in 2022.

[2] Ministry for the Environment (2017) 'Coastal Hazards and Climate Change'
[3] National Institute of Water & Atmospheric Research (2018) 'High Intensity Rainfall Design System–Version 4'

## 2.10 Legislative Changes, Government Policy Statements and Proposals

### 2.10.1 Local Government (Community Well-being) Amendment Act 2019

The purpose of local government has been amended by deleting references to good quality (efficient and effective) infrastructure, and reinstating promotion of the social, economic, environmental, and cultural well-being of communities in the present and for the future.

Three examples of how this directs Council's management of infrastructure are:

- environment, health and safety outcomes are the transport team's priorities, above vehicle capacity outcomes
- both a safe and a sustainable water supply for the city are priorities for water supply management
- the need to consider the effects of climate change on infrastructure, with flow on effects for the four wellbeing's.

### 2.10.2 Climate Change Response (Zero Carbon) Amendment Act

The Climate Change Response (Zero Carbon) Amendment Act 2019:

- sets a new domestic greenhouse gas emissions reduction target for New Zealand to reduce net emissions of all greenhouse gases (except biogenic methane[4]) to zero by 2050
- establishes a system of emissions budgets to act as stepping stones towards the long-term target
- requires the Government to develop and implement policies for climate change adaptation and mitigation
- establishes a new, independent Climate Change Commission to provide expert advice and monitoring to help keep successive governments on track to meeting long-term goals.

There will be a transitional period to 2021 to get the new provisions up and running. The Ministry for the Environment:

- is involved in the establishment of the new, independent Climate Change Commission

[4] The other target is to reduce emissions of biogenic methane to 24-47 per cent below 2017 levels by 2050, including to 10 per cent below 2017 levels by 2030

- has already begun work on the first National Climate Change Risk Assessment (future Risk Assessments will be carried out by the Climate Change Commission) which will inform the development of a National Climate Change Adaptation Plan
- is developing a provisional emissions budget for 2021–2025.

The New Zealand Emissions Trading Scheme (ETS) will be an important tool in delivering emissions reductions and helping New Zealand achieve its emissions budgets and 2050 target. The provisional emissions budget for 2021–2025 will be used to inform the unit supply settings.

### 2.10.3 Draft Government Policy Statement on Land Transport (March 2020)

The Government Policy Statement on Land Transport (GPS) sets out the government's priorities for expenditure from the National Land Transport Fund over the next 10 years.

The Government Policy Statement on Land Transport has a strong focus on safety, accessibility, resilient and liveable cities, the environment, mode neutrality, reducing dependency on vehicles, and recognising how the transport system can improve access to economic and social opportunities.

### 2.10.4 National Policy Statement on Urban Development

The Government has issued a new National Policy Statement on Urban Development (NPS-UD). The NPS-UD requires councils to carry out long-term planning about how their cities will grow in the future, and:

- describe the kinds of features that make a well-functioning urban environment
- require councils to provide enough opportunities to meet demand for development
- require councils to describe the type of development they expect and ensure their plans allow for expected levels of development
- require councils to enable more dense housing development in certain areas
- allow for consideration of urban development where land has not yet been released or not identified for urban development
- remove the ability of councils to regulate the number of car parks required for a development
- include general proposals to require, preclude the use of, or replace particular rules in district plans

### 2.10.5 Outcomes from the Three Waters Review

***[Section to be reviewed by SLT following recent government announcement]***

The Three Waters Review is looking at how to improve the management of drinking water, stormwater and wastewater (three waters) to address issues identified by the Havelock North Drinking Water Inquiry, and improve overall management of our water resources.

On 11 December 2019, the Taumata Arowai – Water Services Regulator Bill was introduced to Parliament. The Bill implements decisions to establish a new regulatory body – Taumata Arowai – which will be responsible for:

- administering and enforcing a new drinking water regulatory system (including the management of risks to sources of drinking water); and
- a small number of complementary functions relating to improving the environmental performance of wastewater and stormwater networks (developing standards and regulations then monitoring and enforcing compliance with them, and providing training)

The Bill passed its third reading on 22 July 2020 and now requires Royal Assent to become an Act. This is expected to be completed shortly.

A separate Water Services Bill was introduced to Parliament on 28 July 2020. The Bill will establish the new drinking water regulatory system and develop provisions relating to source water protection. It also includes some obligations on wastewater and stormwater network operators. The Bill is not expected to complete the parliamentary process until sometime after the elections in October 2020.

In July 2020, the Government announced a funding package of $761 million to provide immediate post-COVID-19 stimulus to local authorities to maintain and improve three waters infrastructure, and to support reform of local government water services delivery arrangements. Initial funding will be made available immediately to those councils that sign up to the Memorandum of Understanding (MoU) and associated Funding Agreement and Delivery Plan for the first stage of the Three Waters Services Reform Programme by 31 August 2020.

The Government has indicated that its starting intention is public multi-regional models for water service delivery to realise the benefits of scale for communities and reflect neighbouring catchments and communities of interest. There is a preference that entities will be in shared ownership of local authorities. Design of the proposed new arrangements will be informed by discussion with the local government sector.

### 2.10.6 Proposed changes through the Action for Healthy Waterways programme

The Action for Healthy Waterways proposals include amendments to the Resource Management Act, an updated National Policy Statement for Freshwater Management, an updated National Environmental Standard for Sources of Human Drinking Water, and new National Environmental Standards for Freshwater and Wastewater.

Key proposals:

- speed up the implementation of freshwater regulations through amendments to the RMA
- set and clarify policy direction to bring our freshwater to a healthy state within a generation in a new National Policy Statement for Freshwater Management (NPS-FM)
- raise the bar on freshwater ecosystem health by introducing new attributes and requirements in the NPS-FM to protect threatened species and habitats
- support the delivery of safe drinking water through amending the National Environmental Standard for Sources of Human Drinking Water
- better manage stormwater and wastewater to stop things getting worse and improve freshwater health in a generation, through new regulations and potentially new legislation
- improve farming practices where needed to stop things getting worse and improve freshwater health in a generation, through new National Environmental Standards for Freshwater and regulations.

#### Water supply implications

Amendments are proposed to the National Environmental Standard for Sources of Human Drinking Water (the Drinking Water NES) to:

- define the land area to which the regulations in the Drinking Water NES apply
- define the types of activities that must be assessed as potential risks to source waters within the source protection areas
- apply to all registered water supplies serving more than 25 people (for at least 60 days per calendar year)
- manage specific contaminants in source waters
- control development and use of land in source water risk management areas

- require review of resource management plan rules for activities located within source water risk management areas

### Wastewater implications

The Government is proposing to require wastewater network operators to prepare a risk management plan, and to introduce a new National Environmental Standard for Wastewater (Wastewater NES). It is likely to require consent conditions to include:

- minimum treatment standards
- targets or limits on the volume and frequency of wet weather overflows (which is a challenge in the face of climate change impacts, particularly increased intensity of storms)
- methods for monitoring compliance
- approaches for incorporating culturally-acceptable wastewater treatment processes

Council's stormwater activities will need to contribute to achieving a reduction in wet weather overflows, through upgrades that reduce inflow and infiltration of stormwater into the waste water network by providing a stormwater network where there currently is not one or it is under capacity.

### Stormwater implications

The Government proposes to require stormwater network operators to prepare a risk management plan (RMP). This is similar to the proposal for wastewater operators, but would address specific stormwater risks, including at a minimum:

- meeting stormwater discharge resource consents and/or permitted activity requirements
- ensuring public health risks associated with stormwater are managed where community values exist, such as for recreation or mahinga kai
- proactively managing the risk of flooding in and around buildings and habitable areas (which will be exacerbated by climate change).

### Replacement of the NPS Freshwater Management

The NPS-FM 2020 is a full replacement of the National Policy Statement for Freshwater Management 2014 (as amended in 2017).

Key changes:

- strengthen and clarify the requirement to manage freshwater in a way that gives effect to Te Mana o te Wai
- introduce new attributes and requirements in the NPS-FM to protect threatened species and habitats.

### 2.10.7 Waste disposal levy

The Government has confirmed an increase the landfill disposal levy. This will mean more money is available for waste minimisation initiatives at both a national and regional level. The broadening of the levy to other types of landfill will also influence how waste disposal occurs in future.

The government is also proposing to introduce product stewardship for a range of waste streams. Depending on how these programmes are delivered, this could have implications on cost of future delivery of services such as kerbside recycling.

# PART TWO – ISSUES AND OPTIONS


## TRANSPORT

### Asset description

The Transport services and assets associated with this activity are primarily focused on connecting people and moving goods across Nelson safely, efficiently and effectively. This includes the provision, operation and maintenance of physical infrastructure on the road reserve such as for driving, parking, cycling, walking and amenity, as well as the provision of safety, traffic control and public transport services.

**Table 1: Summary of Transport Assets**

***[These 2018 valuations will be redone in July 2020 so this table will be rechecked after that]***

| Asset | Quantity | |
|---|---|---|
| | Km | units |
| Roads | 274km (255km sealed and 19km unsealed) | |
| Bridges (including footbridges) | | 104 |
| Retaining walls | | 431 comprising 32,365m$^2$ |
| Footpaths, walkways and cycle ways | 380km | |
| Off street carpark areas | | 6 (1100 spaces) |
| Kerb and channel | 456km | |
| Culverts | 52km | |
| Sumps /drainage assets | | 6,637 |
| Streetlights | | 4,869 |
| Other transport assets include 33 bus shelters, 14 sets of traffic signals and 9 cameras, signs, 1 stock effluent disposal facility, 28 electronic signs and land for legal roads. Parks bridges are not included unless they are part of the transport network. | | |

**Infrastructure Objective 1:** Increase resilience to natural hazards and climate change

One of the key findings of the Nelson Tasman Lifelines Project (2017) was that roads, bridges and retaining structures are vitally important to allow reinstatement of the other services the community needs in order to rebound from natural hazard events. If resources are stretched following an emergency, Council will follow the One Network Road Classification (ONRC) hierarchy when prioritising which roads to open first. The road network gives access to the water supply, sewer and stormwater networks as well as critical telecommunications and power reticulation. It also provides the means for accessing food and fuel, and for emergency services to be moved around the region, which is critical to enabling the community to respond and recover.

Climate change can influence the frequency and intensity of events or one-off emergencies. However, Council will also need to plan for slow onset change associated with climate change, such as increasing average temperatures and sea level rise.

Trees and green spaces will become increasingly important for the contribution they make to adapting to the climate change impacts such as increasing temperatures and higher intensity rainfall, by providing shade to cool paved areas and limiting the rates of water run-off from roads, as well as providing amenity in intensification areas.

*Key risks to the transport network — earthquakes and flooding*

Earthquakes are a considerable risk to the transport network, especially in areas of reclaimed coastal margins and steep hillside suburbs. The transport assets at most risk of earthquake damage are bridges and retaining walls. Council also needs to manage transport risks associated with unsupported hill slopes.

The Waimea-Flaxmore fault line passes through Bishopdale and the Grampians, so Waimea Road may be at risk of slips during a rupture of this fault line.

Due to Nelson's hilly topography, many high value retaining walls and structures are required to support the transport network compared to other cities located on flatter ground. Increased storm intensity as a result of climate change (combined with the local geology) is increasing stresses on the retaining wall assets, and leading to more frequent failures. In addition, slope failure can result in the need for new structures to remake the road.

Unplanned road network closures as a result of flooding and landslips cause disruptions in the functioning of the city (as occurred in the December 2011 and 2013 rainfall event). Service disruptions to the transport network associated with severe weather are typically due to flooding from under-capacity or overwhelmed drainage and bridge structures, the road acting as the secondary flow path, slope and retaining wall failures blocking roads, and fallen trees due to the occurrence of high winds, which are often associated with major storm events.

Active transport pathways within esplanade reserves are vulnerable to flooding from rivers and the sea. This has implications for decisions on the surface type (e.g. asphalt or concrete) and construction methods to use in areas where coastal erosion and/or flooding is occurring regularly. There are also longer term considerations related to the viability/cost of continuing to operate that activity in that area, and the need to assess the full range of adaptation options, which are protection, accommodation and retreat.

*Financial implications*

Where transport activities that are subsidised by the Waka Kotahi NZ Transport Agency (NZTA) are damaged by natural hazards, NZTA pays 51% for small events and 71% for large events. Council needs to plan for contributing the local share of these costs, or take out sufficient insurance to manage this risk, and to consider what the picture looks like when Nelson has more frequent and larger events, and access to insurance is not guaranteed. (Council's Emergency Fund is discussed in Part One of this strategy.)

**Note:** Petrol taxes have been one source of funding for NZTA to pass on to councils. However, as New Zealand transitions to increasing use of electric vehicles, the amount of money collected by the Government through petrol taxes will decline. This also has potential implications for future NZTA subsidies of Council's renewals and maintenance work.

**Issue T1:** The transport network is critical to enable all other utilities to get up and running following natural hazard events, by enabling essential service vehicles to access affected areas.

## Desired Benefits/Investment Objectives:

- Essential service vehicles are able to access the parts of the network which are critical for recovery from natural hazard events.
- Reduction in the number of vehicles affected by closures.
- Businesses and other activities can return to normal as soon as possible
- People can move about and interact with others, which is a key ingredient of community resilience

**Table T1: Principal options to ensure the transport network is resilient to natural hazards and climate change**

| PRINCIPAL OPTIONS | EXPLANATION AND IMPLICATIONS | √ or X | COST ESTIMATE & TIMING |
|---|---|---|---|
| **Preferred Option 1**<br>Implement the future works schedule which:<br>• uses lifeline route status and ONRC as a factor when prioritising structure renewals and resilience-related capex works<br>• considers ONRC, and if alternative routes or sole access is available to customers, when prioritising structure renewals and resilience-related capex works. | The works schedule prioritises renewals which reduce natural hazards risks for homes and businesses.<br>Right time right intervention (value for money) is a focus of the AMP. Renewal in coastal areas which are being flooded more often might not be prioritised due to the natural hazard making the demand redundant.<br>Existing networks may need to be supplemented/replaced with new networks with greater resilience and lower risk exposure. | √ | $15–30M over the next 30 years. |
| **Preferred Option 2**<br>New infrastructure and new developments are constructed in a manner that increases resilience, such as providing connections to adjacent networks so there are multiple access/egress points for each community.<br>This approach will have less focus on car access by multiple access routes. | These requirements help to future-proof new development, and are reflected in the LDM 2019.<br>One of the problems for Nelson is the high number of residential areas with a single entry and exit, including the Maitai, Brook and Stoke valleys, as well as the Glen and Cable Bay. | √ | Some of the costs of new infrastructure are developer costs. |
| **Preferred Option 3**<br>Civil Defence Emergency Response plans ensure lifeline infrastructure is back up and running as quickly as possible following natural hazard events. | It is not practicable or affordable to build infrastructure capable of withstanding all natural hazard events. | √ | Existing resources, as well as insurances or NZTA funding. |
| **Preferred Option 4**<br>Coastal hazards work to include agreed decision points at which to reconsider ongoing investment in maintaining and/or renewing existing infrastructure, including transport assets. | Examples include Monaco and the Glen. However, these decisions will be part of the Council and community-wide conversations as part of the dynamic adaptive pathways planning approach, and is not a transport decision alone. | √ | No cost estimates are available at this stage. |

| PRINCIPAL OPTIONS | EXPLANATION AND IMPLICATIONS | √ or X | COST ESTIMATE & TIMING |
|---|---|---|---|
| **Preferred Option 5**<br>Maintain existing road assets and stormwater drainage on roads. | Carry out renewals and drainage maintenance and improvements based on the need to improve the resilience of the transport assets and on ONRC priorities, and install new sumps and kerbs to support the road as the secondary flow path, and an inlet to the drainage network. (This work needs to be managed alongside desired freshwater improvements.) | √ | Ongoing |
| **Alternative Option 6**<br>Maintain status quo. | Known areas of flooding will not be addressed and residents will continue to be exposed to flood risks.<br>Does not take into account the impacts of climate change, including sea level rise. | X | Costs of future natural hazards are not known. |
| **Investigations/CAPEX decisions**<br>Structural inspections have been completed but an ongoing programme is required, with yearly maintenance inspections, routine inspections every two years and detailed inspections every six years. | | | |
| **Key assumptions**<br>Climate change will increase the frequency and intensity of natural hazards. Climate change will also have slow, ongoing impacts related to sea level rise and higher average temperatures. | | | |

**Infrastructure Objective 2:** Maintain, renew and upgrade existing assets in a cost-effective way

## Asset condition data

Incomplete network data creates uncertainty about the level of renewal investment that is actually required. Council is improving its understanding of pavement performance through testing, investigations and analysis, and use of data on useful life/renewal options, which will help form the future works plan for rehabilitation of road pavements.

In the meantime, visual inspection, analysis of the cost of maintenance, and maintenance records are the primary means of pavement and surfacing renewal programmes, while also maintaining coordination with utilities providers to maintain alignment of programmes as much as possible. (In other words, when Council needs to dig up the road as part of the renewals programme it is important to consider opportunities to renew wastewater, water supply and/or stormwater pipes buried beneath that road, and vice versa.).

Other assets have robust condition assessments (including bridges and retaining walls) and it is a matter of maintaining a good routine for ongoing assessments. It is important to be able to compare apples with apples — which means achieving consistency of assessments even when criteria are changing.

The RAMM data platform (an asset management database) is changing to meet industry demand for better data and is required by our funding partner Waka Kotahi (NZTA). This change will benefit Nelson provided alignment is maintained with data quality standards and reporting platforms.

## Renewals

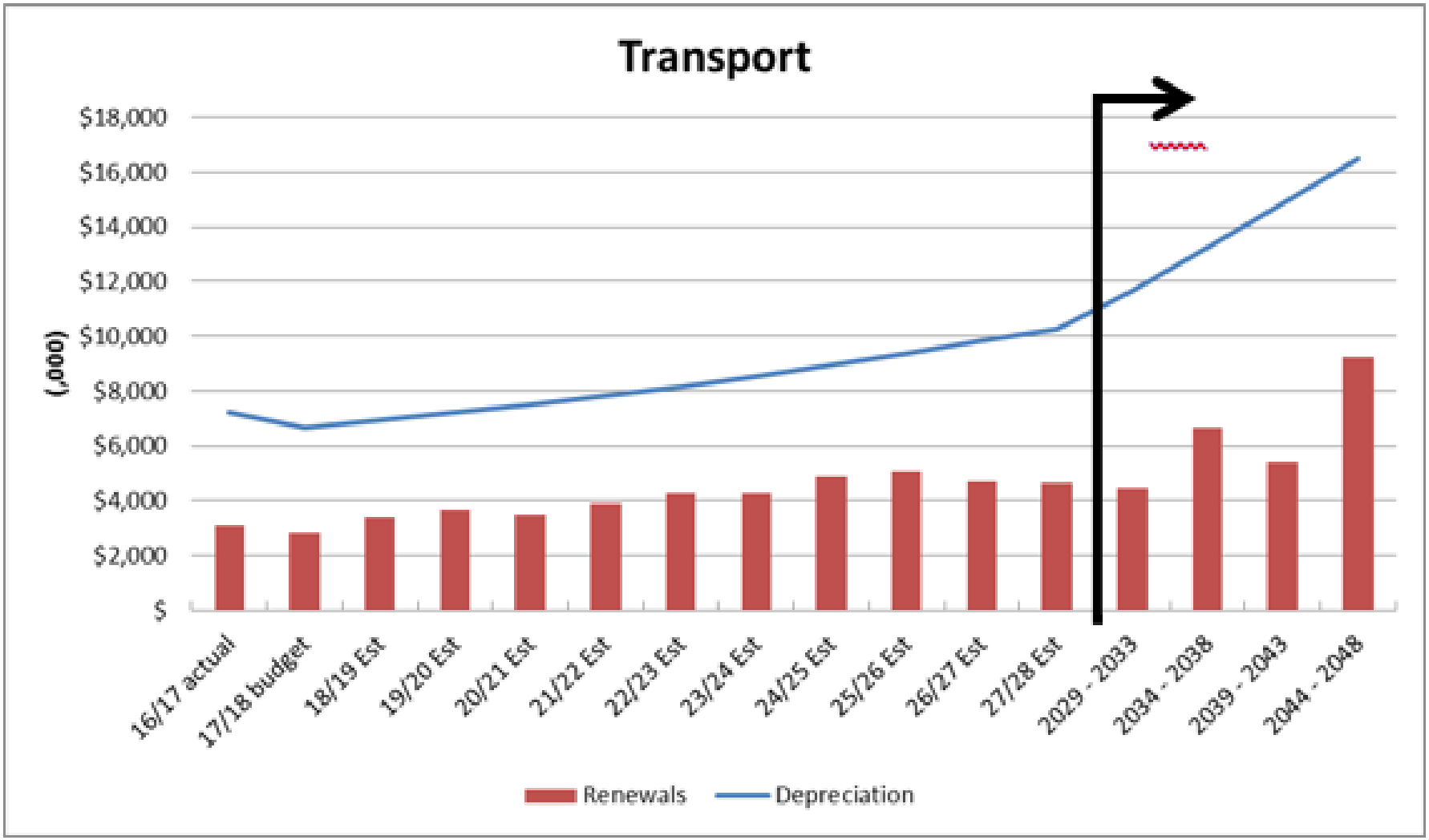
In general, the transport assets are performing as expected for most areas. However, road structural pavement layers are starting to show some signs of age and poor support for expensive asphalt surfaces. The understanding of the pavement asset and medium-term management is being addressed through the 2021–2031 Long Term Plan.

Maintenance and renewals of transport and stormwater assets needs to be integrated to keep the drainage system operating. Roads form secondary flow paths which are likely to be increasingly important due to increasing flooding frequency and intensity as a result of climate change. In addition, stormwater pipes and sumps within roads are a major collector of pollutants.

## Depreciation model versus actual renewals

Figure 5 plots the depreciation based on the book value of the transport assets and their expected life, whilst the red bars represents the actual proposed renewal spend based on observed asset performance. Bridges are the biggest ticket item, but their renewal is not imminent. For example, recent interventions with the Collingwood and Trafalgar Street bridges mean they should last another 30 years before they need to be replaced.

***Figure 5 - Transport Renewal Funding compared to Depreciation Expense***




***[To be updated following completion of the AMP]***

**Issue T2:** Incomplete network data creates uncertainty about the level of renewal investment that is actually required.

## Desired Benefits/Investment Objectives:

- The total cost of ownership of the assets (operating, maintaining and replacing them) is minimised over time
- Better network knowledge
- Renewals are not a surprise. They are well planned, efficient, effective and timely

**Table T2: Principal options to maintain and renew existing transport assets in a cost-effective way**

| PRINCIPAL OPTIONS | EXPLANATION AND IMPLICATIONS | √ or X | COST ESTIMATE & TIMING |
|---|---|---|---|
| **Preferred Option 1**<br>Retain flexibility in the budget to allocate additional (or reduced) renewal budget as network gaps are identified.<br>Optimise levels of service, as appropriate, using good data and the ONRC framework as a guide.<br>Maintain structures inspections and the maintenance and renewal programme. | Improved data and analysis methods will help Council understand existing, underlying issues in the pavement that the historical process didn't always identify.<br>Failure of roads or poor levels of service may be experienced due to risks with optimisation.<br>Heavy commercial vehicles (HCV) are increasing in their gross mass and overall numbers which impacts on road pavement lives. | √ | This option may cost $10M (or more) over the next 30 years. |
| **Alternative Option 2**<br>Reduce levels of service to match available funding and increase reactive maintenance budgets. | Resurfacing and retaining wall backlogs will grow, increasing the renewal liability and resulting in more risk of unplanned road closures.<br>The cost to maintain surfacing on substandard pavements could become problematic.<br>NZTA co-investment is not sufficient to provide matching funding for the Council's preferred road surface and retaining wall renewals programme to support higher levels of service (LOS).<br>Delaying renewals increases the risk that co-funding from NZTA for renewals may not be available for this work if it becomes urgent at a later date. | X | Not known, but this option would be informed by data and analysis. |

| PRINCIPAL OPTIONS | EXPLANATION AND IMPLICATIONS | √ or X | COST ESTIMATE & TIMING |
|---|---|---|---|
| **Investigations/CAPEX decisions**<br>• Increased data collection and analysis, ongoing asset optimisation, and LOS discussions as part of the Transport AMP improvement plan. | | | |
| **Assumptions**<br>Sealed surface LOS follows national best practice, i.e. asphaltic concrete (AC) will only be applied where it provides best value for money outcomes. This is typically where traffic volumes are greater than 15,000 vehicles per day and in high stress pavement areas. | | | |

## Structural improvements

Inspections, age and condition are used to prioritise projects related to structures based on need, using a number of ranking criteria. The renewal phase is an opportunity to make improvements to increase the capacity of bridges, in terms of vehicles, walking and cycle facilities, and flood flow capacity.

Trees are another ageing asset on road reserves, as older trees pose a bigger risk to infrastructural assets and the public if they are not well maintained.

**Infrastructure Objective 3:** Provide infrastructure to enable growth and development

## Traffic congestion

Some parts of the urban road network are operating at or near capacity. This is causing peak hour delays in some areas. These peak delays are likely to increase in volume and time as travel demand increases (with population and freight forecasts).

Travel time variability remains static on Waimea Road and Rocks Road, but the overall travel time is increasing since monitoring began in 2015. The travel time variability and overall travel time is easily affected by works on or near the arterial routes, which indicate that the resilience of these routes is vulnerable to disruption. This type of arterial road congestion has a flow-on effect for other areas, as some motorists are rerouting via residential streets to avoid arterial road congestion, reducing amenity and increasing safety risk in the affected residential areas. This can also occur during works or disruptions on the arterial routes.

Multimodal increases in transport capacity will be needed to meet the projected demand in the Nelson Urban Area (which includes both Nelson and Richmond). Nelson has slightly below medium growth but the Richmond area is a high growth area.

The level of increased congestion pressure on the road network is related to where new development occurs, which is a compelling reason for:

- the focus on intensified development in the Nelson Tasman Future Development Strategy
- encouraging people to live closer to where they work, or along public and active transport networks

The design of transport corridors to provide for access and transport choice (walking, cycling and public transport) also reduces traffic congestion. Council intends to continue enhancing Nelson's walk and cycle network by planning and implementing a strategic cycle route map, connections to public transport nodes, and treatments on local roads to improve the options for cyclists to use the road network.

A much larger investment to vastly improve public transport as proposed in the Nelson Future access short term improvements options will be included in the 2021-31 Transport Activity Management Plan and Regional Land Transport Plan 2021-27. This could include more on-demand public transport and increased uptake of technology. A new bus exchange is also proposed.

In the medium term, predicted growth in population in both Nelson and Tasman has the potential to further increase congestion on the road network. The increase in volume is reflected in increases in peak hour travel times during the busiest time of the day when comparing 2015 and 2016 travel time data.

However, transport data indicates demand is likely to flatten off over the longer time scale of this strategy. Increased congestion also encourages people to change transport modes.

## Nelson Future Access Project

The 2018 Government Policy Statement (GPS 2018) provided an opportunity for Waka Kotahi and Nelson City Council (NCC) to build on the outputs from the Nelson Southern Link Programme Business Case, by taking a broader perspective of the potential for the transport system to contribute to delivering on Nelson's vision for a vibrant CBD, a people focussed world class waterfront, a healthy environment and supporting smart and resilient infrastructure.

***[Place holder text here if the 2020 GPS released following the general election changes direction.]***

The Nelson Future Access Project seeks to provide a future-proofed transport system which considers the needs of all users — whether they are behind the wheel of a car or truck, on foot, going by bike, or using public transport. The Nelson Future Access Project is closely aligned with the Nelson Tasman Future Development Strategy which encourages a greater level of intensification in keys areas including those with good access to public and active transport networks. However, uncertainties about future vehicle choices will make some long-term projections challenging.

The project objectives for Nelson Future Access Detailed Business Case are to develop a detailed multi-modal transport system investment programme which supports community aspirations for a thriving CBD; a world-class waterfront and a healthy environment; and provides a safe, accessible and resilient transport system, whilst meeting the diverse needs of customers and communities. In particular the programme seeks to:

- Identify customer needs and growth pressures in the study area;
- Define the existing and future function of key transport corridors (for all modes) in the study area, to deliver a safe, accessible and resilient network cognisant of NCC's goals, the needs of customers and the wider community
- Make best use of existing infrastructure and services as well as new/emerging technologies
- Ensure integration of land use and transport systems to reduce the dependency on private single occupancy motor vehicles
- Investigate and identify a package of measures that could be progressed on SH6 Rocks Road in the short to medium term which enhances walking and cycling and supports NCC's vision for a world class waterfront
- Investigate and make recommendations in respect of the key journeys between Nelson City's CBD, Waterfront, Airport, Port and Richmond including the need for, and if appropriate the timing and/or triggers for an alternative arterial route to Rocks Road and Waimea Road

***[At the time of developing this Infrastructure Strategy a Draft Proposal for the Nelson Future Access project suggests the future form and function of the arterial routes between Annesbrook and the Haven would consist of XXXXXXXX with a target implementation date of XXXXX based on reaching the trigger of XXXXX by 20XX. This Draft Proposal at the time of writing is being further informed by the public engagement during XXXXXX]***

**Issue T3:** The current transport system is in a highly constrained geographic environment, with hills on one side and the Tasman Sea on the other. The growing demand for travel is being squeezed through two arterial roads that must function as 'all things to all users'.

## Desired Benefits/Investment Objectives:

- Maintain existing levels of service for travel time, safety, efficiency
- Provide resilience for lifeline routes
- A world class waterfront.

**Table T3: Principal options to provide a future-proofed transport system which considers the needs of all users**

***[Recommendations will be available in late September 2020]***

| PRINCIPAL OPTIONS | EXPLANATION AND IMPLICATIONS | √ or X | TIMING & COST ESTIMATE |
|---|---|---|---|
| | | | |
| | | | |

## Increasing road network capacity to provide for urban growth and development

Council is planning to make multi modal transport options attractive to the current population in intensification areas because these are close to amenities and the city centre. However, the timing of urban development is dependent on several factors which are outside of Council's control. That means there is a risk that urban growth and development won't occur at the projected rate. For example, under the National Policy Statement on Urban Development Council is required to provide three years of zoned and serviced land for residential and business development, and 10 years of zoned (and planned to be serviced) land for residential and business development. However, these services (including increased transport capacity) could be provided and then the landowner may decide the time is not right for them to subdivide, redevelop or sell their land.

To manage this risk, some services may be provided ahead of time to create the right conditions for development and to encourage it to occur, and others will be provided once the demand has been created by growth (as discussed in Part One of this strategy). Safety is monitored to manage the implementation programme where there is uncertainty.

The city-wide TRACKS and Saturn models can be used to understand the impact of any large proposed developments at a macro scale, and localised data using micro-simulation (or similar) enables Council to understand the localised impacts. Regular updating of the model is proposed in order to monitor growth and capacity interventions related to both completed and future proposals.

**Issue T4:** When and where to provide increased capacity of the transport network to provide for urban intensification and growth.

## Desired Benefits/Investment Objectives:

- Local road capacity meets LOS D. (Approaching unstable flow where all drivers are severely restricted in their freedom to select desired speed and manoeuvre within the traffic stream. Delays at intersections of 25–35 seconds per vehicle or better and road safety is managed in growth areas.)

**Table T4: Principal options to provide increased capacity of the road network to reflect the impacts of urban growth and development**

| PRINCIPAL OPTIONS | EXPLANATION AND IMPLICATIONS | √ or X | TIMING & COST ESTIMATE |
|---|---|---|---|
| **Preferred Option 1**<br>Prioritise areas to deliver the agreed capacity and safety level of service 'just in time' to match or slightly lag actual development.<br>Use both the city-wide TRACKS model and localised data to support this approach, by enhancing understanding of road capacity needs related to urban growth and development. | This option is likely to result in traffic congestion getting worse before it gets better.<br>There is a risk of investing in infrastructure in areas that don't end up being developed, if services are provided in advance of development.<br>Unplanned/unforeseen development areas would be delayed by the lack of road infrastructure until this can be planned, funded and implemented.<br>Development contributions will provide partial funding (approximately 30%) with the remainder to be funded by rates, as budgeted in the 2021 Transport Activity Management Plan. NZTA funding would only be sought when LOS/safety outcomes match the current GPS outcomes. | √ | Staged provision of roading capacity over 30 years.<br>$30M over 30 years. |
| **Alternative Option 2**<br>Deliver capacity and safety level of service improvements across the city to enable distributed development. | This option would almost certainly result in Council investing in infrastructure in areas that don't end up being developed. | X | Over 30 years.<br>More than $30M. |
| **Investigation/CAPEX decisions**<br>Development Contributions Policy will provide partial funding (approximately 30%), with the remainder budgeted in the 2021 Transport AMP. | | | |
| **Assumptions**<br>• Demand (growth) occurs as forecast by Council.<br>• Travel demand which is not related to new, isolated development continues at current levels. | | | |

**Infrastructure Objective 4:** Maintain or improve public health and safety, and environmental outcomes

The transport activity can improve environmental outcomes through a reduction in fossil-fuelled vehicles on Nelson roads, alternative construction materials (in future, as these become viable options), stormwater filtration, increased active travel and improved amenity such as shade and green space. However, the rate of single occupancy car use has gone up, even while more people are walking and cycling.

Considering Northern European examples where there is much higher utilisation of cycling, with separated cycleways for user safety, and a wider range of footpath usage, with wider footpaths being deployed, it is likely that New Zealand will further embrace these trends. Micro-mobility options (such as skateboards, invalid carriages, electric bikes and electric scooters) may make a significant difference to transport choices in future.

Reconfiguration of the existing transport corridors may be required to facilitate these changes. Cars may be able to be provided for in narrower lanes, particularly if cars are self-drive.

**Issue T5:** Growth in the number of car users, and slow uptake of alternative transport options, has increased the demands on the existing road network.

## Desired Benefits/Investment Objectives:

- Less traffic congestion
- Reduced transport-related emissions

**Table T5: Principal options to reduce traffic congestion and incentivise reductions in transport-related carbon emissions**

| PRINCIPAL OPTIONS | EXPLANATION AND IMPLICATIONS | √ or X | TIMING & COST ESTIMATE |
|---|---|---|---|
| **Preferred Option 1**<br>Implement more travel demand management (TDM) activities including:<br>- a more attractive bus service (including a new bus exchange)<br>- more cycle paths and improvements to the local road network (enhancements to Nelson's walk and cycle network)<br>- education<br>- a rideshare programme. | This option is preferred because development may be constrained or delayed if the traffic generation from development has more than a minor impact.<br>Travel demand management activities typically require social change, which can be difficult to achieve without significant incentives such as increased parking charges. | √ | Ongoing work<br>$20M over 30 years. |

| | | | |
|---|---|---|---|
| **Alternative Option 2**<br>Potentially increase parking charges. | Increased parking charges would provide a significant incentive not to travel to the city centre by car, and would improve the success of travel demand management initiatives. | √ | Potential to generate income. |
| **Investigations/CAPEX decisions**<br>Review of the Regional Public Transport Plan.<br>Review of the Parking Policy. | | | |
| **Key assumptions**<br>Future transport choices will be influenced by micro-mobility options, improved public transport options and technological advancements. | | | |

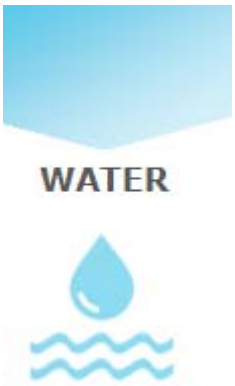
## Other environmental improvements

Increased uptake of alternative fuel sources such as electricity and hydrogen will lead to:

- lower carbon emissions
- less pollution associated with use of vehicle brakes

However, these options could also lead to ongoing demand for vehicles, resulting in road congestion.

Council has noted trials of using recycled plastic as road materials (elsewhere) to both reduce the carbon inputs and to reuse plastics, and is monitoring these developments.




# WATER SUPPLY

## Asset description

The inventory of public water services assets owned by Nelson City Council and managed by the Infrastructure Group is shown in Table 2.

**Table 2: Summary of Water Services Assets (as at June 2020)**

| Asset Category | Quantity | |
|---|---|---|
| | km | units |
| Reticulation | 281.9km | |
| Ridermains | 88.0km | |
| Trunk Mains | 49.12km | |
| Maitai Pipelines | 17.1km | |
| Roding Pipeline | 10.7km | |
| Maitai Water Supply Scheme – capacity of dam | | 4Mm$^3$ |
| Roding Dam capacity | | 5,000m$^3$ |
| Treatment Plant | | 1 |
| Tunnels (Roding, Maitai Dam, Water Treatment Plant) | | 3 |
| Reservoirs and Tanks | | 76 |
| Pump Stations | | 21 |
| Pressure Reducing / Control Valves | | 77 |
| Air & Non Return Valves | | 224 |
| Gate Valves | | 4,597 |
| Manholes | | 104 |
| Hydrants | | 2,630 |
| Water Meters | | 20,829 |
| Customer Residential & Commercial Connections | | 20,260 |

**Infrastructure Objective 1:** Increase resilience to natural hazards and climate change

## Increase resilience to natural hazards

The Maitai Dam is a critically important asset which has been designed to withstand extreme seismic and flood events with only limited damage. However, the pipes between the Maitai and Roding rivers, the Water Treatment Plant, and water users are more vulnerable than the dam to natural hazards, particularly the above ground trunk mains and pipes which cross earthquake faults and waterways. In 2014 Council completed a new duplicate pipeline between the Dam and the Water Treatment Plant to provide resilience for the raw water supply for the city.

Liquefaction and sea level rise are potential risks to the network in coastal areas.

Council commissioned consultants to review the potential natural hazard risks for the three waters (water supply, wastewater and stormwater). Generally all of the water supply system is considered a critical asset because of its importance to life. Within the network, pipelines that also serve other critical activities have been identified and given priority weighting to improve resilience. The basic resilience of the network comes from it being a pressure-based system. This means if one pipe is closed off, due to a breakage, Council often has choices on how to deliver water via other connected pipes. For example, if the main pipeline under Waimea Road to the hospital broke, this section of pipeline could be turned off, and water could be redirected to the hospital via the Vanguard Street and Motueka Street pipelines.

Following the assessment of critical assets, the next step is to set up a programme of work to bolster these assets:

- priorities for renewals (and renewal in a pipe material that is more robust)
- more valves to isolate sections into district metered zones
- ability to use lower criticality pipes (e.g. Vanguard Street/Motueka Street) if there is a failure of a critical pipe (e.g. Waimea Road).

**Issue WS1:** The piped water supply network is at risk of damage during earthquakes and flood events.

## Desired Benefit/Investment Objective:

Improve the resilience of the network and the speed of post-disaster recovery.

**Table WS1: Principal options to improve the resilience of the water supply and the speed of post-disaster recovery**

| PRINCIPAL OPTIONS | EXPLANATION AND IMPLICATIONS | √ or X | COST ESTIMATE & TIMING |
|---|---|---|---|
| **Preferred Option 1**<br>Proactively identify and assess risks to the water supply network from significant flooding and earthquakes.<br>Continue to invest in insurance as a means to assist with recovery costs. | Risks associated with natural hazards are currently being assessed.<br>A better understanding of the likely impacts on the city will allow improvements in future construction — and the costs of enhancing the network resilience will be better identified following completion of the investigation.<br>Significant resilience to natural hazards will be 'built-in' through the renewals and capital upgrade programme for the dams and the Water Treatment Plant.<br>Repairing significant damage to infrastructure from natural hazards is part-funded by insurance. | √ | The design and minor work costs will be approximately $450k, and this work in years 2021–2025 will inform future Long Term Plans.<br>Costs and timing will not be determined until the investigation is completed. However:<br>- $0.3M is identified for hazard mitigation to the Maitai raw water pipeline in years 2025–2028<br>- a budget of $4M over 30 years has been included to allow for any natural hazards risk remediation. |
| **Alternative Option 2**<br>Reactively respond to natural hazard events and rely on insurance to assist with recovery costs. | Repairing significant damage to infrastructure from natural hazards is part-funded by insurance. | X | Costs depend on what events occur. |
| **Investigative work/CAPEX decision**<br>The design and minor works costs in years 1-4 will be approximately $450k which will inform future Long Term Plans. In total the expected 30 year budget is $5.15M. | | | |
| **Key assumptions**<br>• No specific level of service for recovery from natural hazards.<br>• Current level of service continues for recording number of complaints about continuity of supply.<br>• Water supply demand will increase with population growth.<br>• Protection from damage from some natural hazards will be embedded in renewals and capital works.<br>• The impacts of climate change will be monitored and growth controls adjusted to respond to the latest information.<br>• Earthquake risk will be reviewed as any future investigations provide additional information.<br>• Existing information held about fault hazard areas of land instability are reliable, although it is expected that additional areas may be identified that are subject to liquefaction risk. Under a recent November 2019 update to the Building Code, territorial authorities have been given a two-year transition period to map areas potentially prone to liquefaction. | | | |

| PRINCIPAL OPTIONS | EXPLANATION AND IMPLICATIONS | √ or X | COST ESTIMATE & TIMING |
|---|---|---|---|
| • Renewal and upgrade of assets will be designed to minimise vulnerability to known natural hazards. | | | |

## Adapting to climate change — droughts

A report by Consultants WSP showed that Nelson has sufficient water from current sources - Maitai Dam and Roding River to provide drought security for the city out to 2070–2080. Demand strategies will support drought security, and work to reduce water losses (discussed under Objective 2) will also improve resilience to droughts.

Tasman District Council (TDC) is currently constructing the Waimea Community Dam to enhance long term water security in the region. A benefit of this dam is that it can also provide the opportunity for Nelson to develop a further water source and improve the future water supply security for the city into the next century.

Council included a budget of $5M for a contribution towards the construction of the Waimea Dam as part of the LTP 2018–28. This contribution will secure Council's right to access up to 22,000$m^3$/day from the Waimea aquifer once the dam is constructed. If this additional water supply is considered to be necessary in future, additional budget would be required for the infrastructure to abstract, treat and distribute the water. This will be further considered over the next few years and options included in future infrastructure strategies, if required.

Through an engineering services agreement, Tasman District Council (TDC) supplies water to the residential areas in south Nelson adjacent to Champion Road, as well as the Wakatu Industrial Estate, Alliance Freezing Works and ENZA in Nayland Road. Although the demand is not a large volume of water (500,000–600,000$m^3$/year) Council does not have the appropriately sized reticulation in place to be able to supply the required fire flows to all of the areas. Additionally, the supply of these extra volumes in dry summers would reduce the long term drought security provided by the Maitai Dam.

The ongoing supply of water to these areas relies upon Tasman District Council being able to provide that water to the city economically. Future reviews of the agreement will continue to monitor the effectiveness of this arrangement.

## Adapting to climate change — sea level rise

Sea level rise could change the demand profile in the long term. For example, if certain areas become uninhabitable as a result of sea level rise, it will impact where water supply needs to be provided.

**Infrastructure Objective 2:** Maintain, renew and upgrade existing assets in a cost-effective way

## Asset condition/data confidence

Water supply services are beginning to be impacted by ageing infrastructure, such as regular breakages of asbestos cement pipes. Council currently has a 10 year programme of replacing the broken pipes (at $1.6 million per year) but this is not keeping up with the work required.

Council is planning to replace the weakest asbestos pipes in the CBD and industrial areas – as these are critical areas where failure would be unacceptable. Firefighting requirements for specific building types, including four, five and six storey buildings often drive demand for larger capacity water supply pipes. This is why larger watermains are required around the city centre, which will also support intensification. Water supply capacity for firefighting is also a requirement in industrial areas.

Parts of the Stoke water supply will need to be upgraded for growth but it is generally sufficient, based on the assumption that multi- storey buildings will not be constructed here in the short-medium term (as this is when sprinkler requirements generally come into force, requiring higher firefighting flows). There is sufficient capacity for most of the one to two storey intensification in the Stoke area. However, sprinklers are required in retirement villages, which could be a future constraint on the development of more retirement villages in the Main Road Stoke area.

Water supply pipes are generally under roads, so they are expensive to replace. In the past some publicly owned pipes have also been sited under private property which can cause access issues.

## Renewal of the water supply network

Water pipes are renewed when they fail to provide the required level of service, or where performance or reliability is compromised due to age and poor condition. The majority of water assets are relatively new, with an increase in renewals (based on design life) anticipated from the late 2030s onwards.

Figure 6 shows the theoretical renewal dates for pipe materials based on their average expected service life. The theoretical life expectancy is one indicator to help guide renewal funding, and is helpful for assessing the longer term funding needs, but it has limitations.

The current renewal strategy adapts the theoretical renewal dates by balancing the industry resourcing limits and construction costs, which have become apparent through the number of tenders and tendered prices received by Council, against the need to renew parts of the network that have met the end of their service lives or are not meeting expected service lives. Assets are prioritised based on criticality.

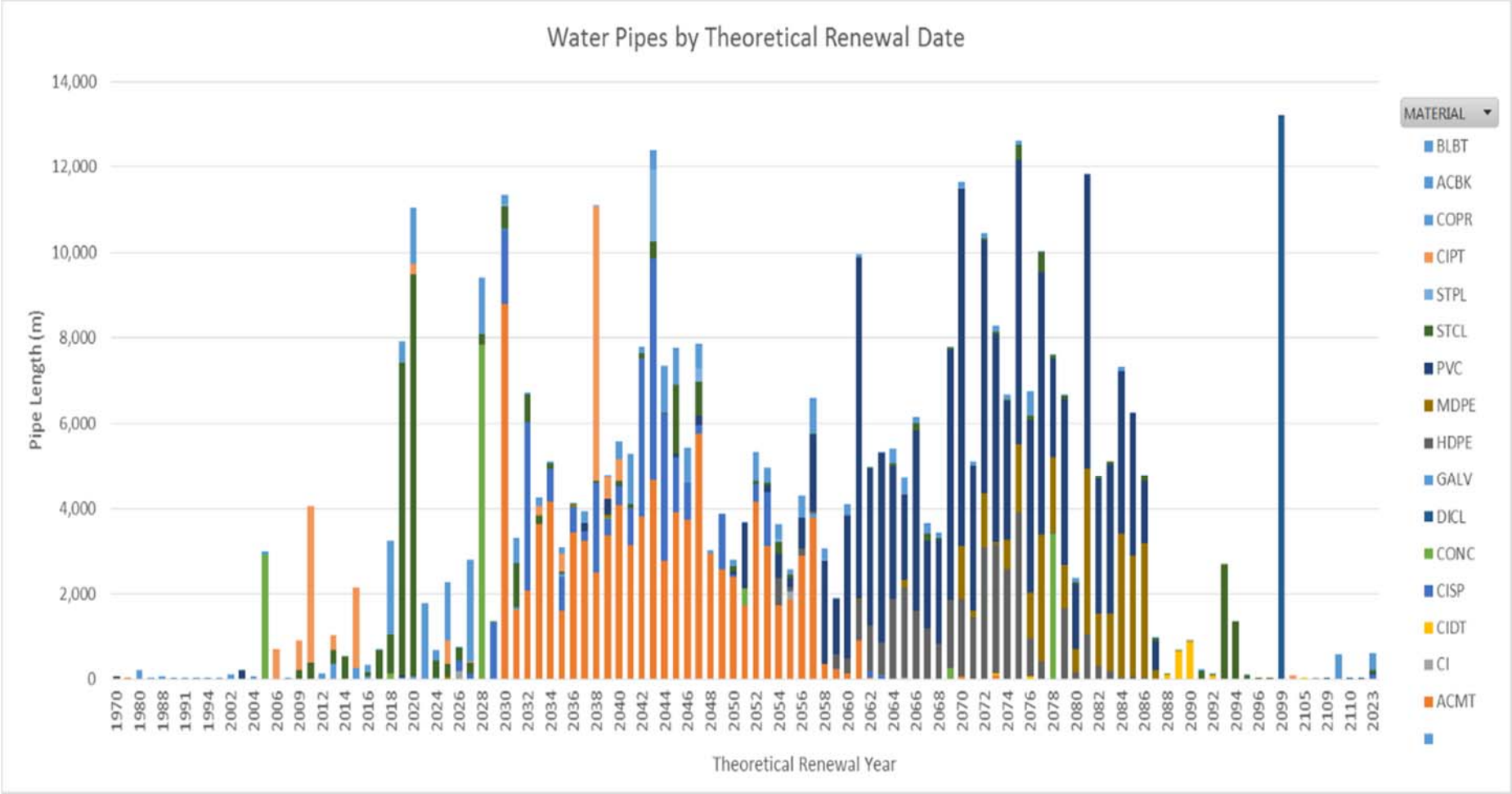
Council aims to ensure pipe life is maximised as much as possible and isn't renewed too early. Council is also investigating ways of extending the service life of assets through measures such as water pressure reduction and pipe lining. Over the next two years these investigations are expected to allow Figure 6 to be re-cast to reflect the renewal criteria based on a more accurate assessment of service lives.

However, Council has recognised that AC Black pipes (bituminous coated asbestos cement pipe) used in the water supply network are showing a larger number of failures than expected. These pipes are the current focus of the renewal programme and have been funded to ensure replacement by 2030. As this material is known to be prone to failures, the rate of failures will be closely monitored and, if necessary, the renewal programme will be adjusted through future Long Term Plans.

Pipe renewals are expected to increase to $3M–$4M per year for the term of this infrastructure strategy to more evenly spread renewal costs predicted from the late 2030s onwards, as shown in Figures 6 and 7 below.

***Figure 6 - Water Supply Theoretical Renewal Dates***

***[To be updated following completion of the AMP]***



In light of the increasing costs and general construction resources shortage Council proposes to review the water network renewal strategy to address the increasing level of anticipated renewals required from the late 2030's onwards, and to identify renewals required earlier due to poor condition or growth. This will prioritise regular assessments of critical assets (including larger pipes and reservoirs) and include consideration of how to maintain critical infrastructure.

Specific renewal budgets are in place for critical assets such as pump stations, the Water Treatment Plant and headworks (dams and raw water pipelines). Other critical assets are being identified through the natural hazards resilience assessment (discussed under Objective 1).

***Figure 7 - Water Supply Theoretical Pipe Renewal Year and Cost***

***[To be updated following completion of the AMP]***

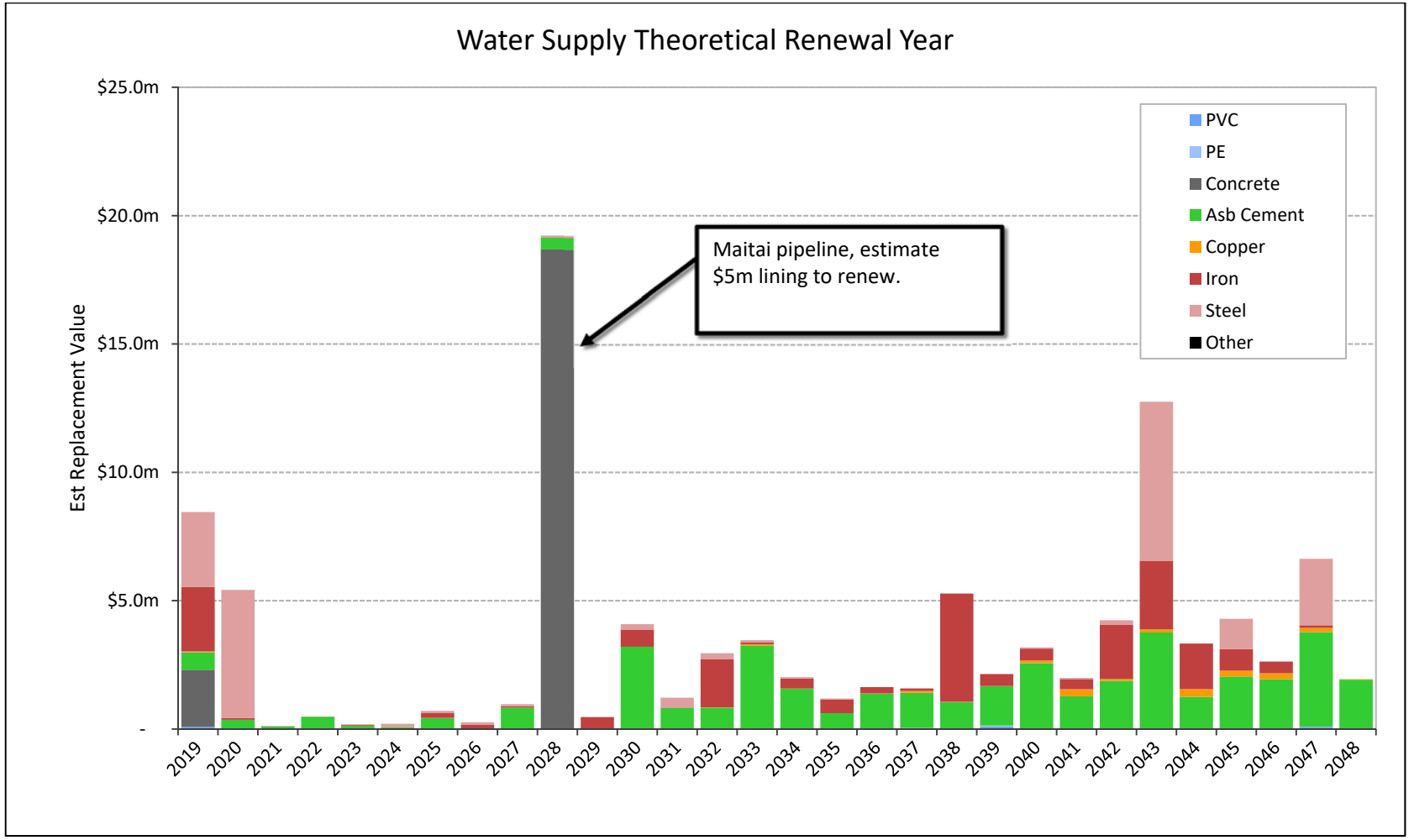


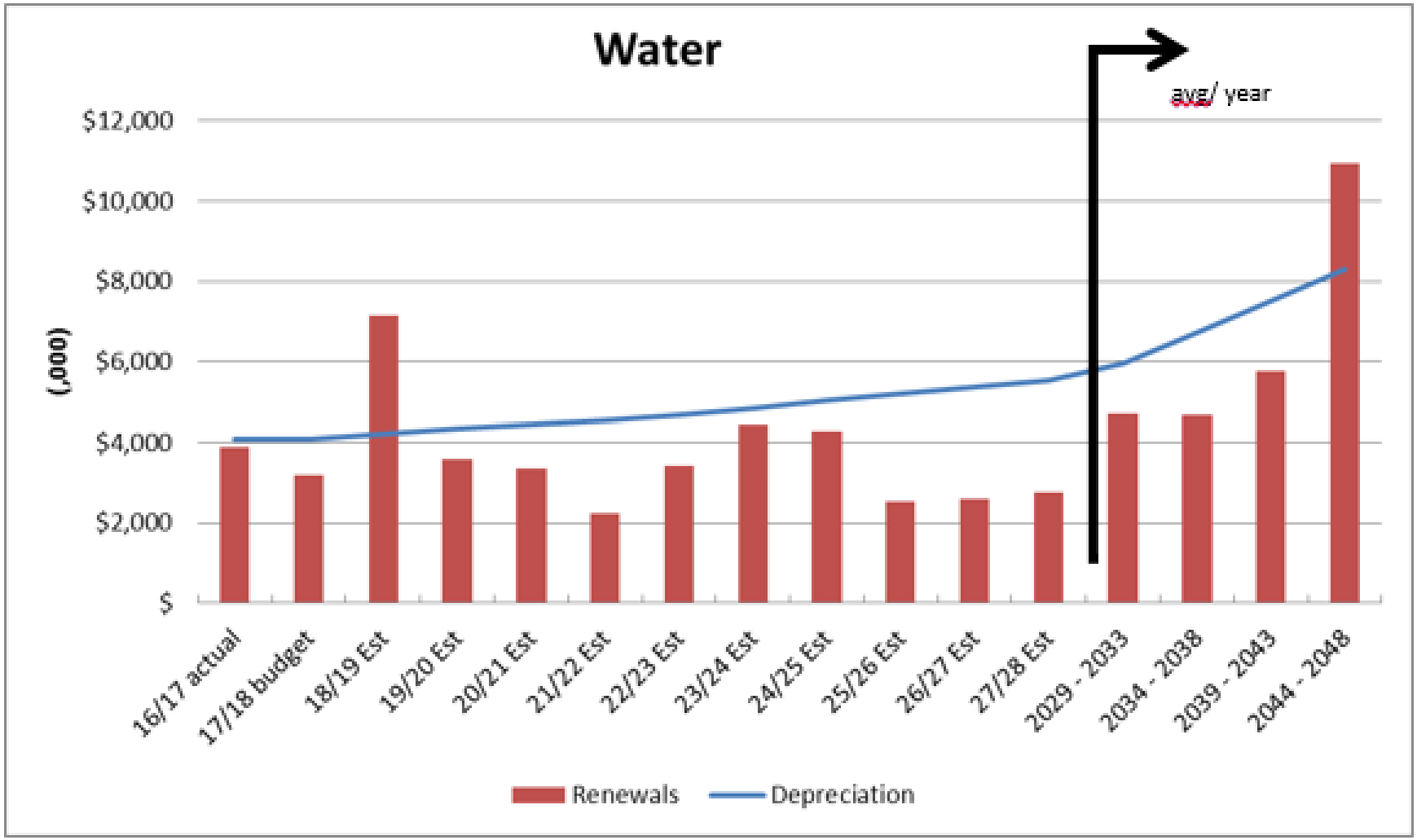
Figure 8 highlights the issue that has led Council to focus on condition assessment of assets and greater investigation of rehabilitation techniques. The renewal strategy based on generic service lives necessarily establishes a level of depreciation to match, and predicts either a shortfall in renewal activity or fails to identify the need for renewal of assets that do not meet their predicted service lives. In addition, this approach does not take into account short term industry resourcing constraints that lead to higher renewal costs and a reduction in the overall renewal programme to maintain affordability.

Figure 8 will also be reviewed to match changes to Figure 7 above and better align renewal expenditure to the more accurate service lives.

Years 2031–2051 are the average of each of the respective five yearly blocks.

***Figure 8 - Water Depreciation compared to Renewal Expense***

**[From A1298796 – to be updated]**



**Issue WS2:** Water supply assets are starting to show signs of age, resulting in regular failures. Due to a greater proportion of the network reaching the end of its design life, a significant length of watermains will need to be replaced within the next 30 years.

This means a big wave of renewals will potentially be required in approximately 20 years' time. While Council currently has a good renewal programme this will need to be increased to allow Council to match the future impacts of the ageing infrastructure.

## Desired Benefit/Investment Objective:

- Continue renewal of the network
- Upgrade of the network to meet increasing demand and firefighting requirements in growth, intensification and industrial areas such as the city centre (enabling intensification including the development of multi-storey buildings)

**Table WS2: Principal options for renewal of water supply assets**

| PRINCIPAL OPTIONS | EXPLANATION AND IMPLICATIONS | √ or X | COST ESTIMATE & TIMING |
|---|---|---|---|
| **Preferred Option 1**<br>Repair or replace broken pipes and introduce new strategic upgrades (including large diameter mains to the main areas of the city centre and future growth areas). | New strategic upgrades support the development of the city centre and the other growth areas. | √ | $3M-$4M per year for repair or renewal of broken pipes due to the need to get ahead of the upcoming wave of required renewals.<br>The renewal budget is approximately $115M over 30 years.<br>A budget of $70M over 30 years has also been included for future strategic upgrades to the network. |
| **Alternative Option 2**<br>Focus on the repair or renewal of broken pipes. | Limits options for growth and development. | X | $1.6M–$2M per year. |
| **Investigative work/CAPEX decision**<br>Costs of strategic upgrades. | | | |
| **Key assumptions**<br>Growth and development in the City Centre will enable the construction of multi-storey buildings. | | | |

**Issue WS3:** Planned levels of service for water supply will not be met unless assets are maintained, renewed and upgraded.

## Desired Benefits/Investment Objectives

- Updated asset ownership information, to reflect the standards in the LDM 2019 and to clarify which pipes Council is responsible for maintaining
- A reticulation, maintenance and operation policy that reduces risks of property damage as a result of water supply being in poor condition, and from a non-maintained water supply network
- Minimal disruption to business and residential customers from day-to-day network activities
- Network renewal strategy which prioritises assets based on criticality, remaining design life, current condition and level of service assessments

**Table WS3: Principal options for improving the maintenance, renewal and upgrade of water supply assets**

| PRINCIPAL OPTIONS | EXPLANATION AND IMPLICATIONS | √ or X | TIMING & COST ESTIMATE |
|---|---|---|---|
| **Preferred Option 1** Proactive focus on gaining a better understanding of water supply asset condition and developing a renewal strategy. | Increase the proportion of the network that has been assessed for condition, prioritising critical assets. This information is required to inform a renewal strategy.<br>Condition assessment is generally an operational cost where this applies to regular assessment of critical assets or condition assessment of adjacent pipework at mains failures. | √ | Condition assessment of the water supply network, prioritising critical pipes and structures, at a cost of $300k over 30 years. |
| **Preferred Option 2** Develop strategies that provide a consistent basis for prioritising upgrades of the water supply network. | An enhanced evidence base is required for improved prioritisation of water supply projects. This includes an assessment of existing levels of service across the water supply network, and assessing the implications of growth areas on potable water demands and raw water sources. | √ | Development of six separate strategies, supported by water network modelling, to cover the city in the first 10 years. Implementation will follow each strategy.<br>Water supply strategies have been budgeted for: Total $630k. |

| | | | |
|---|---|---|---|
| **Alternative Option 3**<br>Status quo — reactive response to service requests for water supply upgrades. | Upgrades occur in the areas where the most complaints are made, which may not be the areas in most need of improvement. | X | Piecemeal expenditure does not represent value for money. |

**Investigative work required/CAPEX decisions**

- Water renewal and growth strategies are required for the whole city. These strategies will assess current renewal provisions and set out appropriate options for each part of the city, taking into consideration growth areas identified in the Future Development Strategy and the impact of growth on the normal renewal cycle.

**Key Assumptions**

- Current levels of service focus on the reliability of the network as measured by pipe failures and the response to issues as measured by contractor response times. There is a focus on maintaining the serviceability of the existing infrastructure and ensuring appropriate water supply options are available across the city.
- Future demand for water supply services are primarily considered through subdivision consents, normal renewal cycles and city growth planning in the Future Development Strategy. Renewal planning aims to match renewals to the rate at which assets reach the end of their service lives and consider the opportunities to increase pipe capacity to allow for growth and changing demands e.g. pressure reduction and fire sprinkler requirements.
- Council only assumes full responsibility for the public water supply network as defined in the Water Supply Bylaw and the Nelson Tasman Land Development Manual 2019. Private laterals or common private supply mains (typically in private roads or rights of ways) are generally the responsibility of the landowners.

## Water losses from the water supply network

Water loss estimates are based on the difference between the three magnetic flow meters at the Water Treatment Plant and the 20,000 water meters on commercial and residential properties. Currently there is a 20–25% gap between the volume of treated water, and the water used.

Some of the reasons for this gap are:

- the need for scouring of cast-iron pipes (which involves flushing water at pressure through the pipes to waste, to address the discoloured water issue)
- contractors' and others' access to unmetered water (currently being addressed through requiring meters and backflow protection)
- water leaks from broken pipes (public and private pipes)
- inaccurate meters (currently being rectified through the meter renewal programme and magnetic flow meter testing)

To understand the scale of the leakages on private property, every year $80k to $100k worth of water credits are granted to people who have had undetected water leaks on their properties for months. This shows a large amount of water is lost from the system through privately owned water supply pipes.

As most of the water leaks are underground, it is difficult to detect these and to quantify the losses. There are also considerable leaks between the Maitai Dam and the Water Treatment Plant.

A significant investment is under way to replace residential meters which will be completed in 2021-22. This will improve the accuracy of these meters.

The next steps are to:

- complete the checks on the magnetic flow meters at the Water Treatment Plant to ensure they are accurate, and then to check that the 2,000 individual commercial meters are accurate
- fix significant known leaks
- ensure all connections to the public network are metered.

These water losses mean:

- more water is being taken from the Maitai and Roding rivers than is actually needed to meet the community's needs, resulting in lower river levels and poorer freshwater habitats
- more limitations on how much water can be taken from the Maitai and Roding rivers as the population grows
- water is not being used efficiently, as required by the National Policy Statement for Freshwater Management (NPSFM) objective B3.

**Issue WS4:** Council is unable to account for 20-25% of water supplied through the water supply network.

## Desired Benefit/Investment Objective:

Ensuring the water take from the rivers is the minimum necessary to meet the reasonable demands of the city.

**Table WS4: Principal options for reducing water losses from the water supply network**

| PRINCIPAL OPTIONS | EXPLANATION AND IMPLICATIONS | √ or X | COST ESTIMATE & TIMING |
|---|---|---|---|
| **Preferred Option 1**<br>Improve the accuracy of the water loss assumptions.<br>Complete checks on the accuracy of the flow meters at the Water Treatment Plant and commercial meters across the city. | Identifying leaks and unmetered uses will help improve water use reporting. Some income could result from monitoring and charging for contractor usage.<br>Monitoring needs to be ongoing to ensure compliance with | √ | Ongoing over the next 30 years.<br>Renewal of treated water pipes — |

| PRINCIPAL OPTIONS | EXPLANATION AND IMPLICATIONS | √ or X | COST ESTIMATE & TIMING |
|---|---|---|---|
| Carry out an ongoing programme of investigating water leaks, and repairing and renewing the public network of water pipes, and residential water meter replacement.<br>This option also involves investigating how much water is actually taken from the network for fire flows, construction uses by contractors, other un-metered connections, plus pipe scouring by Council. | backflow and metering requirements, and any drought restrictions. | | $115M over 30 years.<br>Targeted water loss reduction programme — $3.6M over 30 years. |
| **Alternative Option 2**<br>Place a stronger emphasis on community responsibility for leaks in privately owned pipes through a charging regime that requires people to pay for all water taken from the public network. | This approach could incentivise the economical use of water and the fixing of leaks in privately owned water pipes. However, finding and repairing leaks can be costly, and this may create an affordability issue for some customers. | X | Ongoing over the next 30 years.<br>Charging regime based on recovering network costs. |
| **Investigative work/CAPEX decision**<br>The 2021-31 Water Supply AMP includes funding to address this issue and investigations are currently underway to pinpoint priority areas of need. | | | |
| **Key assumptions**<br>• The current level of service, which sets a limit of real water losses of less than 25%, will be retained. This measure matches the Non-Financial Performance Measures of the Department of Internal Affairs (DIA) and will be adjusted as required to follow central government requirements.<br>• Demand will increase as population increases.<br>• Current sources of raw water will be subject to resource consent conditions.<br>• Expected demand will be met by current sources out to 2060-2080 if Tasman District Council continues to supply water to south Nelson.<br>• Private landowners and contractors will support an increased focus on the issue and will comply with Council policy.<br>• Council will enforce repairs of private leaks and the contractor use policy. | | | |

## Impacts of Maitai Dam water on the Water Treatment Plant

During storm conditions the usual sources of the water supply (the Roding River and the South Branch of the Maitai River) are often too full of sediment to be used for the water supply. In this situation water is taken directly from the Maitai Dam instead. The Water Treatment Plant processes this lower quality water using the ultra-filtration membranes and a coagulant to remove the high levels of organic material from the Dam water. (The organic material needs to be removed to ensure chlorination is successful.)

While adding coagulant into the water enables water treatment membranes to take the organic material out of the water, the additional cleaning of the membranes can reduce their service life.

One option Council is considering is having a primary clarifier between the Dam and the treatment plant. This would be like constructing a swimming pool or reservoir, with the coagulant added there, creating a sludge before the water is filtered through the membranes. This would give the city a 'belts and braces' method of organic removal that would extend the life of the membranes and last well into the future. However it would cost about $20M to set up.

A consultants' recommendation was to rely on working the Water Treatment Plant membranes harder and accept a reduced membrane life. However, at this point Council considers full reliance on the membranes to be a less resilient approach. Council would need to keep a spare set of membranes available to swap out before anything went wrong. As demand for water increases in the future this option could also require expenditure of approximately $10M to reconfigure the Water Treatment Plant, to increase the number of 'trains' of membranes from five to eight sets.

At the moment there is no driver for either option. A decision on these options will not be required until (or if) Council needs to rely more heavily on Dam water as the primary source of the municipal water supply or environmental conditions change and require the use of more marginal water from the rivers.

In 2019 a freshwater diatom *Lindavia intermedia* was discovered in the Maitai Dam reservoir. This diatom has been known to cause 'Lake Snow' to develop in other fresh water lakes in New Zealand, particularly in Central Otago. 'Lake snow' is described as a "suspended mucilaginous microaggregate" that can cause biofouling in the water treatment plant membranes leading to more frequent cleaning cycles and subsequent wear on the membranes. Further investigations are currently underway as to how we can identify the trigger(s) that might lead to the formation of 'Lake Snow' and also how the city water supply might be protected from its impact.

**Issue WS5:** Using water from the Maitai Dam increases impacts on the Water Treatment Plant processing system.

## Desired Benefits/Investment Objectives:

- Ensure the Water Treatment Plant is capable of meeting the demand for water to the required level of service (LOS) in the most cost-effective manner, irrespective of raw water source
- Maintain agreed LOS for customers while recognising that climate change may enhance the need for trade-offs between affordability and levels of service

**Table WS5: Principal options for processing Maitai Dam water at the Water Treatment Plant**

***Note:*** *A decision on these options will not be required until (or if) Council needs to rely more heavily on Dam water or marginal quality river water as the primary source of the municipal water supply.*

| PRINCIPAL OPTIONS | EXPLANATION AND IMPLICATIONS | √ or X | TIMING & COST ESTIMATE |
|---|---|---|---|
| **Alternative Option 1**<br>Invest in a primary clarifier above the Water Treatment Plant. | A primary clarifier will require changes to the layout of the site.<br>Additional sludge will be produced that will require extra settlement lagoons or a lamellar thickener.<br>This option could potentially extend the lives of the treatment plant membranes by 3–5 years. | √ | A primary clarifier would cost $20M–$25M. |
| **Alternative Option 2**<br>Install more membranes at the Water Treatment Plant. | Regular replacement of membranes will lead to replacement before the end of their service lives and some economic inefficiency. | x | $10M for reconfiguration of the Water Treatment Plant.<br>More regular replacement of membranes is estimated to cost $7.5M every 6–8 years. |
| **Investigative work/CAPEX decision**<br>Detailed investigation of options and cost benefit analysis will be the first stage of the project. It is possible that the preferred option may change as a result. | | | |
| **Key assumptions**<br>• The current levels of service require compliance with drinking water standards and resource consent conditions.<br>• Current sources of raw water (with the Waimea Community Dam) are expected to meet demand out to 2070–2080.<br>• Climate change will occur at a gradual rate and allow time for the community to adapt to longer drought periods.<br>• Nationwide freshwater policy will not result in significant changes to water supply resource consent conditions. | | | |

## Discoloured drinking water

Some of the water supply network consists of cast iron pipes. These cast iron pipes are lasting well on the outside, but the insides of these pipes are accumulating a layer of iron and manganese. They also accumulate tubercles (lumps). If these lumps break off it causes discolouration of the water. Scouring is used to remove these deposits and potentially some of the lumps. The risk of breaking the tubercles and allowing the dis-coloration to spread into the network needs to be carefully managed.

While there is no specific level of service in the Water Supply Activity Management Plan regarding water colour, it does cause customer dissatisfaction with the water supply service.

**Issue WS6:** Deposits in the cast-iron pipes are discolouring the water supply received by some customers.

## Desired Benefit/Investment Objective:

Meet reasonable requirements for water clarity and reduce customer dissatisfaction.

**Table WS6: Principal options to resolve discoloration of the water supply**

| PRINCIPAL OPTIONS | EXPLANATION AND IMPLICATIONS | √ or X | TIMING & COST ESTIMATE |
|---|---|---|---|
| **Preferred Option 1**<br>Renewal of cast-iron pipes in problem areas with the modern equivalent earlier than the renewal plan indicates. | Most of the cast-iron pipes which have been tested have been found to be in good structural condition. It is increasingly expensive to replace pipes by trenching.<br>This option will be desirable where the network has to be upsized for growth.<br>Investing in this option could mean Council has to delay renewal of other lower priority (asbestos cement, pvc, steel) pipes. | √ | Renewal (replacement) of 48 km of cast-iron pipes would cost $50–$60M over 10 years.<br>Likely to begin after 2028. |
| **Preferred Option 2**<br>Reline the cast-iron pipes in problem areas depending upon accreditation of products which are suitable for pipes carrying potable water. | The proposed way to address this is to strip everything off the inside of the pipes, and then line them with a food grade sleeve.<br>Relining pipes doesn't require digging them up, but renewing a pipe does.<br>This option will be desirable where the network does not have to be upsized for growth.<br>Investing in this option could mean Council has to delay renewal of other lower priority (asbestos cement, PVC, steel) pipes. | √ | Relining of cast-iron type pipes could cost approximately $10-$20M over 10 years.<br>Would begin after 2028. |
| **Investigative work/CAPEX decisions**<br>Options for re-lining need to be investigated and proven for potable water. The focus would be the removal of iron and manganese oxides from the inside of the pipes and the sealing of the wall to prevent regrowth of tubercles (if possible). | | | |

| PRINCIPAL OPTIONS | EXPLANATION AND IMPLICATIONS | √ or X | TIMING & COST ESTIMATE |
|---|---|---|---|
| **Assumptions**<br>• The current levels of service require monitoring of complaints about water clarity and compliance with the Drinking-water Standards for New Zealand 2005 (Revised 2018).<br>• Asbestos Cement (black bitumen coated) water mains involve more risk and their renewal is more critical over the next eight years.<br>• Suitable products for relining of potable water supply pipes are available in New Zealand but uncertainty remains regarding their performance and success on a large scale. | | | |

**Infrastructure Objective 3:** Provide infrastructure to enable growth and development

The pipe network around the city centre has a mix of smaller pipes, which were designed to serve a smaller city. Now there is a need for larger trunk mains (250mm to 300mm) in the central city and in some other areas. This will support the higher flow capacity required to allow for growth and intensification, including meeting the sprinkler firefighting requirements of buildings with multi-storeys and pressure reduction initiatives.

Providing adequate water supply in greenfield growth areas (such as Saxton and Maitahi/Bayview) is partly funded through development contributions for the growth component of any upgrading works. However, the funding of adequate water supplies for brownfield redevelopment and randomly distributed intensification is more complex.

The proposed approach of upgrading some pipework around key roads such as the existing ring road of Collingwood, Halifax, Rutherford and Selwyn Place to match the normal renewal programme or growth projections can be extended to other development areas. The details of any necessary upgrading can be considered as the timing and nature of any proposed growth developments are confirmed and when pipes are scheduled for renewal, which is likely to be in the first 10 years of this strategy.

A provisional budget of $35M has been included in the water supply cost estimates for renewals and upgrade proposals for growth areas.

Providing sufficient capacity for the next 100 years is the most cost-effective approach because this time period closely matches the expected service life of trunk mains and the material cost of upsizing pipes is only approximately 10% of the cost of digging up the roads to replace the water mains.

At this stage there is less focus on increasing capacity in the Wood due to the uncertainties related to the effects of sea level rise. The intent is to maintain the current levels of water supply capacity in this area. Similar discussions with the community will also be required for other proposed growth areas that may be subject to natural hazards. This includes the lower areas of the city centre.

**Infrastructure Objective 4:** Maintain or improve public health and safety, and environmental outcomes

Usually water for Nelson's water supply is taken directly from the 'run of the river', from the Roding River and the South Branch of the Maitai River. To compensate for this loss of water (particularly during times of low flow), water is released from the Maitai Dam to the Maitai River, to increase river flows to at least the level required by Council's resource consent.

The Maitai reservoir retains higher levels of organic material than run-of-river flows, and there are some slightly elevated levels of minerals as a result of the close proximity to the Nelson Mineral Belt. However, the greatest impact on water quality comes from the tendency of the Maitai Dam to stratify[5], resulting in anoxic (oxygen-depleted) conditions at the base of the Dam. This variable water quality at different times of the year occurs in most large dams.

The lack of oxygen in the colder water (in the lower levels of the Dam) creates a challenging environment for freshwater aquatic life. In addition, elevated levels of iron and manganese occur in the water as these chemicals become soluble. Discharging this water to the river can lead to a poor quality environment until the water becomes oxygenated. In recent years Council has only discharged this water during storm events, when the impact is greatly reduced.

However, as the frequency and intensity of droughts are predicted to increase over the next 30 years as a result of climate change, it is likely Council will be more reliant on the release of Dam water to maintain flow levels, rather than only doing so during storms. This increases the need to address water quality in the Maitai Dam.

In addition, the desire for improved water quality and quantity in the Maitai River may drive increased use of the Maitai Dam water for the water supply. The new water supply resource consent gained in 2019 has increased the minimum flow from 175 litres per second to 230 litres per second (as the Dam gets emptier during dry periods this minimum flow reduces down).

Currently, one cubic metre of water is added to the river (from the Dam) for every one cubic metre taken from the run of the river.

Under the new approach (a higher minimum flow) the drain on the Dam is quite a bit quicker due to the combined effect of augmenting the river flow, and using water from the Maitai Dam for the water supply more frequently.

Ongoing trade-offs are likely between the need to keep the Dam full at the beginning of summer to maintain resilience to droughts and the need to enhance the Maitai River's environmental values.

[5] This means a layer of warm water settles over the heavier, cooler water below, and this restricts the movement of nutrients which then become more concentrated in the cooler water over the summer months.

One way to avoid anoxic conditions in the Dam from impacting on the quality of water released into the Maitai River is to aerate the Dam, either by removing the stratification layer or introducing oxygen to the anoxic layer.

**Issue WS7:** The need to improve the quality of water discharges from the Maitai Dam into the Maitai River to avoid impacts on the downstream environment.

## Desired Benefits/Investment Objectives

- Aeration of the Maitai Dam
- Compliance with the 2019 water supply resource consent

**Table WS7: Principal options to improve the quality of the environment in the lower levels of the reservoir, and in the Maitai River when this water is released**

<table>
<tr><th>PRINCIPAL OPTIONS</th><th>EXPLANATION AND IMPLICATIONS</th><th>√ or X</th><th>COST ESTIMATE & TIMING</th></tr>
<tr><td>Alternative Option 1<br>Homogenise the water - destratify it using bubbles in the bottom of the dam, causing that water to rise up to the surface, removing the stratification layers.</td><td rowspan="2">A model of the Dam has been developed to check that aeration will work. Council's consultants are taking oxygen readings around the dam, modelling the results and comparing the two options.</td><td>√</td><td rowspan="2">Construction is programmed in 2022/23.<br>Final costs are yet to be confirmed. A budget of $2.5M is included in this strategy.</td></tr>
<tr><td>Alternative Option 2<br>Hypolimnetic aeration - pump oxygen into the bottom part of the dam, without breaking the stratification layer. This means this water stays cool while becoming oxygenated, and avoids anaerobic issues by manganese oxide and iron oxide staying in that form and settling at the bottom of the reservoir, rather than being part of the water.</td><td>√</td></tr>
<tr><td colspan="4">Investigative work/CAPEX decision<br>A decision on the options will be made once the outcomes of the modelling work has been completed. Further investigations are also underway on the impact on the reservoir chemistry and potential for algal growth that might follow on from aeration.</td></tr>
<tr><td colspan="4">Key assumptions<br>At least one of the principal options being modelled will be effective.</td></tr>
</table>

## Legislation changes regarding community water supplies to protect public health

At this stage it is not known whether legislative changes will require Council to take on responsibility for private community supplies serving small numbers of people (which would affect both the Glenwood and Maitai Valley supplies). More will be known by mid-2020. Both supplies are well away from the public supplies, so if this change does occur, it would be a matter of arranging for professional management of these water supplies rather than connecting these households to the municipal supply.

A decision is not required unless the legislation confirms Council must take on responsibility. At that point there would need to be a decision on who would pay for this change — the water users of these supplies, or the community as a whole.

Preliminary options:

a) Council takes over these community supplies (and users pay)

b) Council takes over these community supplies (management funded by all ratepayers)

c) Council doesn't take over these community supplies

## Other environmental actions

Other sustainable development improvement actions identified in the Water Supply Activity Management Plan 2021–31 are to develop demand management options, include: monitoring use of improved plumbing and appliance technology, reduced supply pressures in the public network to reduce losses, more structured water restrictions to match supply to available water resources, and possible Council support for on-site greywater and rainwater storage for reuse through the Draft Whakamahere Whakatū Nelson Plan, and pricing incentives.


# WASTEWATER

## Asset description

The inventory of public wastewater services assets owned by Nelson City Council and managed by the Infrastructure Group is shown in Table 3.

**Table 3: Summary of Wastewater Activity Assets (at January 2020)**

| Asset Category | km | units |
|---|---|---|
| Reticulation Pipes | 337 | |
| Trunk Mains | 36.2 | |
| Swallow Mains | 5.5 | |
| Rising Mains | 25.1 | |
| Access points | | 986 |
| Manholes | | 6,985 |
| Tanks | | 7 |
| Valves | | 293 |
| Neale Park Detention Tank | | 1 |
| Pump Stations | | 27 |
| Nelson Wastewater Treatment Plant | | 1 |

**Nelson Wastewater Treatment Plant**

As outlined in Part One of this strategy, Council is also a shareholder in the Nelson Regional Sewerage Business Unit (NRSBU) which manages the Bell Island Wastewater Treatment Plant. The other shareholders are Tasman District Council and a number of primary industry processers (Alliance Nelson, ENZA Foods and Nelson Pine Industries) which have a significant demand for wastewater processing. A separate infrastructure strategy to inform Long Term Plan decisions will be prepared by the General Manager Regional Services. This will cover the responsibilities of both the Nelson Regional Sewerage Business Unit and the Nelson Tasman Regional Landfill Business Unit.

**Infrastructure Objective 1:** Increase resilience to natural hazards and climate change

## Increase resilience to natural hazards

Council's wastewater network covers a wide geographical area which has a range of natural hazards including liquefiable soils, slope instability, coastal hazards (including the impacts of sea level rise), fault lines and flood hazard areas. The levels of risk associated with these hazards vary, as do the return periods associated with them. In addition, the level of knowledge varies between hazards.

The wastewater network for a city the size of Nelson contains the full range of assets required to effectively convey and treat the city's wastewater. These range from small diameter gravity pipes to large diameter pumped pipes, simple pipe connections, highly complex pump stations and a treatment plant. The failure of some assets carries a significantly greater level of consequence than others. For example, a catastrophic failure of the Nelson Wastewater Treatment Plant would be of far greater consequence than the failure of a single property's connection to the wastewater network.

Work is currently underway to map hazards, incorporating current climate change thinking, and determine levels of consequence that will enable identification and prioritisation (for risk mitigation/upgrade work) of assets that have a high consequence of failure when compared against risk from natural hazards. This work is being carried out in conjunction with the water and stormwater activities.

## Adapting to climate change - the Nelson Wastewater Treatment Plant & resource consent

The Nelson Wastewater Treatment Plant (NWWTP) is located at Wakapuaka. However, its low lying, coastal location means it is particularly exposed to the effects of climate change, including flooding, sea level rise and storm surges. This is significant because the Plant treats half of Nelson's wastewater, at around 5 to 7 million litres of wastewater on a dry summer's day. The remainder of Nelson's wastewater goes to the Bell Island wastewater treatment plant in the Tasman district, operated by Nelson Regional Sewerage Business Unit.

The NWWTP is not currently exposed to a 1 in 100 year (1% AEP) flood event from either storm rainfall or tidal inundation. Council developed a catchment flood model in 2016 to evaluate storm rainfall impacts on the NWWTP, covering Hillwood Stream, Todd Valley Stream and the Wakapuaka Flats drainage area. The 2016 model shows the NWWTP will not be inundated, but will be surrounded, by flood water in a present day 1% AEP flood event. Storm rainfall currently generates the highest flood levels across the Wakapuaka Flats. It is expected that in future, due to sea level rise and increased number and intensity of storms, coastal flooding will become the dominant source of flooding. Further assessment of coastal inundation levels is required which will involve modelling of overtopping volumes into the Wakapuaka Flats during storm surge events for future sea levels.

Resource consents granted in 2004 permit the use and operation of the plant and the discharge of treated wastewater to the coastal marine area via an ocean outfall. These consents expire in December 2024 and preparations for consenting began in 2019. The best practicable option for wastewater treatment and discharge in the Nelson region will be identified through the resource consenting process.

As part of the consenting process for the NWWTP, funding has been allocated to undertake studies/investigations relating to:

- natural hazards and the impacts of climate change
- cultural views related to discharges of treated wastewater
- viability of other discharge options
- alternative treatment processes
- the costs associated with any change in treatment and/or location

In addition to the investigations to inform the resource consent application, Council has begun to consider the long-term strategic viability of the Boulder Bank location. Council will be considering at least three alternatives to the current location, as outlined below.

- A retreat option — partial or full relocation progressed over time
- A relocation option to a land disposal site
- A consolidation option — treat all wastewater at the Bell Island wastewater treatment plant

Council also needs to consider the small rating base, as this limits the community's ability to pay for the types of sophisticated technology used in larger centres, and the significant costs associated with changes in location or process/discharge type.

**Issue WW1:** The impact of climate change and vulnerability to other natural hazard events (as well as new requirements for wastewater discharges and greenhouse gas emissions) on:

- The long-term viability of the NWWTP's current location and treatment processes/disposal routes
- The resilience of the wider network

## Desired Benefits/Investment Objectives:

- As a critical asset with significant capital investment, Council wishes to ensure the NWWTP continues to operate (with improvements to treatment processes as required) effectively in this location for as long as practicable, whilst planning for a future, possibly in a different location, with potentially different treatment/disposal processes
- Gain resource consent (prior to the expiry of the existing consent) for the continued operation of the NWWTP in its current location, recognising it could take 20 plus years to potentially relocate the wastewater treatment after a decision is made
- Certainty on the location of the NWWTP to enable the replacement of the Atawhai rising main, as this large diameter (approximately 1m) is in need of partial or full replacement

- Ensure that the NWWTP is operating as efficiently as possible and is operating to minimise the production of greenhouse gases
- Ensure the network is as resilient as realistically possible.

**Table WW1: Principal options for the operation of the Nelson Wastewater Treatment Plant**

| PRINCIPAL OPTIONS | EXPLANATION AND IMPLICATIONS | √ or X | TIMING & COST ESTIMATE |
|---|---|---|---|
| **Preferred Option 1**<br>Complete existing work to understand areas of high risk and consequence (this is likely to impact on the NWWTP and related assets). From this, develop a strategy and associated programme of works to improve the resilience of Nelson's wastewater network.<br>Investigate long term options for managing natural hazard risks affecting the NWWTP in its current location as part of the resource consent process.<br>Investigate alternative NWWTP locations or treatment options including:<br>- retreat further inland<br>- dispose wastewater to land<br>- treat all wastewater at Bell Island through the NRSBU. | Some geographical areas are more prone to natural hazards. In addition, some of the wastewater network has a higher consequence of failure. Combining these two factors establishes parts of the network that need to have a higher priority. This work increases our understanding of the natural hazards that impact on the NWWTP.<br>The cost of any actions required in response to this investigation at the NWWTP are not yet known, but could be considerable, particularly if relocation is the most cost-effective option in the long term.<br>Upcoming regulatory changes related to greenhouse gas emissions and wastewater treatment plant discharge quality will be an important factor in decision making relating to the future of the plant. | √ | As the city's wastewater network develops and evolves, and our awareness of risk levels associated with different levels changes, there will be a need to review the strategy and programme of works.<br>Approximately $500k over the first decade of the AMP to further develop the strategy and scope projects to increase network resilience.<br>The processes related to a potential relocation of the NWWTP are likely to take between 10 and 20 years. The initial investigations and options study is to be completed from 2019/20 to 2023/24 with follow on work likely. This is a significant piece of work and the investigations are expected to cost from $50k to $100k per annum. Over the 2021–2031 period $800,000 has been allocated for this process.<br>The resource consent for the NWWTP expires 1 Dec 2024.<br>Preparation for the NWWTP replacement consents began in 2019/20. |
| **Investigative work required/CAPEX decision**<br>Investigation work is required as part of the consenting process.<br>Capex decisions are expected after the consenting process is complete in 2024. The consent application will be lodged in 2023 but the outcome of the application will not be known for some time after this. Timing depends on hearings and Environment Court proceedings. | | | |

| PRINCIPAL OPTIONS | EXPLANATION AND IMPLICATIONS | √ or X | TIMING & COST ESTIMATE |
|---|---|---|---|
| **Key assumptions**<br>• The existing treatment plant will have treatment capacity for dry weather flows out to at least 2050–2060.<br>• Replacement resource consents will be granted for the operation of the plant out to 2040–2060.<br>• The impacts of climate change will be monitored and planning timeframes adjusted to respond to the latest information on sea level rise.<br>• Existing information held about fault hazard areas of land instability are reliable, although it is expected that Council may identify additional areas which are subject to natural hazard risk. (Under a recent November 2019 update to the Building Code, territorial authorities have been given a two-year transition period to map areas potentially prone to liquefaction.)<br>• Renewal and upgrade of assets will be designed to minimise vulnerability to known natural hazards.<br>• The NWWTP will remain in its current location or within the Nelson North area for the long term. | | | |

## Other actions

Council has commissioned consultants to carry out an assessment of natural hazards risks for all three waters (water supply, wastewater and stormwater). This investigation may identify opportunities to improve the resilience of critical assets within the wastewater network.

**Infrastructure Objective 2:** Maintain, renew and upgrade existing assets in a cost-effective way

## Asset condition/data confidence

Work is constantly being carried out to improve Council's understanding of the wastewater network. Recent changes include the use of new technology to improve real time understanding of how the network is operating. Related work is underway to improve Council's data management and storage systems.

Work will include the updating, recalibrating and verifying of Council's two hydraulic models to improve data confidence and support achievement of infrastructure objectives. The hydraulic models are very important tools for all aspects of network management, including:

- determining what network improvements (pipe size increases and pump station replacements) are needed to manage urban growth, including intensification (discussed under Objective 3)
- understanding where to undertake renewals
- determining the required size of pipes to allow for future growth

- understanding where to focus resources to limit overflows (discussed under Objective 4)

A key aspect of this work will be to have good data acquisition/retrieval, monitoring and storage systems that are modern and efficient to use. There will be costs associated with this.

More remote monitoring technology is now available, allowing for more reliable and consistent monitoring of the wastewater network than has been the case historically. The availability of more information (also to be included in the hydraulic model and to monitor network performance) will provide Council with an increasingly full picture of how the whole network is operating.

## Renewal of the wastewater network and theoretical renewal dates

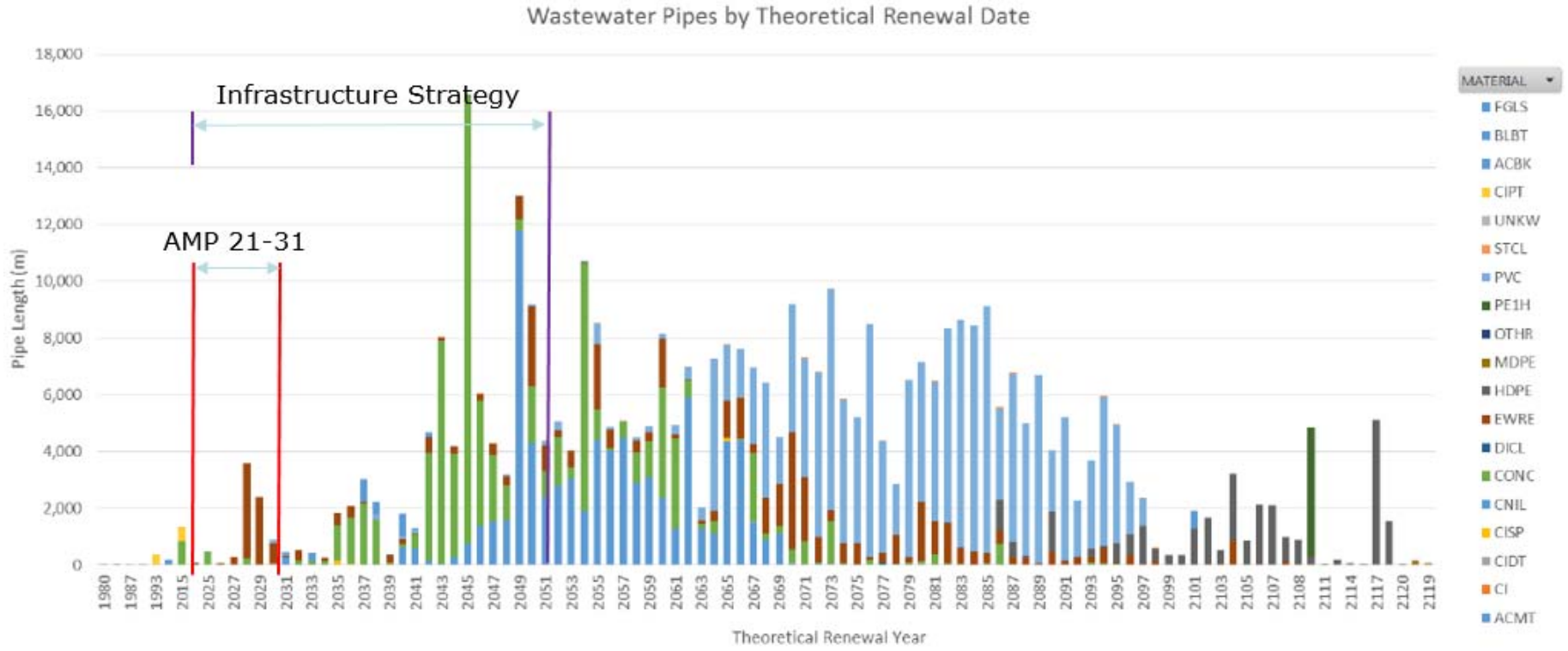
Wastewater assets are renewed when they fail to provide the required level of service, or where performance or reliability is compromised due to age and poor condition. Wastewater assets are a mixture of relatively new facilities/pipes through to pipes that are well in excess of their theoretical design life, with an increase in renewals (based on design life) anticipated from the 2040s onwards. When this increase occurs it is substantial, moving from an average of less than one million dollars per annum at present to an average in excess of $8 million per annum in the 2040s. There is also significant annual variation if following a "renew on expiry of life" philosophy. To manage this, the strategic approach will be to increase renewals to a relatively consistent and sustainable level over the next decade that will be maintained through the coming renewals "bulge" (see Figure 9).

Council proposes to develop a wastewater pipe renewal strategy that takes into account the following factors:

- asset criticality
- age
- condition
- material
- the ability to combine with other infrastructure work

***Figure 9 - Theoretical Wastewater Pipe Renewal Dates***

**[To be updated following completion of the AMP]**

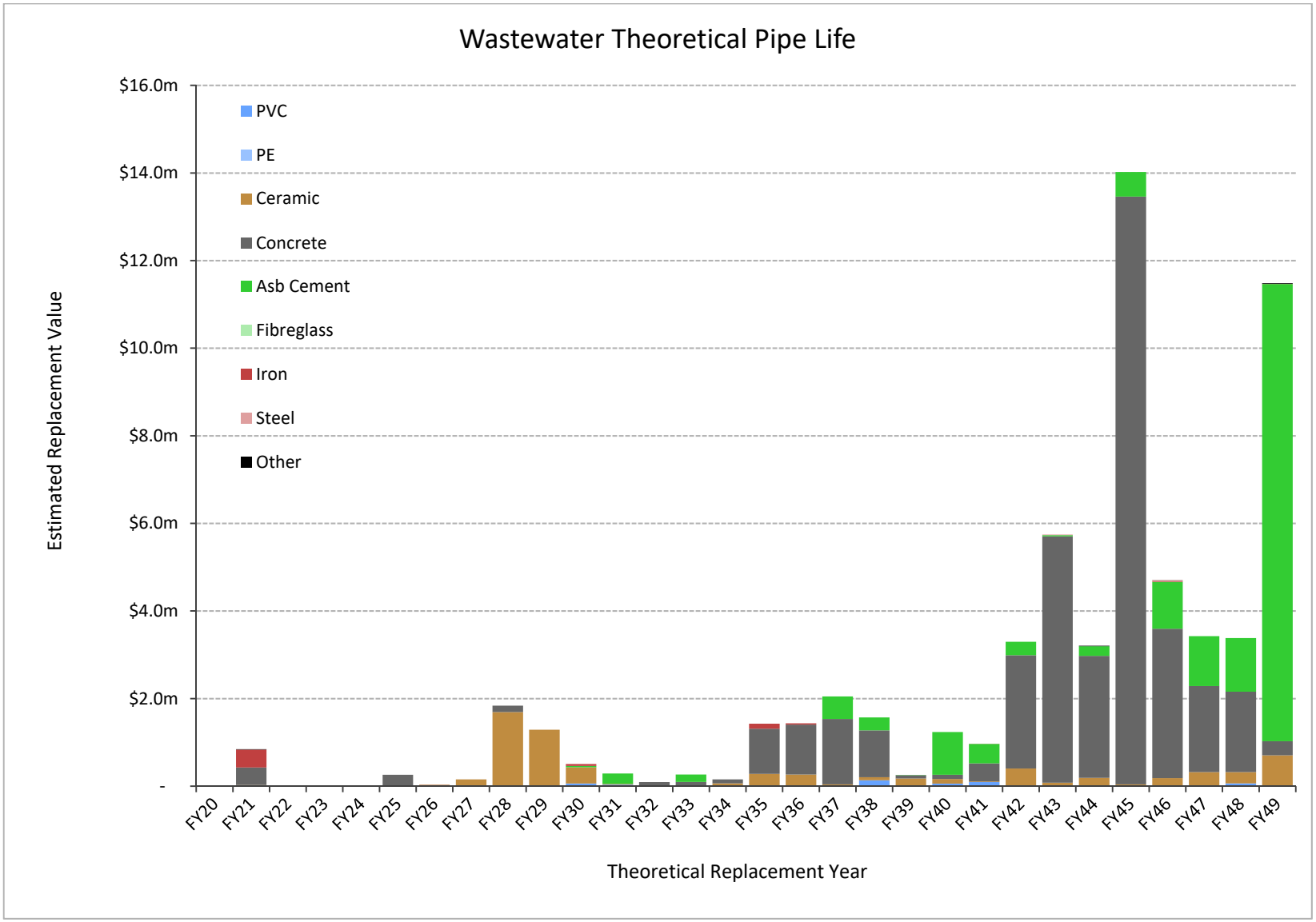


The theoretical renewal dates in Figure 9 are based on industry standards of expected lives of assets. However, the current renewal approach is based on improving Council's knowledge of the actual service lives of the network components through CCTV records, fault analysis, use of the hydraulic models, data analysis, establishing criticality and the Wastewater Overflow Reduction project (and other project support opportunities).

Council will use a variety of techniques for replacement of pipework ranging from traditional "dig and lay" techniques through to more innovative trenchless technologies, where appropriate. Additionally Council is trialling medium-scale rehabilitation of existing pipework by installing PVC 'sleeves' (also commonly called relining). While this technique is quick and cost-effective and allows existing pipes to remain in place, it will not be suitable for all pipes and does not give the same asset life as a full replacement. Risks remain as the long-term outcomes of using this technique are not fully understood. When compared against the conventional approach of installing new pipes, the weaknesses (in addition to a lower asset life) are that the sleeve is not able to bridge sections that have broken or been dislocated, and the sleeve reduces the capacity of the existing pipe.

The renewal work on the Atawhai Rising Main is expected to commence in 2024–25 and to extend into the early 2030s. There are important decisions affecting the Atawhai Rising Main that are linked to the future location of the NWWTP. At this stage it is assumed that the NWWTP will remain in its current location or within the Nelson North area for the long term.

***Figure 10 - Theoretical Wastewater Pipe Renewal Dates***



**Issue WW2:** Planned levels of service for wastewater will not be met unless assets are maintained, renewed and upgraded.

## Desired Benefits/Investment Objectives

- Appropriate capacity in the network
- Solutions to network issues that have a positive impact on the likelihood of wastewater overflows occurring
- Ability to cater for growth and intensification within the city
- Prioritised spend of budget with a focus on critical assets and also considering remaining design life, current condition and level of service assessments
- Council not being in a position of managing assets that are high risk because they have exceeded their design life and managing the consequences of failure (e.g. Wellington City)
- Use of network modelling and other data to inform good asset renewal decision making

**Table WW2: Principal options for improving the maintenance, renewal and upgrade of wastewater assets**

| PRINCIPAL OPTIONS | EXPLANATION AND IMPLICATIONS | √ or X | TIMING & COST ESTIMATE |
|---|---|---|---|
| **Preferred Option 1**<br>Proactive focus on gaining a better understanding of wastewater asset condition and developing a renewal strategy. | Increase the proportion of the network that has been assessed for condition, prioritising critical assets. This information is required to inform a renewal strategy.<br>Condition assessment is generally an operational cost where this applies to regular assessment of critical assets. | √ | Condition assessment of the wastewater network, prioritising critical pipes and assets. |
| **Preferred Option 2**<br>Develop wastewater strategies that provide a consistent basis for prioritising renewal and upgrades of the wastewater network in line with key drivers. | The wastewater network generally functions well. Technology and the availability of greater levels of data open up a number of opportunities for Council in terms of understanding where the best value for money can be obtained. In addition there are key societal and environmental | √ | Development of strategies, supported by wastewater network models, condition assessment and improved data analysis.<br>Completion of wastewater network models: $500k. |

| PRINCIPAL OPTIONS | EXPLANATION AND IMPLICATIONS | √ or X | TIMING & COST ESTIMATE |
|---|---|---|---|
| | drivers that need to be satisfied. | | |
| **Alternative Option 3**<br>Status quo — reactive response to service requests for wastewater improvements and like for like replacements. | Upgrades occur in the areas where the most complaints are made, which may not be the areas in most need of improvement. | X | Piecemeal expenditure does not represent value for money. |
| **Investigative work required/CAPEX decisions**<br>• Wastewater strategies will address the overall need to undertake wastewater asset renewal (pipes/pump stations/wastewater treatment plant) and to meet specific environmental and societal drivers e.g. reducing wastewater overflows. Some of these strategies are in place (e.g. Wastewater Overflow Reduction) but others need to be completed.<br>• The condition assessments programme needs to be enhanced to take into account advances in technology that are occurring. Additionally more work needs to be done on prioritising condition assessments to better target key/critical infrastructure given technological advances. | | | |
| **Key Assumptions**<br>• A philosophy of smoothing out the renewals "bulge" will be employed. This will involve early replacement for some assets and later replacement for others<br>• An increased spend on renewals will be feasible.<br>• Investing in better condition assessments and data gathering will be key to making good decisions related to asset renewal. | | | |

## Wastewater overflow reduction

*Stormwater/wastewater issues*

If households' stormwater pipes have been connected to the Council's wastewater network instead of to the stormwater network, rainwater run-off from roofs and driveways ends up flowing into the wastewater system. These above-ground effects are called inflow.

Stormwater and natural sources of groundwater also enter the wastewater system if underground stormwater and wastewater pipes are broken. These underground effects are called infiltration.

This is a significant issue because inflow and infiltration of groundwater can lead to wet weather wastewater flows which are several times greater than the flows the network was designed for. The increased flows into wastewater pipes put pressure on the capacity of the wastewater network as a whole, and can result in wastewater overflows during wet weather in combination with other factors (such as dryness of soil, existing network blockages, debris levels within the network etc.).

*Climate change and environmental standards*

The height of the tide also influences groundwater levels, and therefore the amount of groundwater infiltration into the wastewater system. For example, daily flows of wastewater to the NWWTP increase by approximately 1,000 $m^3$/day with a 4.4m tide compared to a 3.4m tide.

If infiltration is not addressed, wastewater overflows will become an even bigger problem in future, as a result of the predicted increase in sea level in combination with the increased frequency and intensity of future rainfall events. That means wastewater contamination of land or water would have ongoing impacts on cultural wellbeing, public health and the environment, and make it difficult to achieve the outcomes required by the National Policy Statement for Freshwater Management (NPS-FM).

Council currently has a level of service regarding compliance with resource consents with respect to wastewater overflows. Council's wastewater resource consent requires no dry weather overflows from pump stations by 2023 and a maximum of five wet weather overflows from pump stations per 12 months by 2032. The incoming Draft Whakamahere Whakatū Nelson Plan is expected to set more challenging targets.

Levels of service are likely to increase as a result of changes to the NPS-FM, the new National Environmental Standard for Wastewater Discharges and Overflows, and the probable new obligation on wastewater network operators to prepare a risk management plan, and/or to report annually on environmental performance measures. Further expenditure will be needed to meet the new requirements.

The updating and calibration/verification of the two hydraulic models (discussed above in relation to asset condition data) is key to understanding network performance and where constraints exist and therefore to investing appropriately to reduce wastewater overflows.

Misconnections and broken pipes on private property are not always easy to resolve either through education or regulation, and can become extremely challenging.

To have the best chance of completely solving the issue, Council would have to replace most of the wastewater network, including privately owned pipes and pump stations, and ensure stormwater was being disposed of appropriately across the city (which itself is a challenging piece of work particularly where there is no existing stormwater network).

One approach, and likely a part of any solution to limiting wastewater overflows, is to upgrade the system downstream (to carry flow away from areas prone to overflows) and/or provide storage to minimise overflows by:

- developing a holistic strategy, using the hydraulic model to predict where there is a higher likelihood of overflows
- factoring in the entry of some stormwater and groundwater into the wastewater system by increasing network capacity, potentially including the ability to store limited amounts of wastewater
- continuing to investigate high E.coli readings in water samples and repair any damage in the public network (noting that the network is, in the natural order of things, constantly degrading)

**Issue WW3:** Inflow and infiltration causes overflows from the wastewater network.

## Desired Benefits/Investment Objectives:

- Compliance with resource consents and legislative requirements
- Increased public knowledge of inflow and infiltration issues to decrease the incidence of cross connections, and an increased understanding of affordability
- Minimisation of risk of environmental impacts due to overflows from the wastewater network

**Table WW3: Principal options to reduce overflows from the wastewater network**

| PRINCIPAL OPTIONS | EXPLANATION AND IMPLICATIONS | √ or X | TIMING & COST ESTIMATES |
|---|---|---|---|
| **Preferred Option 1**<br>Finalise the Wastewater Overflow Reduction Strategy document, complete the trial area work and develop a programme of work.<br>Complete upgrades to the wastewater hydraulic models and use them to assist in confirming poorly performing catchments, allowing investigation work to be focused. Part of the solution is likely to be system improvements (such as pipe renewal/upsizing, pump station upgrades and storage tanks) in locations at risk of overflow. | This is a significant piece of work for the city and it is expected that a small team will be required to deliver the programme.<br>Additional resources are required to follow up on the results of property investigations.<br>Detention tanks or network upgrades are 'end of pipe' solutions and do not treat the source of the problem. Instead, they work to remedy the consequences, but they | √ | <u>Timing</u><br>This is an ongoing piece of work that will never fully conclude. The strategy and programme will need reviewing periodically, and an upgrade of hydraulic models will be required in 2021.<br><u>Costs</u><br>Ongoing, consistent operational and corresponding capital budgets will be required. |

| PRINCIPAL OPTIONS | EXPLANATION AND IMPLICATIONS | √ or X | TIMING & COST ESTIMATES |
|---|---|---|---|
| Continue site investigations into high E.coli levels in receiving environments, and undertake mitigation work as needed.<br>Develop an approach to remedying inflow and infiltration that occurs on private property that aligns the desire to minimise overflows with the community's ability to pay. | are still an important part of the solution. | | |
| **Alternative Option 2**<br>Rely on pipeline renewal to reduce infiltration. | Wet weather overflows will continue into the foreseeable future.<br>This is not a particularly strategic approach.<br>This approach would be more effective if combined with financial and practical support to make changes on private property, and if used as part of a wider, comprehensive approach to tackling the issues of inflow & infiltration and wastewater overflows. | X (on own) | Ongoing as the network ages and deteriorates.<br>Significant costs. Actual quantum dictated by the timeframes over which the work is completed (noting that longer timeframes will likely mean overflow reduction will occur at a slower rate). |
| **Alternative Option 3**<br>Undertake a public education campaign to encourage appropriate disposal of stormwater. | Uncertainty regarding how much investment property owners would be willing to make in resolving cross connections and broken pipes on a voluntary basis.<br>This approach would be more effective if combined with financial and practical support to make changes on private property and if used as part of a wider, comprehensive approach to tackling the issues of inflow & infiltration and wastewater overflows. | X (on own) | This would need to be an ongoing programme for a considerable time period to ensure the messaging reached people and became a societal norm. |

| PRINCIPAL OPTIONS | EXPLANATION AND IMPLICATIONS | √ or X | TIMING & COST ESTIMATES |
|---|---|---|---|
| **Alternative Option 4**<br>Increase resources for investigating discharge of stormwater (by inflow and/or infiltration) to wastewater pipes on private properties, to avoid inflow of rainwater to the wastewater system. | Significant issues on private properties would require land owner support and possible funding to resolve.<br>This approach would be more effective if combined with financial and practical support to make changes on private property and if used as part of a wider comprehensive approach to tackling the issues of inflow & infiltration and wastewater overflows. | X (on own) | The costs of fixing private stormwater/wastewater cross-connections have not yet been assessed.<br>This is likely to be a slow process as it would involve dealing with landowners on an individual basis over several decades. It is also likely to require a significant level of staffing to ensure it is successful. |
| **Investigative work required/CAPEX decisions**<br>• A level of service related to a wet weather event return period needs to be identified and agreed.<br>• Investigations into which catchments require attention will need to continue as data improves and regulatory standards are clarified.<br>• Confirmation of an approach to deal with private property inflow and infiltration is required. | | | |
| **Key assumptions**<br>• Council will increase LOS to improve environmental outcomes in line with regulatory requirements.<br>• The community is generally in support of resolving the wastewater overflows issue but may be less supportive of remediating private property issues.<br>• Growth may be constrained where wet weather capacity is insufficient or requires alternative solutions to be developed. | | | |

## Discharges to Nelson Haven from the Atawhai Rising Main

There is one large pipeline (approximately 1m in diameter) between Nelson and the NWWTP, which is located along Atawhai Drive. This rising main suffered significant damage from acid attack (from the gases emanating from the sewage being carried in the pipe) after approximately 30 years of service, and extensive repairs were carried out in the 1990s. However, further failures have since occurred, leading to low volumes of untreated wastewater discharging directly into Nelson Haven.

These untreated wastewater discharges impact on coastal water quality, cultural values, and public perceptions of the quality of the environment. They also have the potential to affect Council's compliance with future resource consent conditions, as the regulatory environment related to discharges of wastewater to the environment is likely to become more stringent over time.

Investigation and condition assessment of the Atawhai Rising Main is being carried out from 2019–2023. However, decisions on early renewal (replacement) of the rising main will depend on whether Council is able to gain consent for the NWWTP to continue in its current location. It is not cost-effective to upgrade the existing rising main if the future location of the NWWTP is not going to be in the Nelson North area. At this stage however, it is assumed that the NWWTP will remain in its current location or within the Nelson North area for the long term.

**Issue WW4:** Failures of the Atawhai Rising Main are occasionally causing untreated wastewater discharges directly into Nelson Haven.

## Desired Benefit/Investment Objective:

Avoid wastewater discharges to Nelson Haven due to asset failures.

**Table WW4: Principal options to address discharges to Nelson Haven due to asset failures**

| PRINCIPAL OPTIONS | EXPLANATION AND IMPLICATIONS | √ or X | TIMING & COST ESTIMATE |
|---|---|---|---|
| **Preferred Option 1**<br>Increase and maintain funding and resources for pipeline investigation/ inspection. Check all fittings and access hatches along the pipeline. Carry out spot repairs as required.<br>Monitor technological developments for smart solutions. | Investigations are focused on access points such as air valves and person access hatches. Ongoing investigation of the pipeline will be required as opportunities arise. Risk of pipe wall failure remains.<br>Technological developments are fast moving and Council needs to be aware of what is in the market that may offer good condition assessment information. | √ | Ongoing until a decision about the future location of the NWWTP is confirmed.<br>The investigation and spot repairs will cost several hundred thousand dollars per annum until a decision is reached. |

| | | | |
|---|---|---|---|
| **Preferred Option 2**<br>Renewal of the Atawhai Rising Main pipeline.<br>This may involve the prioritisation of critical portions (i.e. those in particularly poor condition) of the rising main using the investigation/inspection findings. | Dependent on decisions about the long term location of the NWWTP.<br>A derivative of this option would be to undertake a selective replacement of the pipeline. This option may be particularly appropriate if the NWWTP is likely to remain in place for a significant period (20–30 years) from the present, and the alternative NWWTP locations which are likely to be considered are not in Nelson North. | √<br>(future) | Subject to resource consent approval for the NWWTP, renewal investigation and options are to start in 2024/25 with construction scheduled to commence in 2027/28 and to take 5-10 years to complete.<br>The renewal work may be brought forward, depending on the outcome of the pipeline/fittings condition investigation from 2020–2023.<br>The renewal of the pipeline would cost approximately $42M. However, work is being undertaken to review this figure. |

**Investigative work required/CAPEX decision**

- The internal condition of the pipeline is to be investigated as opportunities arise. Technological developments to be monitored for opportunities to use technology that will provide greater insight into the internal condition of the pipe.
- Investigation of renewal options, including a duplicate pipeline which is located to minimise impacts of climate change, or relining/sleeving the existing pipeline.
- Investigation of key physical features to continue wherever possible (physical conditions and availability of finance limit the inspection frequency of some features).
- CAPEX decision linked to NWWTP resource consent renewal outcomes and decisions.

**Key assumptions**

- There is no current level of service specific to the Atawhai Rising Main. The existing rising main is expected to have capacity for dry weather flows out to 2050–2060.
- Access for repairs and maintenance alongside the state highway will continue to be available.
- Periodic failures are expected to occur. Good contingency planning is required to manage these events.
- The NWWTP will remain in its current location or within the Nelson North area for the long term.

## **Infrastructure Objective 3:** Provide infrastructure to enable growth and development

Council is progressing implementation of the Future Development Strategy (FDS) which was adopted in June 2019. The FDS identifies intensification as a significant means to achieve its growth and development objectives. . Wastewater services will be required to be responsive to new urban expansion and intensification areas.

Reducing inflow and infiltration and freeing up network capacity is supportive of growth and development (see Issue WW2). There are also some opportunities to increase the current pipe diameters when the network is renewed, and the use of an up-to-date hydraulic model is critical to support these decisions.

**Issue WW5:** Nelson's wastewater network has capacity constraints that impact on the city's ability to accommodate growth and intensification.

## Desired Benefit/Investment Objective:

Accommodate growth and intensification.

**Table WW5: Principal options to accommodate growth and intensification acknowledging existing network constraints**

| PRINCIPAL OPTIONS | EXPLANATION AND IMPLICATIONS | √ or X | TIMING & COST ESTIMATE |
|---|---|---|---|
| **Preferred Option 1**<br>Upgrades to the wastewater network occur in time to convey additional wastewater flows generated by development | This focuses on ensuring the network has adequate capacity to convey flows.<br>The required network upgrades can occur ahead of growth/ intensification (lead) or can be undertaken in parallel (lag).<br>The decision about whether upgrades would be lead or lag will depend on a number of factors including:<br>confidence in development<br>availability of capital budget<br>severity of existing network constraints. | √ | Timing will be led by the FDS/actual development.<br>Costs will be dependent on a number of factors including length of network to be upgraded, depth of pipe and size of upgrade. |
| **Alternative Option 2**<br>Use on-site storage to detain flows to prevent overflows within the network. | This would involve providing storage either at an individual property or at development level to retain all wastewater flows (from the development) during a rainfall event.<br>The downstream network would still need to be upgraded at some point in the future.<br>This option could be implemented with the development and more quickly than most network upgrades. | X | Timing will be led by the FDS/actual development.<br>The long term cost of this option is expected to be greater than focussing on network upgrades (as there will be storage installed and over time network upgrades will take place as well). |
| **Investigative work required/CAPEX decision**<br>Use the wastewater hydraulic model to understand likely constraints within the network. Investigate potential options to deal with constraints within the network. | | | |
| **Key assumptions**<br>• Updated version of the hydraulic wastewater model will be available. | | | |

| PRINCIPAL OPTIONS | EXPLANATION AND IMPLICATIONS | √ or X | TIMING & COST ESTIMATE |
|---|---|---|---|
| • Development areas as identified in the FDS and IAP will be consistent and changes will not be too significant (i.e. number of properties may increase/decrease but the locations are consistent).<br>• Funding is available and flexible to accommodate the relatively reactive nature of development responsive projects. | | | |

**Infrastructure objective 4:** Maintain or improve public health and safety, and environmental outcomes

As noted previously, more work will be carried out to limit wastewater overflows. This work will have positive impacts on both public health and safety and environmental outcomes.

Additionally work related to Issue WW1 (and generally across the Wastewater Activity) will have a significant focus on carbon neutrality and the Zero Carbon Bill requirements.

Incoming legislation will affect Council's ability to discharge treated wastewater effluent to the coast, this will have significant cost implications. (See Objective 1 for a brief discussion of the option of discharging wastewater to land.) More details on the proposed legislative changes are expected to be available at some point in 2020.


# STORMWATER & FLOOD PROTECTION

## Asset description

Council's stormwater system can be categorised into two parts — natural and constructed components. The natural part consists of rivers and streams that play an important role in the support of aquatic ecosystems, recreation and the channelling of stormwater flows in rainfall events. During high rainfall events the rivers and streams transport large volumes of water and sediment with levels of energy that are capable of causing significant damage to property adjoining these areas and within the flood path.

The constructed stormwater network includes pipes, channels, and overland flow paths that convey stormwater to receiving watercourses or the sea. The stormwater system also incorporates two pump stations, and 20 detention devices. In many parts of the city a fully reticulated system is not provided and individual properties discharge stormwater to on-site soakage or to the road channel as part of the primary drainage system.

The inventory of public stormwater and flood protection assets owned by Nelson City Council and managed by the Infrastructure Group as at June 2020 is shown in Table 4.

**Table 4: Summary of Stormwater and Flood Protection Assets**

| Asset Category | Quantity | |
|---|---|---|
| | km | units |
| Pipes Up To 600mm | 198.8 | |
| Pipes > 600mm | 45.5 | |
| Channels | 1.8 | |
| Culverts | 2.9 | |
| Rocks Rd Culvert | 0.3 | |
| Intakes | | 121 |
| Manholes | | 4,924 |
| Outfalls | | 126 |
| Sumps | | 345 |
| Pump Stations | | 2 |

| Asset Category | Quantity | |
|---|---|---|
| | km | units |
| Tide Gates | | 24 |
| Detention Devices | | 20 |
| Urban Streams/Rivers[6] | 31.5 | |
| Bank Protection | 28.5 | |

**Infrastructure Objective 1:** Increase resilience to natural hazards and climate change

## Definitions

**% AEP:** As with other natural hazard events, the likelihood of a flood event is often referred to in terms of its Annual Exceedance Probability (AEP) e.g. a 1% AEP flood event has a 1% chance of occurring in any one year. This is sometimes referred to as a 1 in 100 year, or a 100 year ARI event.

**Q15, Q20, Q50 and Q100:** Open channel and stormwater pipe capacities are generally expressed in terms of the flood event they are designed to contain. Under the Land Development Manual 2019, new stormwater pipes installed in Nelson should have sufficient capacity to carry a future 1 in 15 year (Q15 or 6.67% AEP) flood flow, taking into account higher intensity rainfall predicted for 2090.

## Adapting to climate change - increased rainfall and sea level rise

Nelson City's location on a number of flood plains, and close to the coast, means the community is vulnerable to the impacts of climate change that would cause more intense storms, increased stormwater flows, and coastal inundation resulting from sea level rise.

Some areas of the city already have ongoing drainage issues which will be exacerbated by climate change, especially low-lying coastal areas. Council is progressively working towards achieving a consistent basic standard of stormwater and flood protection across the city, with the final level of protection set through a risk-based approach. In some cases a higher standard of stormwater design may be justified where stormwater and stream overflows could contribute to land instability, wastewater infiltration, or damage to infrastructure and buildings.

Detailed computer catchment flood models have been developed for 10 of the 11 urban streams in the city (Saxton Creek has not yet been modelled). These models show that significant areas of the city will be more regularly and severely impacted by stream and river flooding in future, particularly low-lying areas exposed to tidal inundation and sea level rise.

[6] Urban Streams and rivers are: Todd Valley Stream, Oldham Creek, York Stream, Brook Stream, Maitai River, Jenkins Creek, Arapiki Stream, Poormans Valley Stream, Orchard Creek, Orphanage Stream and Saxton Creek.

Coastal flood models show that higher sea levels will lead to more regular tidal inundation of low lying coastal land during high tides and storm events, and reduce the capacity of stormwater pipes and open channels to drain flood waters away to sea.

The current levels of service in the 2021 Stormwater and Flood Protection Asset Management Plan focus on maintaining major flood protection and control works, and ensuring the primary stormwater system protects habitable floors from a present day Q20 (5% AEP) flood event.

Council has historically committed to a programme of works for urban rivers and streams for a primary capacity of Q50 (2% AEP flow), which is the peak flow arising from a rainfall event with a probability of happening once in 50 years. Ongoing concerns about climate change has led to a reappraisal of this approach. Where new land development and subdivision is proposed, the LDM 2019 has adopted a design standard of Q100 (1% AEP flow) in 2090 for secondary flow paths, open channels, streams and rivers, assuming an RCP 8.5 scenario.

Achieving a similarly high level of service for existing development is not straightforward for a number of reasons. The costs of channel widening or bunding to achieve a Q100 level of service is expected to be very high due to the proximity of existing properties, structures and land of high natural, economic and recreational value on the margins of these rivers and streams. For the tidally-affected sections of these channels, additional challenges apply, as sea level rise would require extensive bunding to contain both coastal storm surges as well as storm run-off. Even if it were feasible to prevent future stream overflows and tidal inflows, low lying coastal areas could still be vulnerable to local stormwater flooding due to impeded drainage, and elevated groundwater levels. Council recognises that the costs of meeting a Q100 design standard for the 2090 climate for all urban streams and rivers is likely to be unaffordable for the community. In addition to this, the scale of works required within and along these watercourses may not be acceptable to the community for amenity, environmental or cultural reasons.

A risk-based approach for existing development is expected to enable Council and the community to prioritise where and how interventions to manage river and stream flooding should be made. It is intended to enable the effective targeting of resources to higher risk areas where a high level of benefit can be achieved through intervention. This implies that some areas facing significant flood risk may not be prioritised due to other considerations outweighing the flood risk, until the flood risk increases to threshold levels. This approach needs to consider a broad range of options including flood works, flood preparedness, land use planning and appropriate urban design. A range of criteria such as environmental, economic, social, legislative, reputational and cultural implications may be adopted when weighing up options to address flooding. The new flood models allow Council to better understand the probability (return periods) and the consequences (location, extent and severity of property flooding) to the community of flood events now, and in the future, under a range of response options. The consequences of flooding should guide the prioritisation of future actions.

Council will be trialling this new approach with the Maitai River Flood Management project and will take into account a broad range of factors including: loss of life, displacement of residents, health effects, building damage, and the cost of replacing

buildings and network services. Funding for the Maitai River Flood Management investigations, consultation and design has been allocated from 2021/22 through to 2023/24, with funding and implementation of construction works (if this is the preferred outcome) to occur in future years. This flood management project involves Council officers, consultants and the community working together in a cross-disciplinary way to develop a decision-making framework for determining how to reduce flood risk (refer to section 2.7.4 for further details). Community perceptions of acceptable risk may evolve over time, particularly if climate change results in more regular and damaging flooding.

Council intends to take the same approach in other areas of the city at a later stage, leading to the development of stormwater and flood protection strategies. This process will need to be prioritised using a risk-based approach that considers current and future flood impacts.

**Issue SW1:** The level of service provided by existing stormwater and flood protection assets will progressively reduce over time due to more intense storms and sea level rise projected with climate change.

## Desired Benefits/Investment Objectives:

- Properties in the city are protected from the effects of uncontrolled stormwater discharges in events up to a Q15 (6.67% AEP) event, as predicted to occur in the 2090s
- No habitable floors flooded up to a present day Q20 (5% AEP) flood event
- A resilient stormwater network that will continue to provide property protection during and after the action of natural hazards
- For areas of existing development, flood management interventions are targeted at where flood impacts are highest, following a risk-based approach
- New development does not increase exposure to flood risk up to a future Q100 (1% AEP) flood event (as predicted to occur in the 2090s)

**Table SW1: Principal options for adapting to more intense storms, increased rainfall and sea level rise**

| PRINCIPAL OPTIONS | EXPLANATION AND IMPLICATIONS | √ or X | TIMING & COST ESTIMATE |
|---|---|---|---|
| **Preferred Option 1 - Stormwater**<br>The preferred approach is to progressively upgrade the public piped stormwater network to a 6.67% AEP (Q15) event based on predicted conditions in the 2090s.<br>Events which exceed this threshold will utilise secondary flow paths (such as roads, open channels and natural gullies) to collect and convey stormwater to a safe discharge point. | Many parts of the existing stormwater network were installed prior to the recognition of climate change and will not cope with increasing flows into the future. For low lying areas, additional measures will be required to provide protection against tidal inundation as sea levels rise.<br>Meeting the proposed level of service may also be achieved through providing additional stormwater detention and increasing infiltration, including allowing for more on-site soakage, permeable surfaces, and other green infrastructure. | √ | Ongoing for 30 years.<br>The extent of the network which does not meet the 6.67% AEP (Q15) level of service is being assessed. A very rough cost estimate is in the order of $150M over 30 years to meet the proposed level of service for the public network across the entire city.[7]<br>The cost of installing new detention capacity for existing development or for intensification areas will be assessed following stormwater network modelling. |
| **Preferred Option 2 – Flood Protection**<br>The preferred option is a risk-based approach to flood protection which means focusing flood protection interventions on areas where flood impacts are highest, and where a high level of benefit can be achieved through intervention at an affordable cost to the community. | Vulnerability to flooding is expected to increase due to climate change, but raising sites and buildings in low-lying areas can also reduce risk over time. The risk profile can change annually as property valuations change and land use changes through redevelopment. Council expects the flood risk will need to be reviewed regularly to enable effective prioritisation of interventions. | √ | Ongoing for 30 years.<br>The cost of implementing a risk-based approach will not be known until the analysis for each stream and river has been completed. A very rough estimate is likely to be in the order of $100M over 30 years. |
| **Preferred Option 3 – Flood Protection**<br>New performance target for flood protection of existing development: No damage | This performance target is already in place for the stormwater activity, and would supplement the risk- | √ | The cost of meeting this new performance target in the short term is expected to be minimal as most urban |

[7] Compares to $80M in previous AMP. New storm rainfall datasets from NIWA have increased design flows.

| PRINCIPAL OPTIONS | EXPLANATION AND IMPLICATIONS | √ or X | TIMING & COST ESTIMATE |
|---|---|---|---|
| to urban areas from flood events of a level that has a 50% probability of occurring in any one year.<br>No more than 10 per 1000 properties in urban areas with habitable floor damage from events that have a 5% probability of occurring in any one year. | based approach for the flood protection activity.<br>Introducing this target would remove complications around establishing the source of the flooding when a habitable floor is inundated, as in some cases flooding may arise from multiple sources.<br>This target is consistent with the stormwater performance target, which relates to present day flood risk. | | watercourses have 5% AEP (Q20) capacity.<br>This measure may be more challenging to achieve in the long term as sea levels rise. |
| **Alternative Option 4 – Stormwater**<br>An alternative approach is to progressively upgrade the public piped stormwater network to a 10% AEP (Q10) event, based on predicted conditions in the 2090s.<br>Events which exceed this threshold will utilise secondary flow paths (such as roads, open channels and natural gullies) to collect and convey stormwater to a safe discharge point. | Updates to NIWA's stormwater rainfall database (HIRDS) in 2018 have resulted in increases to predicted future rainfall depths. The result is that a 10% AEP (Q10) event now exceeds the 6.67% (Q15) standard set under the previous LDM (2010).<br>The most recent Water NZ survey for 2018/19 showed that the majority of councils across New Zealand have adopted a Q10 level of service for urban stormwater design.<br>Changing this level of service would require an amendment to the LDM 2019 which would align NCC's level of service with TDC. | No action at this stage.<br><br>Investigate this option further for the LTP 2024–34. | The cost of upgrading the public stormwater network to a Q10 (10% AEP) level of service has not been assessed but will be lower than for Option 1.<br>The extent of the public stormwater network which does not meet a Q10 level of service is being assessed, so that the costs of meeting this level of service can be compared with the cost of meeting the existing Q15 level of service. |
| **Alternative Option 5 – Flood Protection**<br>An alternative option is to upgrade all streams and rivers to ensure flows from a future 1% AEP event (in the 2090s) are contained within the river channel. | The cost of upgrading channels to meet a 1% AEP event would be expensive and in some areas the cost of upgrades may be found to outweigh the costs of damage from natural hazard events. The environmental effects of achieving such a high level of protection may | X | Ongoing for 30 years. A very rough estimate of costs for the work would be in the order of $200M over 30 years.<br>This level of service may not be possible to achieve or sustain in the long term if the |

| PRINCIPAL OPTIONS | EXPLANATION AND IMPLICATIONS | √ or X | TIMING & COST ESTIMATE |
|---|---|---|---|
| | be unacceptable for the community. | | high end climate change projections eventuate. |
| **Investigative work required/CAPEX decisions**<br>• Complete stormwater network modelling to establish existing levels of service for the stormwater network, and the cost of meeting the Q15 and Q10 level of service options, including consideration of climate change effects.<br>• Complete assessment of flood impacts for the largest 11 urban streams. Complete development of a risk-based framework for flood protection, and progress flood management strategies for the urban streams on a prioritised basis.<br>• Investigations for the Maitai River are in years 1–3. Any subsequent construction works will be identified in future LTPs. | | | |
| **Key assumptions**<br>• The stormwater and flood protection activity does not currently address flood risk from tidal inundation or groundwater ponding, or a combination of these.<br>• It is assumed that strategies for areas vulnerable to future tidal inundation will be progressed in line with Policy 27 of the NZCPS (2010), and that clear parameters and timeframes are set in relation to protecting these areas from future flooding.<br>• A risk-based response to flood protection will underpin the stormwater and flood protection activity for the life of this strategy.<br>• Construction costs have escalated in recent years and this has significantly affected the cost of achieving the levels of service set out in the table above. This provides further justification for adopting a risk-based approach.<br>• Development in flood prone areas of the city is controlled by the Nelson Resource Management Plan, under the Resource Management Act. Coastal inundation mapping and river and stream flood models are expected to support future controls for subdivision and land development through the upcoming Draft Whakamahere Whakatū Nelson Plan (which will replace the Nelson Resource Management Plan) to ensure flood risk does not increase due to new development.<br>• Climate change will be monitored and both flood assessments and development controls will need to be updated on a regular basis to respond to the latest information. | | | |

## Increase resilience to natural hazards

Council commissioned consultants to identify natural hazard risks for the three waters assets (the stormwater, wastewater and water supply networks) and to assess how these could affect the critical assets within each network.

Earthquake damage as a result of ground shaking and liquefaction can cause significant and long-term disruption to the community, and loss of services to affected areas.

Increases in rainfall intensity and sea level rise as a result of climate change will also impact on stormwater services, including increasing the likelihood of stormwater network blockages, silting up of pipes, or tidal inflows due to malfunctioning flood gates.

Assets are also increasingly being renewed as part of an upgrade to address inadequate capacity. The 2011 storm event highlighted issues with the size and debris control of

many of the intake structures around the city. A programme of upgrading key intakes is underway and is expected to be completed by 2027/28.

**Issue SW2:** Damage to the stormwater network from natural hazards and climate change.

### Desired Benefit/Investment Objective:

A resilient network that will continue to provide property protection during and after the action of natural hazards and slow-onset change that may not be considered as 'events' (e.g. sunny day flooding).

**Table SW2: Principal options to manage risks of damage to the stormwater network as a result of natural hazards and climate change**

| PRINCIPAL OPTIONS | EXPLANATION AND IMPLICATIONS | √ or X | COST ESTIMATE & TIMING |
|---|---|---|---|
| **Preferred Option 1**<br>Identify and assess network risk (this investigation is underway as described above) and develop a resilient network to withstand moderate earthquakes and other natural hazard events with minimal damage.<br>Have insurance as a means to assist with recovery costs. | A risk assessment of assets is being carried out between 2019 and 2024, and will be repeated every 10 years thereafter. To date, the assessment has focused on defining the areas potentially subject to natural hazards, and the criticality of the Three Waters assets. This will lead to prioritisation of 'resilience works' with construction of network upgrades to follow investigation.<br>The Tahunanui Hills Slump stormwater upgrade is an example of a stormwater resilience project, as it includes flexible HDPE pipe across block boundaries. | √ | Accurate costs will not be known until this investigation is completed and the risk profile is better understood.<br>Investigation cost of $400k over 30 years has been included in operational budgets.<br>A rough order cost of $10M[8] for works over 30 years has been included in capital budgets.<br>Insurance costs are ongoing. |
| **Preferred Option 2**<br>Upgrade key stormwater intakes and culverts to reduce risks of debris blockage. | This work is currently in progress under the Flood Protection Activity and is expected to be completed by 2027/28. | √ | Funded through the LTP 2018–28. |
| **Alternative Option 3**<br>Identify and assess network risk (this investigation is underway) and rely on insurance as a | Significant damage to the network from major events, and slower recovery.<br>This option includes an assessment of risks, but no remedial action to address them. | X | Risk assessment of assets in years 1-5 and every 10 years thereafter.<br>$400k over 30 years (as per option 1). |

[8] Note: costs assume resilience works include the Tahuna slump stormwater upgrade which has already been costed > $5M.

| PRINCIPAL OPTIONS | EXPLANATION AND IMPLICATIONS | √ or X | COST ESTIMATE & TIMING |
|---|---|---|---|
| means to assist with recovery costs. | Insurance withdrawal is increasingly likely in high-risk areas in the face of climate change. | | |
| **Investigative work required/CAPEX decisions**<br>Complete investigation and risk analysis of key components of the network. Develop a response plan to inform priorities for network upgrades. | | | |
| **Key assumptions**<br>• Existing information held about fault hazard areas of land instability are reliable, although it is expected that additional areas may be identified that are subject to liquefaction risk. (Under a recent November 2019 update to the Building Code, territorial authorities have been given a two-year transition period to map areas potentially prone to liquefaction.[9])<br>• Renewal and upgrade of assets will be designed to minimise vulnerability to known natural hazards.<br>• Climate change will be monitored and design standards and growth controls adjusted to respond to latest information. Sea level rise and increased storm intensity/frequency are two key considerations, but effects on groundwater including increased liquefaction risk are also likely to be important.<br>• Earthquake risk will be reviewed as and when any future investigations provide additional information.<br>• A risk-based approach will underpin the prioritisation of stormwater and flood protection resilience projects over the lifespan of this strategy. | | | |

**Infrastructure objective 2:** Maintain, renew and upgrade existing assets in a cost-effective way

## Asset condition/data confidence

Effective management of stormwater assets relies on the availability of reliable asset data. Existing issues with asset data primarily relate to ownership, performance, condition and structural attributes.

Ownership of the stormwater network is shared between a number of parties. According to data presented in the 2018 Asset Management Plan, the stormwater piped network is largely made up of concrete and PVC pipes with a smaller number of earthenware pipes collectively extending 483 km. Of this, approximately 42% are recorded as stormwater activity assets. The balance of the network is owned privately, or as private–common pipes, by Waku Kotahi NZTA, Port Nelson and by other Council departments including: Roading, Parks, and Solid Waste. These other owners hold responsibility for the operation, maintenance and renewal of pipes they own.

[9] https://www.mbie.govt.nz/dmsdocument/6582-building-code-update-consultation-november-2019

New standards under the LDM 2019 give further guidance relating to drain ownership, including for private and public drains. It appears that based on these new standards, a significant number of stormwater pipes currently recorded as privately owned should be recorded as public drains (Council pipes). A review of stormwater asset ownership is required to better align ownership data with the new LDM 2019 standards.

Stormwater pipe performance is generally measured in terms of the level of service provided, which relates to pipe capacity and reliability. It is useful to have a specific level of service (e.g. Q15 or Q10 flow capacity) to progressively work towards a consistent level of service across the city. As a result of a changing climate, and varying levels of service being provided when stormwater systems were constructed, Council doesn't have a good overview of the level of service being provided throughout the city, and how this will be affected in future by a warmer climate and rising sea levels.

Council is seeking to increase confidence in its data about stormwater levels of service through the creation of stormwater network models. These are hydraulic models into which Council can apply present day and predicted future storm rainfall and sea levels to assess what level of service the network delivers. These models also identify where there are constrictions in the system, restricting the flow of stormwater, and the secondary flow paths resulting from the network overflows. They are therefore a useful tool to optimise the performance of the overall network (or to identify areas where performance may be severely compromised due to climate change).

Stormwater pipe condition surveys have historically been undertaken to support the investigation of new capital projects, prior to the laying of new pipes, and as a tool for assessing any stormwater issues which have been reported through service requests. The proportion of the network which has been surveyed for condition is estimated to be low (<5%). Condition surveys should be undertaken on a more regular basis for critical stormwater and flood protection assets, and this also needs to be incorporated into a renewal strategy for assets approaching the end of their design life.

Structure details for stormwater and flood protection assets are recorded in Council's asset system. Generally pipe diameter and length is well documented, although there are data gaps for attributes such as surveyed levels of pipes, which means that assumptions often need to be made in relation to pipe grade (slope), based on other survey information. These data gaps may affect capacity assessments for stormwater pipes.

## Development of stormwater strategies

A more strategic, risk-based approach is required to identify and prioritise stormwater issues across the city and develop appropriate responses, which will primarily be level of service upgrades. Stormwater network models are being progressed to inform this assessment. Once the network models are developed, Council will be able to take a more strategic approach to managing and improving the performance of these assets.

Five stormwater strategies are proposed, as follows:

- Stoke Stormwater Strategy (currently underway)
- Central Nelson Stormwater Strategy
- Tahunanui Stormwater Strategy
- Port Hills Stormwater Strategy
- Atawhai Stormwater Strategy

These will guide all of the following elements of stormwater management:

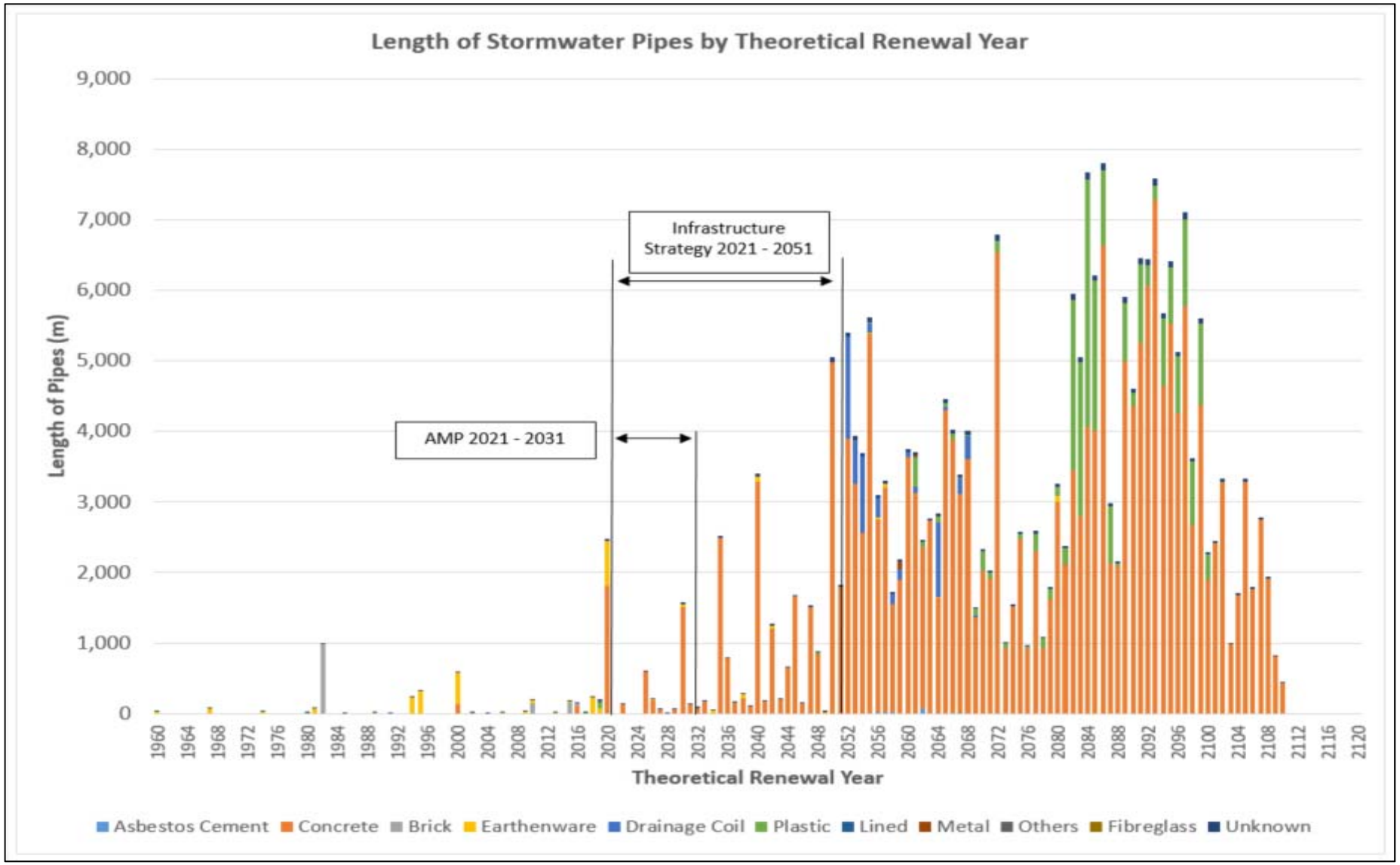
- primary stormwater system capacity (pipes)
- secondary flow paths (roads and open drains)
- receiving environments (freshwater and coastal environments)
- growth areas and assessment of additional stormwater flows
- prioritisation of stormwater upgrades

## Renewal of the stormwater network

Stormwater pipes are renewed when they fail to provide the required level of service, or where performance or reliability is compromised due to age and poor condition. However, the majority of stormwater assets are relatively new, with an increase in renewals (based on design life) anticipated from the 2050s onwards. In addition, stormwater pipes are not subject to the same water pressures or continuous use as the wastewater and water supply networks, so do not have the same pipe integrity requirements.

Pipe renewals are expected to remain at a low level (less than $100k per year) for the first 10 years of this strategy, but then increase beyond 2031 to more evenly spread renewal costs predicted from the 2050s onwards, as shown in Figure 11 below.

***Figure 11 - Theoretical Stormwater Pipe Renewal Dates***



Council proposes to develop a stormwater renewal strategy (see Option 1 in Table SW3) to address the increasing level of anticipated renewals required from the 2050s onwards, and to identify renewals required earlier due to poor condition. This will prioritise regular assessments of critical assets (including larger pipes and detention basins) and consideration of how to maintain low impact infrastructure.

Specific renewal budgets are in place for critical assets such as pump stations, tide gates and larger culverts. Other critical assets are being identified through the natural hazards resilience assessment (discussed under Objective 1). A new funding line has been established for renewal of detention devices, as the number of these is increasing rapidly to service areas of urban growth. There are 20 existing facilities, and an additional 8 facilities have been planned or constructed but not yet vested in Council.

The other potentially vulnerable parts of the stormwater network are the remaining sections of brick culverts in the city. According to the 2018–28 Asset Management Plan, there are 2.2 km of brick culverts within the city. These are becoming difficult to repair due to an enhanced health and safety awareness of confined spaces. These will be inspected by CCTV to confirm their condition, and included in the renewal strategy referred to above.

### Requests from property owners

Much of Nelson still uses a network of small open drains to channel stormwater from hillsides to public drains or streams. These channels are largely on private property but serve a wider public purpose. However, lack of maintenance of all of the pipes and drains which are not owned or maintained by Council can result in ponding and flooding, causing property damage and land instability.

Council receives regular requests for assistance from property owners to maintain drains located on private land. Developers and Council officers need clarity on what Council can enforce and what it can maintain. The LDM 2019 provides guidance over what Council owns and what Council has responsibility to maintain. It defines public drains as drains which service six or more properties. This, together with legal advice, gives sufficient direction to update the asset ownership information contained in Council records.

This will increase the stormwater assets under Council control and increase the percentage of pipe length managed by the stormwater activity above 42%. This will increase operation and maintenance costs, as well as long term renewal costs, but will have the benefits of clarifying responsibilities and delivering a higher level of service for the community.

**Issue SW3:** Planned levels of service for stormwater and flood protection will not be met unless assets are maintained, renewed and upgraded.

## Desired Benefits/Investment Objectives

- Updated asset ownership information, to reflect the standards in the LDM 2019 and to clarify which drains Council is responsible for maintaining
- Drainage ownership/maintenance policy to reduce risks of property damage as a result of stormwater pipes being in poor condition, and from non-maintained stormwater networks
- No damage in urban areas from flood events of a level that have a 50% probability of occurring in any one year
- Stormwater strategies that support a risk based approach, informed by stormwater network modelling and watercourse assessments, and which include prioritisation of upgrade projects
- Network renewal strategy which prioritises assets based on criticality, remaining design life, current condition and level of service assessments

**Table SW3: Principal options for improving the maintenance, renewal and upgrade of stormwater assets**

| PRINCIPAL OPTIONS | EXPLANATION AND IMPLICATIONS | √ or X | TIMING & COST ESTIMATE |
|---|---|---|---|
| **Preferred Option 1**<br>Proactive focus on gaining a better understanding of stormwater asset condition and developing a renewal strategy. | Increase the proportion of the network that has been assessed for condition, prioritising critical assets. This information is required to inform a renewal strategy.<br>Condition assessment is generally an operational cost where this applies to regular assessment of critical assets. | √ | Condition assessment of the stormwater network, prioritising critical pipes and culverts, at a cost of $1.1M over 30 years. |
| **Preferred Option 2**<br>Develop stormwater strategies that provide a consistent basis for prioritising upgrades of the stormwater network. | A better evidence base is required for improved prioritisation of stormwater projects. This includes an assessment of existing levels of service across the stormwater network, and assessing the implications of growth areas on stormwater flows and receiving environments. | √ | Development of four[10] separate strategies, supported by stormwater network modelling, to cover the city in the first 10 years. Implementation will follow each strategy.<br>Strategies: $700k<br>Modelling: $450k |

[10] Excludes Stoke Stormwater Strategy which has been completed.

| PRINCIPAL OPTIONS | EXPLANATION AND IMPLICATIONS | √ or X | TIMING & COST ESTIMATE |
|---|---|---|---|
| **Preferred Option 3**<br>Update Council stormwater asset ownership data and develop a drainage ownership/maintenance policy that will provide more clarity related to the responsibilities of operational staff and owners of private and common private drains. | Some risk of not being able to define every possible scenario, affecting Council's ability to provide timely responses to queries.<br>Stormwater asset ownership can be complex and includes considerations such as whether there is a history of Council having installed or maintained a drain.<br>Developing a clear stormwater drain ownership policy was referred to in the 2018–48 Infrastructure Strategy. | √ | Policy to be developed over the first five years of the LTP 2021–31, based on drain ownership standards in the LDM 2019.<br>To be undertaken by Council staff. No external cost expected beyond that required for the LDM 2019. |
| **Alternative Option 4**<br>Status quo — reactive response to service requests for stormwater improvements. | Upgrades occur in the areas where the most complaints are made, which may not be the areas in most need of improvement. | X | Piecemeal expenditure does not represent value for money. |

**Investigative work required/CAPEX decisions**

- Stormwater strategies are required for the whole city. These strategies will assess current disposal provisions and set out appropriate disposal options for each area, taking into consideration growth areas identified in the Future Development Strategy and the impacts on receiving environments. Stormwater strategies are already provided for in the LTP 2018–28, but Central Nelson has now been included in the programme.
- The stormwater drain ownership records in Council's database need to be updated. There is scope for improvement of pipe ownership data, including a number of private common drains which should be recorded as public drains, based on how drain ownership is defined in the LDM 2019.

**Key Assumptions**

- Current levels of service focus on the reliability of the network as measured by blockages and the response to issues as measured by contractor response times. There is a focus on maintaining the serviceability of the existing infrastructure and ensuring appropriate disposal options are available across the city.
- Future demand for stormwater services are primarily considered through subdivision consents and city growth planning. Renewal planning aims to match renewals to the rate at which assets reach the end of their service lives.
- Council only assumes full responsibility for public stormwater drains as defined under the LDM 2019 (a drain serving six or more properties, within road reserve, or covered by easement), or where legal advice states drains are public. Private drains (serving an individual lot) or common private drains (serving two to five properties) are generally the responsibility of the landowners, although Council may subsidise works on a prioritised basis.

**Infrastructure objective 3:** Provide infrastructure to enable growth and development

Council is progressing implementation of the Future Development Strategy (FDS) which was adopted in June 2019. The FDS responds to the requirements of the NPS on Urban Development, which requires councils to plan for growth over the next 30 years.. The FDS identifies intensification as a key means to achieving its growth and development objectives.

Providing for more housing and the infrastructure to support these new houses in intensification areas will require high levels of collaboration across Council. For example, low impact stormwater solutions will rely on use of road reserves, supportive planning rules which enable and encourage intensification (such as sharing driveways between different houses), and monitoring from the Science and Environment team to measure Council's progress towards meeting the freshwater objectives.

As noted in Part One of this Strategy, while the FDS provides for the intensification of existing urban areas, the FDS also provides for two urban expansion areas. Increases in hard surfaces are inevitable as part of new development, through the establishment of more roofs and driveways, which creates more stormwater run-off. The stormwater network generally lacks sufficient capacity to accommodate additional peak flows associated with intensification. On-site ways to manage this additional stormwater include detention tanks, permeable constructed surfaces which enable water to be absorbed into the ground and rain gardens. This may be easier to achieve in greenfields development (as part of urban expansion) than in intensification projects. Innovative solutions will be needed in areas of intensification to mitigate the potential increase in run-off, which are likely to rely on more use of public land (such as road reserves and parks).

**Issue SW4:** Management of increased stormwater flows associated with urban intensification and growth.

## Desired Benefits/Investment Objectives:

- The stormwater network has sufficient capacity for areas of urban intensification and expansion
- Stormwater levels of service are able to be achieved for new growth areas
- Stormwater quality from growth and intensification areas is maintained, or improved where necessary, to achieve freshwater quality targets

**Table SW4: Principal options for managing increased stormwater flows associated with urban intensification and growth**

| PRINCIPAL OPTIONS | EXPLANATION AND IMPLICATIONS | √ or X | TIMING & COST ESTIMATE |
|---|---|---|---|
| **Preferred Option 1**<br>New growth/intensification areas shall provide stormwater detention capacity to mitigate downstream effects where downstream stormwater network capacity is not sufficient to accommodate increased peak flows. | This is provided for in the LDM 2019, but there may be insufficient land area to provide for detention in some areas where intensification is planned.<br>Treatment of stormwater quality may also be required to enable Council to achieve water quality targets set under the NPS-FM. | √ | Ongoing for 30 years<br>In the first 20 years of this strategy there are eight separate growth/ intensification areas identified. |
| **Alternative Option 2**<br>Increased stormwater run-off from new growth and intensification areas to be provided for by upgrading the capacity of the downstream network. | This involves increasing pipe size to accommodate greater stormwater flow associated with urban development.<br>Treatment of stormwater quality may also be required to enable Council to achieve targets set under the NPS-FM. | For some sites. | The cost of upgrading the stormwater network downstream of all growth areas will be assessed following completion of stormwater network models. |
| **Investigative work required/CAPEX decision**<br>• Assessment of additional storm run-off associated with growth and intensification areas to be assessed through stormwater network modelling. Additional CAPEX is sought under Objective 2 above.<br>• Stormwater quality objectives need to be established in order to achieve receiving environment freshwater targets (refer to Objective 4 below). | | | |
| **Key Assumptions**<br>• All new developments within the Nelson Urban Area are required to provide appropriate stormwater disposal through connection to public services (where they have sufficient capacity) and disposal to ground or detention, as appropriate.<br>• Costs to Council for new growth areas will generally be up to the limit of development contributions. | | | |

**Infrastructure objective 4:** Maintain or improve public health and safety, and environmental outcomes

As outlined in Part One of the strategy, the Action for Healthy Waterways package includes a number of new initiatives, and the Nelson Plan will specify higher receiving environment water quality targets to meet, including sediment limits. There will also be stricter controls over maintaining open waterways, and ensuring fish passage is not obstructed by structures in the beds of rivers.

New regulations are also proposed to avoid the impact of structures such as culverts, tide gates and tide flaps on freshwater species which need to swim between coastal and freshwater habitats to complete their life cycle. There are likely to be more regulations related to structures affecting fish passage such as culverts, dams and tide gates, and no piping, diversion or infilling of streams is likely to be permitted.

Council will need to develop a clear picture of the extent of rivers, streams and man-made stormwater channels affected by these policy changes as this will affect Council's range of options to deal with tidal inflows to the stormwater system. It is not expected that these will apply to all man-made drains, as not all of these are likely to support freshwater habitats.

As discussed under Objective 2, Council receives quite regular requests from land owners to pipe or cover over drains and open channels that run through their property. Land owners may view these as a safety hazard, a source of flooding, or consider that the amenity of their property could be improved by covering the drain. Council will need to develop a clear picture of the extent of channels affected by these policy changes and make this information available to the public.

The LDM 2019 includes specific standards for stormwater quality and treatment. Treatment is required for greenfield, infill and brownfield developments that exceed specific threshold criteria for high contaminant-generating surfaces. It is anticipated that measures to improve stormwater quality will also be required for existing development. This will need to be prioritised based on the risks that existing stormwater discharges present to receiving environment freshwater quality, and the targets set under the Nelson Plan.

Further investigation and monitoring will be required to establish the quality of existing stormwater discharges relative to receiving environment water quality, and the targets set. This will need to be done alongside ongoing investigations into wastewater overflows, and wastewater inflow to the stormwater network.

As discussed under Objective 2 above, the stormwater network has multiple owners, and currently the stormwater activity directly manages only 42% of the network. This raises a question over responsibility for stormwater discharge quality from outlets owned by other parties, and where contaminants enter and pass through a network where multiple owners are involved.

**Issue SW5:** Meeting new freshwater quality objectives and standards set under the Draft Whakamahere Whakatū Nelson Plan, the National Policy Statement for Freshwater Management (NPS-FM), and the upcoming National Environmental Standard for Freshwater Management (NES-FM). Data gaps regarding the function and effectiveness of the existing stormwater systems currently impact on meeting these objectives.

## Desired Benefits/Investment Objectives:

- Stormwater discharges enable Council to achieve the freshwater quality objectives for receiving environments established under the NPS-FM, as well as the quality targets set for specific watercourses in the Nelson Plan
- A clear overview of the quality of stormwater discharges across the network so that high priority catchments for intervention can be identified, and ongoing monitoring of these catchments is undertaken to assess the effectiveness of interventions
- Stormwater connections are available to land owners in areas where the wastewater network is subject to inflow/infiltration during storm events

**Table SW5: Principal options for improving stormwater quality**

| PRINCIPAL OPTIONS | EXPLANATION AND IMPLICATIONS | √ or X | TIMING & COST ESTIMATE |
|---|---|---|---|
| **Preferred Option 1**<br>Develop a stormwater quality treatment strategy prioritising high risk catchments, and establish a monitoring network.<br>This will also include a review of the existing Low Impact Devices identified in the Activity Management Plan to identify issues and develop best practice. | Existing information is not sufficient to identify the highest priority catchments for intervention.<br>Monitoring is required to understand stormwater quality variation spatially and temporally, the relationship between stormwater discharge and receiving environment water quality, and the gap between existing stormwater quality and that needed to achieve freshwater quality targets. | √ | Funded through the LTP 2018–28.<br>Operational costs estimated for the first 10 years of this strategy are $500k for strategy development and monitoring costs. |
| **Preferred Option 2**<br>Provide or require a combination of stormwater treatment at source, and stormwater treatment at neighbourhood level, to deliver improved stormwater quality. | Treatment devices at neighbourhood level will require land to be allocated for green infrastructure in road reserves or public parks.<br>Treatment devices on private property rely on maintenance by property owners. | √ | The level of treatment required to meet new targets for wastewater overflows under the NES-FM has yet to be established.<br>Capital costs estimated at $2.5M over the first 10 years for monitoring instrumentation and implementing high |

| PRINCIPAL OPTIONS | EXPLANATION AND IMPLICATIONS | √ or X | TIMING & COST ESTIMATE |
|---|---|---|---|
| | | | priority catchment upgrades. |
| **Preferred Option 3**<br>Provide stormwater connections to properties located within high risk catchments for inflow and infiltration to the wastewater network. | Responsibility for meeting freshwater targets primarily lies with Council.<br>This should not be the default approach but may be justifiable in some instances. | √ | This cost will be built into new stormwater projects servicing high risk catchments. |
| **Alternative Option 4**<br>Require stormwater treatment at source in all cases. | Treatment devices on private properties rely on maintenance by property owners.<br>Policy and rules around stormwater discharges from private property to be consulted on through the Draft Nelson Plan. | – | May be required in some instances. Costs lie with property owners. |
| **Alternative Option 5**<br>Implement treatment solutions within the stormwater network or at stormwater outlets to intercept stormwater prior to entering the receiving environment. | Public responsibility for meeting freshwater targets, primarily lies with Council.<br>This approach may be required for treatment of stormwater from high contaminant generating surfaces such as busy roads and large car parks, where no land is available for green infrastructure. | – | Likely high CAPEX and OPEX costs. This will be estimated following development and implementation of the strategy referred to in Option 1. |

**Investigative work required/CAPEX decision**

- Investigation required to identify priority areas and freshwater quality attributes requiring treatment, most appropriate treatment methods, and business case development to assess costs and benefits.
- Establish a stormwater quality monitoring network to track a range of attributes over time and ultimately trace the source of contaminants.

**Key Assumptions**

- Proposed freshwater changes will be adopted in legislation and reflected in the Draft Whakamahere Whakatū Nelson Plan. The Nelson Plan will include provisions relating to contaminants being released into the stormwater network.
- Wastewater activity will be able to identify priority wastewater overflow sites and catchments where concerted action is required to remedy overflows.

## Other actions to improve environmental outcomes:

Collaborative action by Council and the community is being taken to improve freshwater quality through the Nelson Nature and Healthy Streams programmes.

Freshwater environments are being maintained or enhanced through best practice associated with:

- natural gravel management in beds where practicable
- protection of natural river banks
- river bank shade through vegetation and protection of fish spawning areas
- protection of natural 'pool and riffle' stream bed forms
- maintaining or reinstating natural meanders where practicable
- moving away from using rock armouring for stream bank protection to using geotextile soil-filled bags which grow vegetation, and look like green walls

The LDM 2019 includes requirements for detention and low impact design methods to manage the quality of stormwater discharges. Developers establish and maintain these systems for the first two to five years to prove they are functioning well, and then Council takes over ownership and maintenance. Council will need to budget for more of these over time.


## SOLID WASTE

The strategy of solid waste is to provide waste disposal services which minimise carbon emissions and any environmentally harmful effects of waste collection and disposal, whether contemporary or historical. Solid Waste also actively promotes improvements to waste disposal which have quantifiable social, economic, or cultural benefits. It does this by managing and controlling disposal methods while maintaining economic dominancy over services that could otherwise be completed by private providers, such as recycling and transfer stations. This activity is supplemented by programs to actively reduce the production of waste, and to assist individuals to manage their waste at a household level.

Solid waste activities are funded through a combination of, a share of the Local Disposal Levy paid to each Council (TDC and NCC) from the jointly-owned landfill, and the Nelson share of the central government Waste Disposal Levy. The Waste Disposal Levy is a per tonne charge for waste, charged at the time it is disposed to landfill. This fund is managed by central government to develop nationally important waste minimisation infrastructure. Approximately 50% of the amount collected is also returned to the region to be used in waste minimisation activities. This in effect makes Solid Waste a 'closed account' and its activities do not burden residential rates.

Between 2020 and 2024 the present $10 per tonne waste disposal levy will increase to at least $50 per tonne which will provide a significant increase in locally available waste minimisation funds. This will potentially allow activities, such as a kerbside kitchen waste collection to be instigated, which will reduce emissions and improve services without increasing the cost to the ratepayer.

**Table SWA1:Summary of NCC assets (excluding land)**

| Asset Category | units |
|---|---|
| Hoppers | 2 |
| Compacting mechanism and gantry crane | 1 |
| 30 cubic metre haulage bins | 7 |
| Hopper building at Nelson Waste Recovery Centre | 1 |
| Barn building at Nelson Waste Recovery Centre (and attached sorting shed) | 1 |

| | |
|---|---|
| Kiosk Building at Nelson Waste Recovery Centre | 1 |
| Residential recycling bins | 20,308 |
| Unused Residential recycling bins | 1240 |
| CBD street litter bins | 203 |
| Atawhai closed landfill | 1 |
| Wells at Atawhai Closed landfill | 10 |
| Bins in school recycling service (660 litre or 1100 litre) | 12 |

| Asset | Location | Replacement Cost |
|---|---|---|
| Hoppers & Hopper Building | Nelson waste recovery centre | $950k- $1.2M |
| Barn in recycle yard | Nelson waste Recovery centre | TBD |
| Residential Recycling Bins | | $800k |
| CBD Street litter bins | CBD dairies and bus stops | $400k |
| Atawhai Closed Landfill | Incurs cost without revenue so is considered a negative value asset. | |

**The activities of Solid Waste**

Residential kerbside refuse and commercial refuse services are provided to Nelsonian by numerous private companies on a user-pays basis. It is not within the strategy to compete with this service.

Most other waste services are provided or managed by council. These include:

**Nelson Waste Recovery Centre,** (formally referred to as Pascoe street), which includes a free public drop off for recyclables, a transfer station operation including green waste and a NGO operated but leased from NCC re-use shop. This format has been proven effective and will be expanded to include e-waste recycling.

**Transfer Station**: Hoppers and the associated plant are an NCC asset. Operation of the hoppers and the cartage of green waste to 'Green waste to zero' (composter) and refuse to York valley (landfill) are contracted to Fulton Hogan until 2029

**Public drop off Recyclables:** Included in the recycling collection contract and operated by Nelmac until 2023

**Residential Kerbside Recyclables Collection**: NCC provided 21,000 households with a yellow wheelie bin and blue glass bin for the collection service which is contracted to Nelmac until 2023. Sorting and sale of commodities on behalf of Nelmac is by Smart Environmental Limited through the Regional Materials Recycling Facility situated in Richmond, Tasman. Bins are an NCC asset so replacement bins are provided by council.

**Street litter**: 166 bins in the CBD, dairies and at bus stops. Bins are an NCC asset maintained at an average cost of $70k per year. Collection service is contracted to Nelmac until 2021

**Tidy town**: Loose litter in the CBD and some specific cleaning of central city streets and street furniture (Bridge Street). This contract includes collection of freedom camper zones and 'fly tipping'. Contracted to Nelmac until 2021.

**Waste Minimisation**: Council managed implementation of the Joint Waste Management and Minimisation Plan (JWMMP) which was jointly adopted by Nelson City Council and Tasman District Council. This is the guiding document for waste minimisation activities in the region. It is reviewed every 3 years and the present document expires in 2028

**Infrastructure Objective 1:** Increase resilience to natural hazards and climate change

Solid waste supports rather than directs the York Valley landfill so information related to the York Valley Landfill will be included in the Nelson Tasman Regional landfill Business Unit (NTRLBU) strategy and is not replicated here.

The infrastructure strategy includes the closed landfill at Atawhai. This area primarily encompasses Miyazu Park, Whakatū Marae, The Nelmac nursery, Founders Park, Neale Park and some surrounding residential properties.

There is an ongoing management plan for this landfill which includes six monthly testing for gas, leachate, and contaminants. The area is a HAIL site and as such has restrictions on excavations and constructions. While this management plan will continue, consideration will also be given to the potential effects of sea level rise and climate change.

Present NCC-utilised models for sea level rise place Atawhai landfill at risk of inundation during storms or weather events in the mid-2040s. Through the term of this strategy closer monitoring and discussion relating to mitigation options will be instigated to increase preparedness.

The contracted collection services, and Solid Waste services which require vehicles, will be reviewed prior to the start of each new contractual term to ensure greenhouse mitigation options are considered. This will be most easily evidenced by Solid Waste's expectation that vehicles will be either electric or zero carbon.

The instigation of a residential kitchen waste kerbside collection service will require an assessment of all processing options to ensure the process aligns with the council emissions policy and will be guided by the 2020/21 trial.

Green waste will continue to be accepted and subsidised to encourage landfill diversion and appropriate processing. At the end of each contract term alternative processing options will be considered to ensure the efficacy of the process and to ensure that the process aligns with council policies.

The waste minimisation activities of Solid waste will receive annual internal reviews to establish a base-line for diversion activities, from which mitigation and benefits of diversion can be calculated.

**Infrastructure Objective 2:** Maintain, renew and upgrade existing assets in a cost-effective way

If solid waste 'owns' the waste stream they can control its methodology and manage its outcomes. This does not necessarily require assets. While ownership of the landfill is essential, (under the NTRLBU) control of a kerbside recycling service requires no more assets than the kerbside bins, and an economic basis for paying for the collection. This eliminates potential competition. The primary risk of competition is that the division of any waste stream from such a geographically constrained area as Nelson would lead to multiple but inefficient or uneconomical options for the same service.

The asset strategy is to maintain assets which will ensure council control of the waste stream or the facility, and to phase out unnecessary assets at the end of their effective life.

Kerbside recycling bins are replaced as required.

Hoppers at Pascoe St are depreciated and replaced as required. By maintaining the hoppers NCC controls transfer station operations, and sets the conditions of the contract.

Street litter bins require regular replacement, (average $70k/yr.).

**Infrastructure Objective 3:** Provide infrastructure to enable growth and development

Many solid waste activities, particularly waste minimisation or reduction activities, are developed in coordination with Tasman District Council (TDC) through the JWMMP. There will be 3 yearly reviews of the Joint Waste Management and Minimisation Plan (JWMMP). This plan is leading to programmes to establish independently operated waste diversion opportunities which will assist both councils in achieving their waste diversion targets.

The Nelson-Tasman region now has a combined population of 103,000 with 49,000 living in Nelson. There is growth in the region's population and there is also a nationally recognised growth in the amount of waste per capita being disposed of to landfill. Therefore the strategy is to provide alternative disposal or diversion options through partnerships with NGOs and private waste management providers. This will not necessarily include purchasing significant assets.

**Infrastructure Objective 4**: Maintain or improve public health and safety, and environmental outcomes

## Waste minimisation

Council will be focusing more on waste avoidance in future, recognising the important role of waste minimisation in reducing emissions, in order to reduce the scale of future climate change. Work will include advising on waste at events, community engagement, education about waste and minimising waste in the home, school recycling, and education about waste avoidance through better purchasing, be continued and expanded where a need or positive outcome is identified.

Approximately 34% of the region's waste is diverted away from landfill as a result of Council-funded initiatives and by others in the community. There is still significant opportunity to divert resources away from landfill. Council has set a target of 10% waste reduction per capita to landfill by 2030 in the Joint Waste Management and Minimisation Plan (JWMMP), recognising the need to make better use of resources and to reduce emissions from landfill, and the benefits of extending the life of the landfill. Increased diversion will lower landfill revenue, and the revenue share of the local disposal levy will be off-set by the increase in the per tonne charge of the waste disposal levy.

The 2017 waste assessment shows that approximately 12,000 tonnes of potential waste from commercial and residential waste production is diverted into productive use each year. A further waste assessment is being carried out at York Valley in 2020 to identify appropriate targets for increasing diversion and minimisation.

The diversion of plant-based organic materials from landfill will lower the production of emissions from landfill. This diversion will be achieved by more encouragement for home composting, stopping the acceptance of mixed loads (refuse and green waste combined) at the transfer station, and through a kerbside kitchen waste service.

The diversion of building construction materials from landfill to NGOs will be supplemented by the encouragement of 'deconstruction' of buildings rather than demolition. NGOs will recover and retail the deconstructed materials.

There is also an increased availability of recycling services for hazardous items such as chemicals and batteries and solid waste is actively pursuing options to keep more residential hazardous materials from landfill.

Following the introduction of product stewardship the format of the recyclable collection service will need to be reviewed. Depending on the structure of the payment schedule there may be opportunities to reduce collection costs to reflect the increased value of the commodities. Product stewardship will also immediately divert most of the tyres in Nelson. This will reduce tyre waste to landfill by 6-700 tonnes per year.

The waste hierarchy shown below identifies the preferred methods for waste management and minimisation. Council aims for movement upwards, towards the most preferred options. The primary objective is to avoid the creation of waste, and waste minimisation programmes increasingly focus on encouraging the adoption of circular economy design principles. National compulsory producer responsibility initiatives (consulted on in October 2019) will contribute to achieving this goal.


**Issue SW1:** Solid waste will contribute to Council's obligations under the Climate Change Response (Zero Carbon) Bill by directing contractors to change to zero carbon vehicles, and through the diversion of materials which would otherwise be producing carbon emissions.

**Table SWA2: Principal options to divert waste from landfill**

| PRINCIPAL OPTIONS | EXPLANATION AND IMPLICATIONS | √ or X | COST ESTIMATE & TIMING |
|---|---|---|---|
| **Option 1**<br>Product stewardship | Government is proposing to regulate product stewardship for these priority products: tyres, electrical and electronic, containers, farm plastics, and packaging<br><br>Adjustment to services, particularly tyres and containers, in line with the legislation this may provide economic benefit. | √ | Central government implementation by 2021-24. |

| PRINCIPAL OPTIONS | EXPLANATION AND IMPLICATIONS | √ or X | COST ESTIMATE & TIMING |
|---|---|---|---|
| **Option 2**<br>Residential kitchen waste collection service trial | A 12 month trial will be carried out to determine the viability of a service in Nelson in 2020/21. | √ | Trial in 2020/21 at a cost of $120k |
| **Option 3**<br>Residential kitchen waste collection service | Nelson-wide residential service for collection and processing in line with climate declarations and NCC policies. | √ | Capex cost $800k then $600k/yr. Post 2023 |
| **Option 4**<br>Carbon neutral collection vehicles | Preference given to contractors with carbon neutral vehicles. | ✓ | $200k/yr. Post 2023 |
| **Option 5**<br>Bio digester or in-vessel composting | Contracted service only. Not an NCC asset. Built and managed by contracted party. | ✓ | $700k/yr. Post 2023 |
| **Option 6**<br>Joint waste Minimisation with Tasman District Council | The two councils will develop, implement and promote activities that engage the community in waste reduction. | ✓ | Funded through the waste levy Present plan to 2028 |
| **Option 7**<br>Green waste | Contracted to open windrow composter review alternate options as contract ends. | ✓ | 2022 |
| **Option 8**<br>Polystyrene | Set up user pays disposal in the NWRC and assist in the establishment of a private polystyrene recycler | ? | Not estimated 2022 |
| **Option 9**<br>Waste to incineration | Waste to Energy is not a preferred option as it does not align with council waste strategy. This is also a NTRLBU decision as it replaces landfilling but has minimal operational impact on collections. | X | Not estimated |
| **Option 10**<br>Small incinerator for non-recyclables plastics | A small incinerator will save landfill airspace (revenue) and unlike a waste to energy can be turned on and off | ? | Not estimated 2025 |
| **Option 11**<br>Atawhai closed landfill | Potential for extraction of waste from Atawhai landfill to place in alternate landfill. | □ | Not estimated 2040 |
| **Option 12**<br>Deconstruction diversion to NGOs | NCC diverting deconstructed building materials to NGOs for re-sale | □ | $100k/yr. 2021 |

# PART THREE — FINANCIALS

*To be completed later in 2020, following completion of the AMPs and the preparation of 30 year financial information.*

# GLOSSARY

| | |
|---|---|
| **AMP** | Asset Management Plan |
| **NGO** | Non-Government Organisation |
| **Renew** | Replace it with exactly the same type of asset |
| **Saturn** | A software programme that calculates transport assignment on road networks. Saturn accurately reflects the effects of congestion on urban road networks by explicitly modelling the impact of queues that form at a particular junctions on the capacity of those upstream ('blocking back') and the reducing flows able to travel downstream ('flow metering') |
| **TRACKS** | A suite of some sixty programs which have been developed by Gabites Porter Consultants to assist the analysis and interpretation of land use and transport planning problems |
| **Upgrade** | Replace it with a bigger pipe, larger channel or additional capacity |