NRSBU | Nelson Regional Sewerage Business Unit

Wastewater Activity Management Plan 2024 – 2034

Mahere Waipara 2024 – 2034

Nelson City Council
te kaunihera o whakatū

tasman district council
Te Kaunihera o te tai o Aorere

Document Control

Title: NRSBU Wastewater Activity Management Plan 2024-2034					
Date	**Version**	**Description**	**Prepared by:**	**Reviewed by:**	**Authorised by:**
25/08/2023	V1	Draft for NRSBU Joint Committee Meeting	NRSBU		
13/11/2023	V2	Final for Joint Committee Approval	NRSBU	Brad Nixon	Nathan Clarke

Cover Photo:

Bell Island Wastewater Treatment Plant

Table of contents

Appendices

Table of Figures

Overview

1 Executive Summary

1.1 Our context

The Nelson Regional Sewerage Business Unit (NRSBU) is a joint committee of Nelson City Council (NCC) and Tasman District Council (TDC), the two owners. It was established to look after the owners' interests in the Nelson Regional Sewerage Scheme (NRSS) and has been delegated authority to act on the owners' behalf. NRSBU provides wastewater services to NCC and TDC. It also services two major industrial operators as well as several minor customers (liquid waste operators).

Reflecting on the last three years and looking ahead to the next ten years, the key aspects of our context are:

- NCC and TDC are continuing to see incremental growth in their peak and average discharge volumes.
- One industrial contributor (T&G) relinquished their capacity in the NRSS during July 2022. With the delays to Three Waters Reform implementation the additional capacity will now be offered to other contributors. The flows and loads from the other industrial contributors have been relatively stable.
- Longstanding concerns held by local iwi are being given increased priority, with NRSBU working with Te Tauihu iwi and TDC on long term planning for wastewater
- Network resilience has been identified as a strategic issue.
- A new operations contract was implemented, which introduced a collaborative, outcomes driven focus with the contractor.
- An application for renewal of the resource consent for biosolids reuse on Moturoa/Rabbit Island has been received and we are working through minor coreections with Tasman District Council at the time of issue.The consent epiries 2040 aligning with the Bell Island discharge consent.
- Understanding and managing the emissions from NRSBU's facilities has become a strategic issue.
- Central Government Three Waters Reform (Affordable Waters) is well progressed, however recent alterations to zoning and implementation timing have pushed the commencement timeframe for centralisation out to 1 July 2026 (at the latest).
- NRSBU is beginning to recognise the long-term vulnerability of its sites to sea level rise, with works completed to defend in place the two most vulnerable sites (Songer St pump station and Beach Rd pump station).
- Significant rainfall events in the last two years have demonstrated the vulnerability of NRSBU's infrastructure and the impact that these events have on the volume of wastewater received at the treatment plant.

1.2 Our Strategic Goals and Performance Objectives

Strategic Goal	Objective (This is what it looks like)	Level of Service (This is how we do it)
We will implement and operate infrastructure considering the needs of our community. Our priorities for this are protection of public health, the environment, and cultural values.	Containment and conveyance that is resilient and minimises adverse impacts on the health of the environment and community	We have sufficient capacity in our network to cope with peak flows
		We are resilient to mechanical and electrical failures and natural hazards
		We can readily maintain the network
	Resilient wastewater treatment that minimises the impact on the environment and community	The treatment plant can reliably accept (N+1 for critical assets) all peak flows from the network
		The treatment plant can fully treat all dry weather flows
		The treatment plant does not create odour issues for the community
		Effluent Quality meets or exceeds required discharge requirements
	Long term vision that considers the future needs of the community	Our ongoing business is safeguarded through engagement with council planning processes
		We have long term plans for our activities and their impacts
		Have systems in place for the ongoing monitoring and reporting of emissions
	Alternative methods of biosolids disposal that protect public health and the environment and are sensitive to cultural values	Have a backstop for issues with biosolids disposal
We will work towards the beneficial reuse of resources	Use of ongoing improvement processes to identify, implement, and operate feasible biosolids reuse	Treatment to maintain 100% reuse of biosolids
		Increase reuse value
		Maintain 100% diversion of biosolids from disposal to landfill
	Identify implement and operate feasible systems and infrastructure for the reuse of wastewater	We minimise the amount of effluent we discharge to water (working towards zero days discharge to water during summer)

1.3 What we plan to do

NRSBU plans to provide operation, maintenance, renewal, and upgrades of the assets within the NRSS to meet the required levels of service and to be consistent with its annual budgets and long-term plans. The actions we are taking to address better planning and delivery of capital works are listed below.

Better planning: actions to support this include:

- Development of a 50-year master plan
- Secure our future by identifying, purchasing and designating land.
- Continue investigating high-value end uses for treated wastewater and biosolids.
- Monitoring of emissions and investigation of energy efficient solutions.
- Improve our working relationship with iwi and the community.
- Facilitate regional conversations and encourage the development and adoption of a regional wastewater philosophy.

Capital works: to upgrade the resilience and capacity of the network and treatment plant and to increase our wastewater reuse potential. These include:

- Adding capacity to accommodate foreseeable storm flows and future growth, i.e. duplicate key pipelines, increase pump station capacity and provide emergency storage.
- Expansion of re-use water generation and increase alternative disposal options (other than discharge to water), including implementing irrigation of treated effluent on Best Island to minimise the amount of effluent that is discharged to water.
- Implement and maintain redundancy for mechanical equipment so that components (N) have at least one independent backup component (+1) or, where not feasible, have the ability for quick installation of ready spares.
- Fully integrate emergency power generation at pump stations and wastewater treatment plant (WWTP) to allow sites to utilise full generation capabilities.
- Increase seismic resistance of our facilities.
- Increase capacity through the treatment plant processes, e.g. secondary treatment, pipeline upgrades, discharge pump duplication
- Implement anaerobic digestion to improve the quality of biosolids treated and continue biosolids reuse.
- Construct additional pump station in Richmond to reduce flows to Beach Road pump station
- Construction of reuse distribution pipework (Nelson and Richmond) to enable the distribution of treated effluent.
- Land purchase for storage and climate change adaption purposes.

1.4 Key challenges for NRSBU

There are a diverse range of challenges that NRSBU will need to navigate as it works towards achieving its strategic objectives and implementing its programme of works.

Key challenges include:

- Affordability - NRSBU is investigating measures to increase the efficiency and therefore the affordability of its operations and is also investigating methods for reuse and creating additional value from the by-products of its processes, with the intention of generating revenue streams to offset operational costs. Actions include conducting energy audits to identify areas where power savings can be made, setting emissions reduction targets and investigating/implementing operational changes for water recycling and biosolids reuse.
- Growth - NRSBU plans for growth using data from its contributors to programme capital works such that growth can be accommodated within its network. Specific measures include acquiring

land, upgrading/duplicating assets and providing buffer storage capacity. This also aids preparations for climate change and network resilience.

- Climate Change - NRSBU is protecting its assets from sea level rise and erosion by monitoring and understanding the impacts, developing sea level rise defences (up to 1.0m SLR), implementing drainage, dewatering and stormwater/seawater pumping and landscape planning and planting with saline tolerant species.
- Resilience of infrastructure - NRSBU is duplicating/providing redundancy for critical assets and adding storage to its network.
- Inflow and Infiltration – Is the main source of the large wet weather flows received by NRSBU. Infrastructure upgrades to accommodate these peak flows are expensive and ultimately increase the volume that NRSBU discharges to the estuary.

1.5 What we cannot do

NRSBU cannot provide the increased levels of service that its owners may desire without a significant impact on the costs of providing the services.

We cannot do everything that we, or our owners and community, would like. This is primarily due to the financial implications that this would have on our contributors. Key elements that we cannot do within the ten-year timeframe of this plan are:

- Deliver significant changes to our presence in the Waimea estuary. The size of the capital investment required for this means we will need to make these changes over a long timeframe.
- Address some resilience issues with the network and treatment plant. These primarily relate to adding storage in the network to reduce the risk of overflows and provide better maintainability.

1.6 Managing the risks

Key risks for NRSBU have been identified as follows:

- Ageing infrastructure.
- Natural disasters.
- Overflows from our system.
- Blockages/bursts in our system.
- Faster growth and higher flows than forecast.
- Constrained sites without space for expansion or for coastal retreat
- Communication systems/control system failures

Managing the risks includes:

- Ensuring the systems NRSBU utilises are fit for purpose.
- Maintaining accurate data and continuously updating information on NRSBU assets.
- Allowing for climate change when designing new works and upgrading existing infrastructure.
- Having operation manuals and emergency procedures in place and maintaining business continuity plans.
- Forward planning that includes adequate consultation with landowners and acquisition of land where necessary.
- Proactive maintenance of infrastructure, ensuring failures are minimised.

Risks are discussed further in Section 13.

1.7 What does it cost?

Our high-level capital and operational forecasts are shown in the figures below (Figure 1-1 and Figure 1-2).

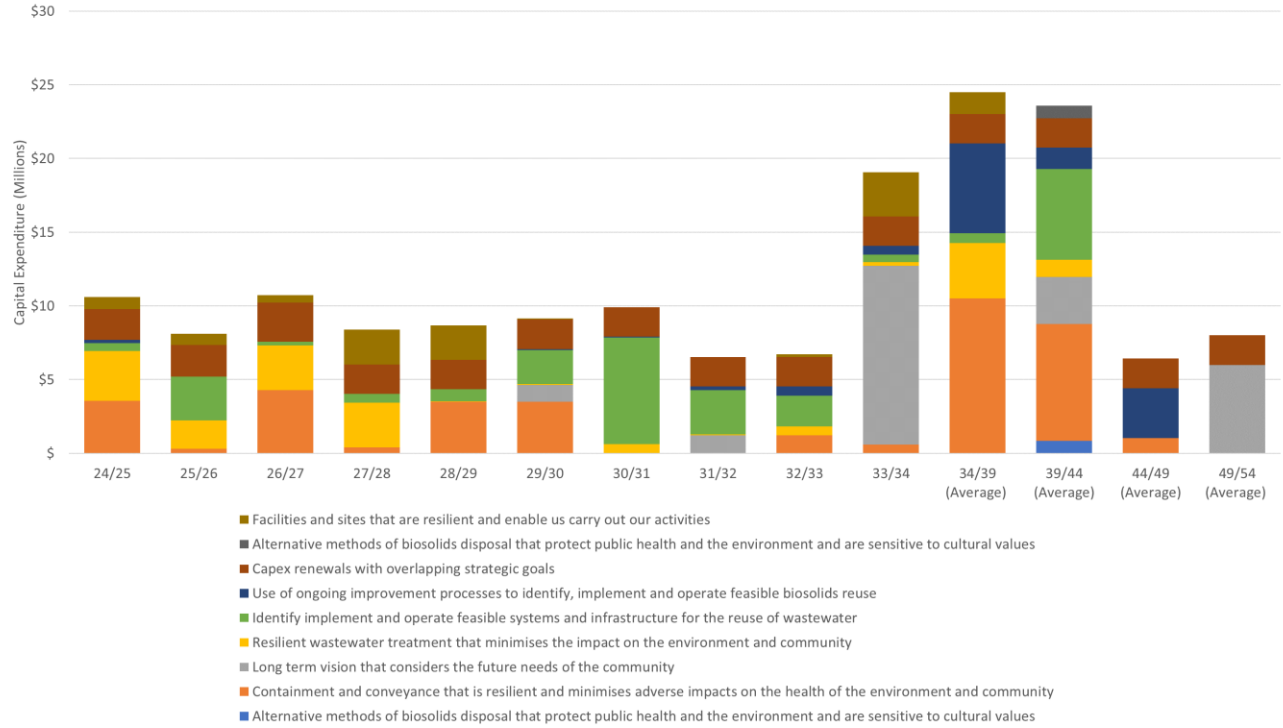


Figure 1-1: Capital expenditure for the next 30 years

Our operational expenditure is expected to increase, as shown in Figure 1-2, due to the implementation of new processes and infrastructure.

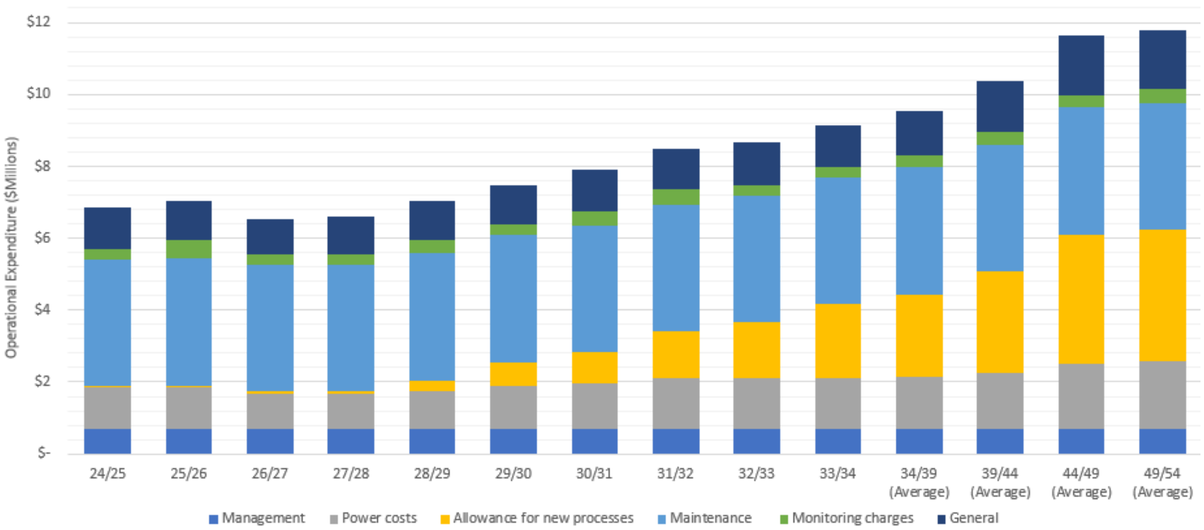


Figure 1-2: Operational expenditure for the next 30 years

Overall, our proposed capital programme will result in an increase from current debt levels (Figure 1-3).

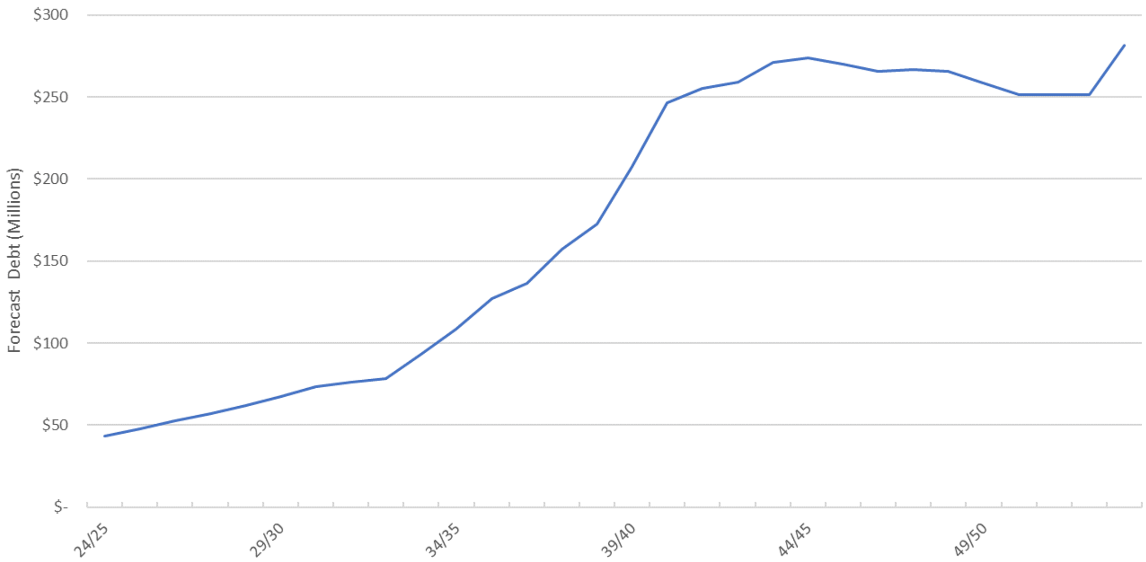


Figure 1-3: Forecast debt levels for the planned works

1.8 The next steps

The total capex budgets for the next ten years, including the planned renewals budget, are shown in Table 1-1 while capex projects (excluding renewals) are identified in Table 1-2. Total planned capital expenditure for the ten year period from 2024/25 to 2033/34 is $126.9M.

Table 1-1: Total capex budget 2024-2034 ($ millions)

Capex	Total years 1-10	24/25	25/26	26/27	27/28	28/29	29/30	30/31	31/32	32/33	33/34
LoS	**$50.3**	$6.2	$4.5	$2.6	$3.6	$6.9	$6.3	$8.3	$3.6	$3.9	$4.4
Growth	**$8.6**	$0.5	$1.5	$3.0	$3.0						$0.6
Land	**$17.5**	$1.8					$1.1		$1.2	$1.2	$12.1
Renewals	**$20.9**	$2.1	$2.1	$2.7	$2.0	$2.0	$2.0	$2.0	$2.0	$2.0	$2.0
Total	**$97.3**	**$10.6**	**$8.1**	**$8.3**	**$8.6**	**$8.9**	**$9.4**	**$10.3**	**$6.9**	**$7.1**	**$19.1**

Table 1-2: Planned capital projects excluding renewals ($ thousands)

Project	Capex	24/25	25/26	26/27	27/28	28/29	29/30	30/31	31/32	32/33	33/34
Anaerobic digestion	LoS						61	61	242	606	606
Beach Rd PS replacement	LoS				400	3500	3500				
Beach to Saxton pipeline duplication	LoS	1730									
Bell Island reuse	LoS		650	250	250	250	250	250	250	250	250
Best Island irrigation	LoS		305		611	500	1833	1222			
Data collection and visualisation	LoS							100	75	100	50
Design and consenting of clockwise retic to WWTP	Growth										606
Desludging ponds	LoS	756	750	500							
Duplicate WWTP discharge pump	LoS	272	2000								
Electrical Upgrades	LoS				300	1000					
Hydraulic capacity upgrades at WWTP	LoS	1833							61	611	
Biosolids Pipeline and Equipment	LoS		61	484							
Effluent discharge improvements required by R/C	LoS	523									
New plant and equipment	LoS	20	20	20	2020	845	20	20			
New technology assessments to meet Consent	LoS	61						61			
Pump Stations - land purchase for storage/adaption	Land	1817									
Rabbit Island biosolids consent	LoS	450	400								
Reconnection of secondary rising mains	LoS		244	1385							
Investigate and increase reuse capacity	LoS	250	31								500
Reuse pipework (Nelson)	LoS								2950	1475	
Reuse pipework (Richmond)	LoS					321	482	6000			
Secondary treatment system upgrade	Growth	500	1500	3000	3000						
Secure land for our future needs	Land						1120		1222	1222	12110
UV disinfection facility	LoS								61	611	
WWTP access	LoS				500	500	75			200	3000
WWTP inlet works capacity upgrades	LoS						61	546			

2 Purpose of the Plan

This Activity Management Plan (AMP) is intended to demonstrate how NRSBU will achieve its required strategic goals and objectives. This plan focusses on the activities, outcomes and services NSRBU is delivering and the assets needed to deliver them.

The relationship of this plan with the other documents in the NRSBU's planning framework is shown in Figure 2-1 below.

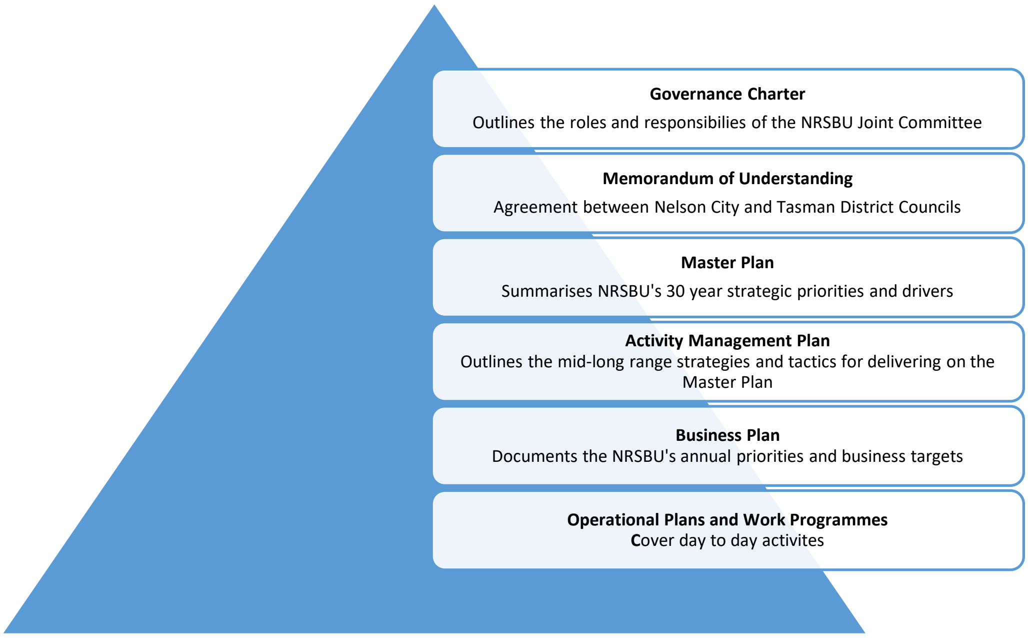


Figure 2-1: Relationship with other documents

3 AMP structure

Following this overview, the AMP is structured in three parts:

- **Part A: Our strategic context.** This outlines our existing business, what is driving change as we look to the future and how we plan to respond to this.
- **Part B: Where we want to be.** This section describes our reticulation, pump station, treatment and disposal assets and outlines the issues, options and preferred future state of these assets. This section also includes our financial projections for the next 30-year timeframe.
- **Part C: How we manage what we have.** This outlines our existing management approaches for our people, assets, risks and systems. It also documents where we consider there to be gaps in our management practices and what plans we have to reduce those gaps.

Through the AMP, we demonstrate that we:

- Understand the needs of our contributors.
- Understand our asset and non-asset requirements to provide our strategic levels of service into the future.
- Improve our knowledge of our assets on a proactive and ongoing basis.
- Are transparent about the processes in place for managing, operating, maintaining, renewing and extending our assets in ways that consider risk, quality and cost.
- Consider what is the appropriate level of sophistication for managing our assets and have plans in place to address gaps between actual and target maturity.

- Consider adequately the class of risks this activity faces and have systematic processes in place to mitigate identified risks.
- Plan for adequate funding of asset operations, maintenance, renewals and upgrades.
- Have processes that continually improve the outcomes delivered by the assets, as measured against the requirements of the contributors and to other internally and externally imposed standards.

Part A: Our strategic context

4 Where are we now?

4.1 Nelson Regional Sewerage Business Unit

The role of NRSBU is to manage and operate NRSS (incorporating the wastewater treatment plant on Bell Island, the associated reticulation network and the septage reception facility) efficiently and in accordance with the required resource consent conditions to meet the needs of its contributors. NRSBU shall plan for future needs of the community in a cost-efficient manner rather than focus on making a financial return. A Memorandum of Understanding, signed by the two Mayors and CEOs of NCC and TDC in May 2019, governs the operation of NRSBU.

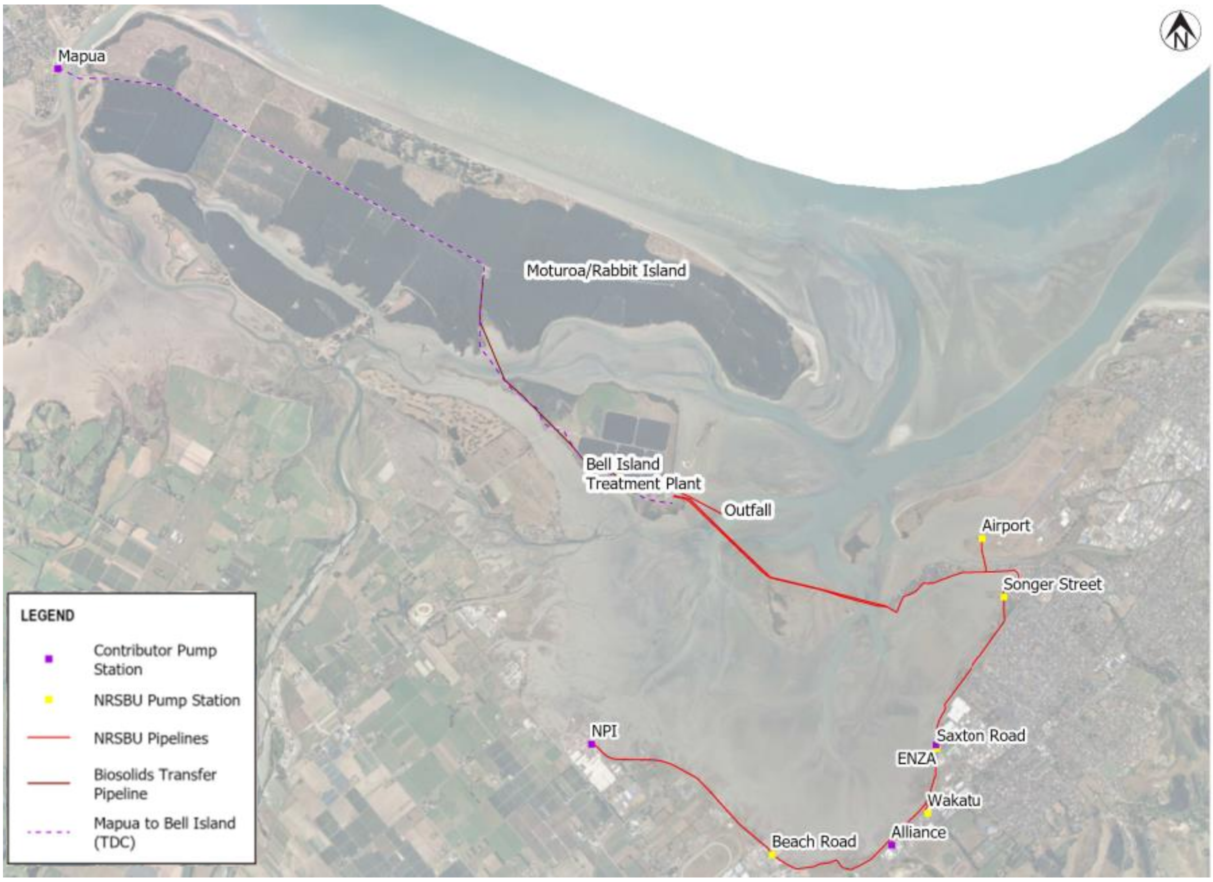


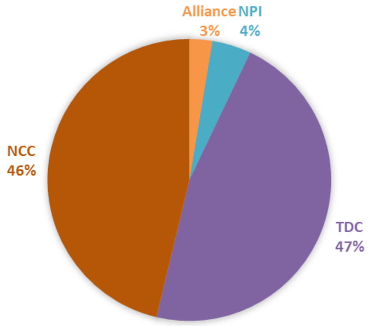
Figure 4-1: Overview of NRSS

4.2 Services provided

NRSBU treats municipal wastewater from the following contributors:

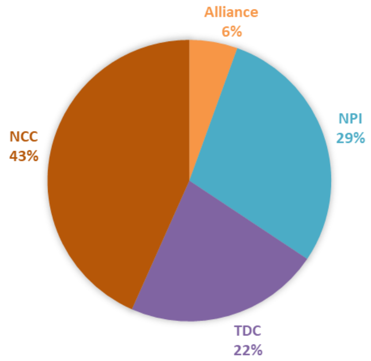
- Nelson City - Stoke and Tāhunanui areas.
- Tasman District - Richmond, Wakefield, Brightwater (the Waimea Basin) and Māpua.
- Industrial wastewater from the Alliance Group and Nelson Pine Industries.
- Minor customers such as trade waste, stock effluent, Portaloo suppliers and septic tank servicers disposing into the septage disposal facility.

The following figure (Figure 4-2) outlines the proportion of average daily flow and average BOD load per contributor for the year 2022/2023.



Annual average flow per contributor

Most wastewater flows to the treatment plant are from the two councils. The remaining flows are spilt between the industrial contributors.



Load (BOD) per contributor

The differences between the load from the two councils can be attributed to the Wakatū and Saxton catchments which include significant industrial flows. Both these catchments are part of NCC's contracted flows.

Figure 4-2: Flow and load per contributor as a proportion of totals received at WWTP

4.3 Asset description

NRSS includes:

- 16.8 km of rising mains
- Septage reception facility
- Five pump stations
- Wastewater Treatment Plant (WWTP)
- 712 m outfall
- Biosolids Application Facility (BAF)

A schematic of NRSS, with the pump stations and the WWTP is shown in Figure 4-3 below.

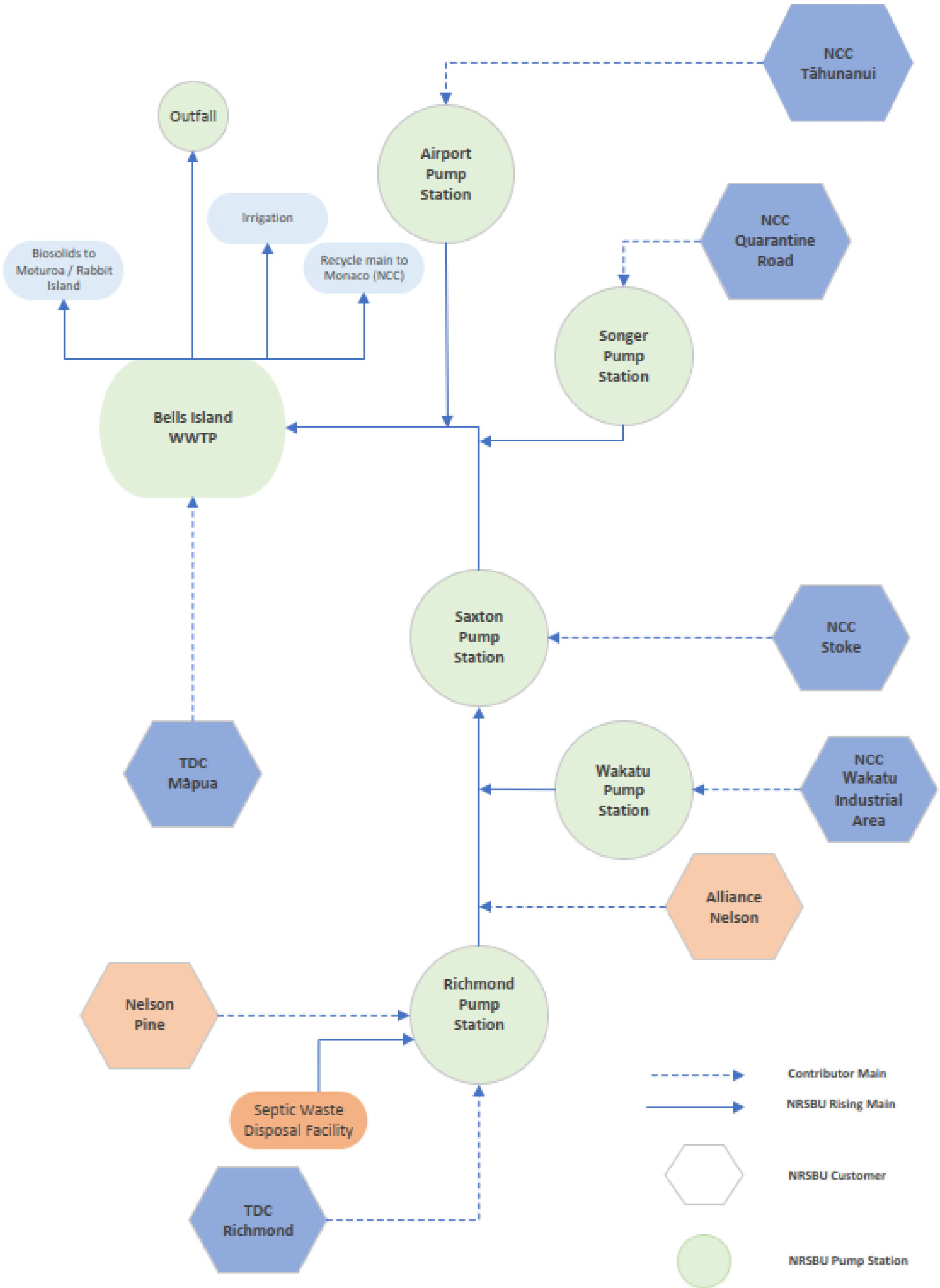


Figure 4-3: Schematic of the NRSS

4.4 Key relationships

4.4.1 NRSBU's owners

NRSBU is jointly owned by NCC and TDC. NRSBU has relationships with the two councils at multiple levels including strategic, management and business relationships (as shown in Figure 4-4). The strategic outcome for the two councils as owners and service providers is to meet the current and future needs of their customers in way that is cost-effective and environmentally sustainable. NRSBU's AMP feeds directly into the LTPs of each of the councils.

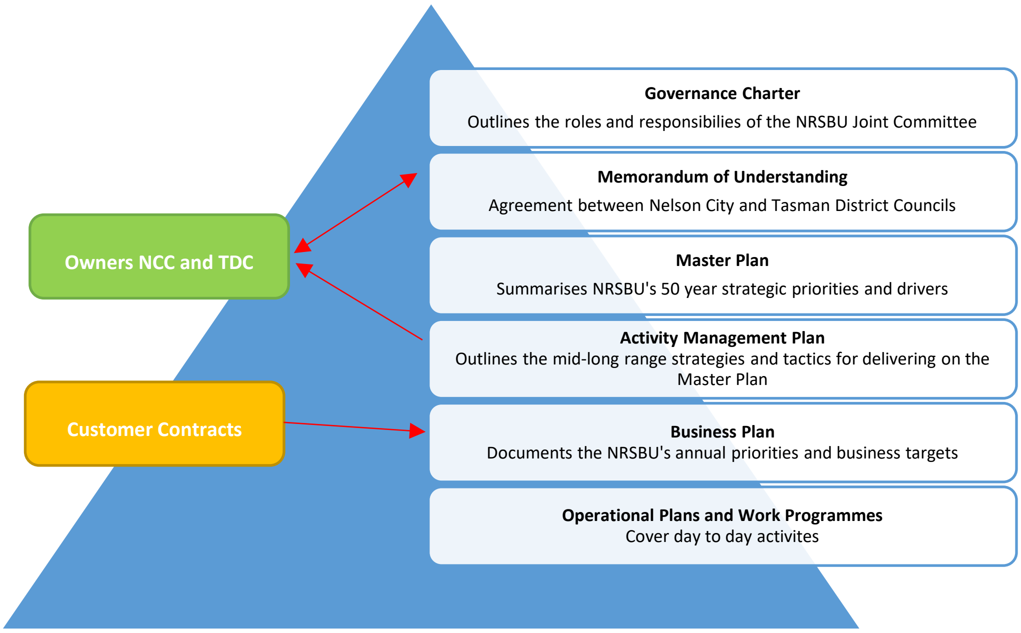


Figure 4-4: Linkages with owners and customers

4.4.2 Contributors

NRSBU’s contributors include the two councils and significant waste producing industries in the region (Nelson Pine Industries and Alliance Group). These contributors each have individual Disposal of Trade Waste Agreements with NRSBU, which outline their flow and load requirements. The following table (Table 4-1) summarises what we believe are the desired outcomes for our contributors.

Table 4-1: Contributors’ desired outcomes

Contributors	Desired Outcome
NCC and TDC as contributors	Long Term Strategy and Business plan, and delivery of strategic outcomes as per the memorandum of understanding
Industrial contributors	Ability to dispose of effluent in a sustainable manner

4.4.3 General stakeholders

In addition to the owners and customers outlined above there are key external stakeholders who have specific involvement with the assets and/or the service facilitated by the assets. Table 4-2 describes their main interests.

Table 4-2: General stakeholders’ outcomes

Stakeholder	Desired Stakeholder Outcome
TDC and NCC as unitary authorities	Adhering to relevant resource consents and regional plans.
Local Government New Zealand or Central Government	Ensure that Local Government Act is complied with (via Auditor-General).
Government departments and agencies, including Ministry for the Environment, Ministry of Health, Audit NZ	Treated water quality is suitable, consistently assured and does not spread diseases. Enhance conservation value of natural waterways.

Stakeholder	Desired Stakeholder Outcome
Tangata Whenua comprising eight Iwi. Ngāti Apa ki te Rā Tō, Ngāti Kuia, Rangitāne o Wairau, Ngāti Koata, Ngāti Rārua, Ngāti Tama ki Te Tau Ihu, Te Ātiawa o Te Waka-a-Maui, and Ngāti Toa Rangatira.	Protection and restoration of the mauri of wai (water). No discharge of wastewater to wai. No discharge of wastewater to areas of wāhi tapu (sacred sites) and mahinga kai (food and resource gathering), including no infrastructure on or near these areas. No wastewater infrastructure in areas prone to flooding
Contractors and Consultants	Fair contracts, good relationships and efficient and reliable service.
Wider Community	Dispose of waste safely and sustainably.

4.5 NRSBU outcomes

NRSBU's mission statement is: "Resilient, reliable, and effective infrastructure that supports and protects our community and environment".

This mission statement plays out in three key areas: public health, cultural sensitivity, and sustainability. The implications of each of these are summarised below.

4.5.1 Public health

Public health is important to aiding and prolonging life. A well-managed, resilient wastewater collection, conveyance, treatment, and disposal system benefits public health, reducing the risk of spreading chronic diseases and protecting the environment, thereby enabling communities to enjoy active and healthy lifestyles.

NRSBU's Programme of Works is directed at making improvements to its sewerage, increasing the level of treatment of wastewater such that the by-products of the treatment processes are suitable for reuse rather than being disposed of to land or water.

4.5.2 Cultural sensitivity

NRSBU is cognisant of iwi concerns regarding discharge of treated wastewater effluent to water and is planning on increasing the amount it discharges to land or supplies for industrial reuse. Currently we apply around 10% of our dry weather treated wastewater discharge to land, although this represents less than 1% of the total annual discharge.

Use of recycled ultrafiltration membranes in the pilot plant is ongoing, providing recycled water onsite to offset potable water use, with excess production being delivered to Greenacres Golf Course for irrigation.

In conjunction with TDC, NRSBU has commenced development of a Regional Wastewater Philosophy with Te Tauihu iwi. This looks at the management of wastewater from a long term strategic level, and once completed will provide a collective vision and outcome that will impart direction for our wastewater projects.

4.5.3 Sustainability

Sustainability is a widely used term which has a variety of meanings depending on the context in which it is used.

The Brundtland Commission of the United Nations on 20 March 1987 defined sustainable as "*meeting the needs of today's generation without compromising the ability of future generations to meet their own needs*."

In a similar manner, the Resource Management Act 1991, which provides the guiding principles behind sustainable management in NZ, defines sustainable management as:

"managing the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural wellbeing and for their health and safety while:

- Sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and
- Safeguarding the life-supporting capacity of air, water soil and ecosystems; and
- Avoiding, remedying, or mitigating any adverse effects of activities on the environment."

Within New Zealand, local authorities are entrusted with ensuring the health and wellbeing of their communities are protected by providing the necessary infrastructure, as such, it is becoming increasingly important for public entities to work and think in ways that take account of long-term sustainability. For local authorities, taking a sustainable development approach is a requirement of the Local Government Act 2002.

NRSBU does not have its own Sustainable Strategy or policy but works in general accordance with NCC's policy.

4.6 Strategic goals

The strategic goals as detailed below take due regard of NRSBU's mission statement (Section 4.5), with its three areas of focus, and the objectives detailed in the Memorandum of Understanding between NCC and TDC. These goals have been summarised into three categories:

Our Approach: Implement and operate infrastructure considering the needs of our community. Our priorities for this are the protection of public health, the environment and cultural values.

Our Aspiration: We will work toward the beneficial reuse of resources.

Our Conduct: We will undertake our activities transparently, fairly, respectfully, in a timely manner and we will encourage co-ordinated regional infrastructure development.

4.7 Strategic objectives

To achieve these goals, ten objectives have been developed and are displayed in Figure 4-5. These objectives are used throughout this AMP to categorise the planned works and future capital budgets. The programme of works for the next ten years, showing projects greater than $0.3M, is included in Appendix D.

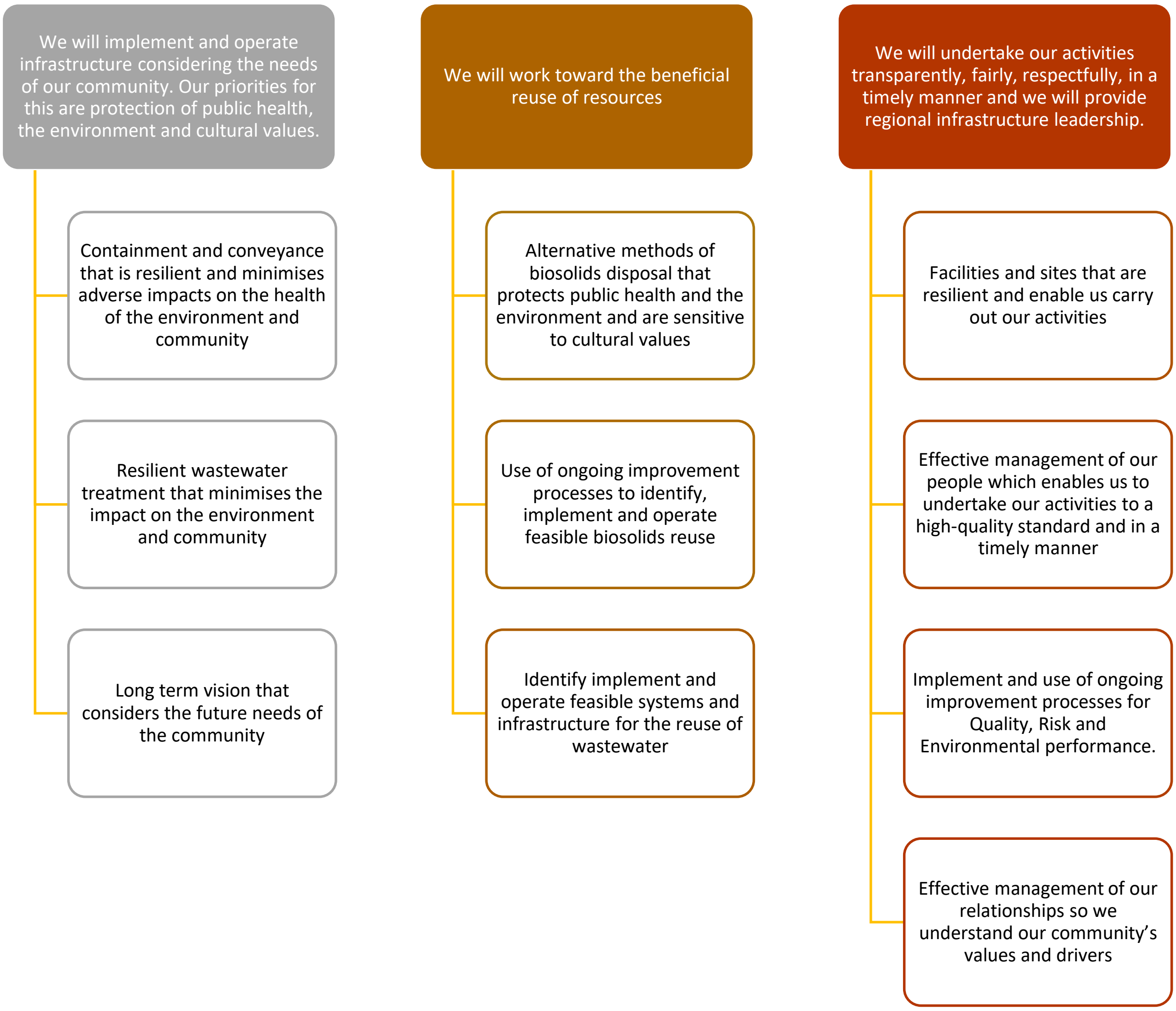


Figure 4-5: Objectives categorised by each strategic goal

NRSBU is conscious of the impacts of its budgets and actions on its Contributors. Therefore, the following framework shown in Table 4-3 has been developed to classify the relative importance of projects. This framework has been used to prioritise the capital expenditure over the next 10 years.

Table 4-3: Importance level framework

Importance	Purpose	Category of activity
High	Core function	• Capital works to avoid overflows • Capital works to avoid breaches of Resource Consents (due to effluent quality, odour, discharge volume, etc.) • Capital works to convey contracted flows • Health and safety improvements • Future planning to continue core functions
Medium	Do better	• Resilience (ability to maintain 'core functions' if something goes wrong, e.g. mechanical failure, flood, seismic event, etc.) • Future proofing (beginning to act in preparation for changes in technology, growth, climate changes, etc.) • Regional thinking and coordination • Beneficial reuse (reuse of effluent/biosolids to replace potable water or fertiliser) • Operational improvements (Undertaking core functions better, more efficiently)
Low	Achieve Excellence	• Improved quality of treatment (over and above the requirements of the Resource Consents) • Operational convenience (making it easier to maintain and operate assets) • Odour reduction (over and above achieving Resource Consent conditions) • Non-beneficial reuse (reuse of effluent/biosolids to avoid discharge to sea/landfill but not providing a resource that is 'needed') • General 'doing good'

5 What is driving change?

This section provides information on areas of change that we anticipate will impact on the levels of service we can provide and our response to those issues.

5.1 Overview

The key issues for our services and the impact these could have on our service levels are summarised in Table 5-1 below.

Table 5-1 Drivers for change

Driver	Summary of expected/possible impacts
Inflow and infiltration	Inflow and Infiltration (I&I) into our contributors' networks is the source of the large wet weather flows which currently overwhelm parts of our system. I&I is expected to increase over time as our contributors' assets get older. This will impact our levels of service for untreated wastewater overflows and treatment stability (odours).

Driver	Summary of expected/possible impacts
Climate change and sea level rise	Climate change will likely increase the frequency/severity of storm and drought events. Increased rainfall will drive additional I&I, further exacerbating I&I impacts on levels of service over time. More droughts will increase the volatility of our income from volumetric charging. Sea level rise could threaten the long-term viability of our treatment and disposal sites, as well as our pump stations.
Cultural Values	The disposal of wastewater to wai/water is expected to remain unacceptable to mana whenua. It is expected that there will be a stronger focus to increase the quality of treatment and uptake of land-based disposal solutions from the community.
Growth	Population growth increases wastewater volumes. High quality construction of new residential networks can reduce peak flow factors from the catchment, however if poorly constructed and not maintained, an extension of the network may increase I&I.
Contributor changes	A contributor leaving could impact cost sharing for the other contributors. A contributor adding additional flow or load could impact our ability to avoid overflows or treat waste adequately without upgrades.
Disposal Perceptions	Increased community and cultural concern regarding disposal to the environment will put pressure to move away from marine disposal and to eliminate overflows in the system.
Legislation Changes	New legislation is likely to require a higher quality of treatment before disposal and more stringent monitoring and quality processes. The Affordable Water reforms will establish ten new regionally-led water entities; as part of these reforms Marlborough District, Nelson City and Tasman District Councils will form Entity H – Te Tauihu. An AMP for the entity will be created which will define the entity's approach to managing its three waters assets and services. It is likely that there will be changes to target levels of service and strategic goals.
Consumption of resources and production of emissions	Changes to the treatment process to deliver higher quality treatment will increase the consumption of resources and the production of emissions. Relocating the treatment plant and/or biosolids application to an alternative site will increase the consumption of resources and the production of emissions. It is anticipated that there is and will continue to be a strong desire from the community to minimise the consumption of resources and to recover the resources (water, nutrients, and energy) from the wastewater.
Land disposal	As NRSBU moves away from discharging treated wastewater into the estuary (due to cultural values), further land purchase will be required on which to irrigate the treated effluent instead. Investigation will be required to understand the potential issues associated with land disposal, such as the accumulation of toxins in soil, ground water contamination, discharge of nitrous oxide (a potent greenhouse gas)
Public Health and Environmental outcomes	In addition to traditional contaminants, there is increasing concern worldwide regarding the impact of residual drugs and chemicals on our health and ecosystem. Emerging contaminants include chemicals in pharmaceuticals, personal care products and preservatives. Pathogenic contaminants are also a concern.
Affordability	The affordability of our services will always be a consideration and it may be that we need to consider whether our current levels of service are always appropriate if a significant cost saving could be made by accepting a lower level of service for a short duration to meet capacity requirements.

5.2 Inflow and infiltration

The local authority demands are the most influential on the overall system. The ingress of stormwater into the sewer system through direct inflow and infiltration (known as I&I) is the largest contributor to wet weather flows. These peak flows can overwhelm the network and require the implementation and maintenance of over-sized infrastructure.

There is a need for NRSBU's contributors to control their I&I, as ingress of stormwater can exceed the NRSBU system capacity very quickly and the "do nothing" option is not appropriate. Monitoring of flows during rain events has shown peak flows from both local authorities exceeding agreed peak discharge levels, resulting in overflows.

NRSBU has begun investing in additional capacity to mitigate overflow risk, however NRSBU needs to have systems, communication and processes that incentivise its contributors to ensure that they maintain focus on reducing I&I. It will be difficult and expensive for NRSBU to achieve our strategic goal of implementing and operating infrastructure that protects public health, the environment and respects cultural values, if our contributors do not maintain effective control of their I&I.

I&I is expected to increase over time due to ongoing aging of the network, increased severity of storm events and the potential extension of the residential network. NRSBU relies on its contributors to supply accurate forecasts in order to plan and size infrastructure accordingly. Errors in forecasting are possible and due to the setup of NRSBU the costs of these errors will ultimately be borne by the contributors.

NRSBU will manage I&I by encouraging and assisting contributors to achieve less than five times peaking within each of their catchments. NRSBU will regularly supply data to the contributors that highlights where I&I issues may be occurring and will communicate with its contributors to ensure that they are aware of the issues. Commitment to I&I reduction can be inferred through financial commitment reflected in:

- Upgrades within existing reticulation;
- Sewer renewal programmes (dependant on age profile); and
- Specific I&I reduction programmes.

Although we can limit flows from our contributors' points of discharge (as per our agreements) this causes wastewater discharges from an upstream point on our contributors' networks, which is neither constructive nor helpful and does not reflect our strategic goals.

Ongoing assessment of NRSBU charges and process will be undertaken to encourage proactive I&I reduction. Should these processes not result in ongoing maintenance of improvement of I&I, then NRSBU may need to consider implementing the financial incentives available in the contributors' contracts to encourage contributors that exceed agreed peak discharge levels to change their behaviour.

As shown in Figure 5-1 below wet winter months (i.e. July) and large rainfall events (i.e. August 2022) increase the peak daily inflow into the treatment plant.

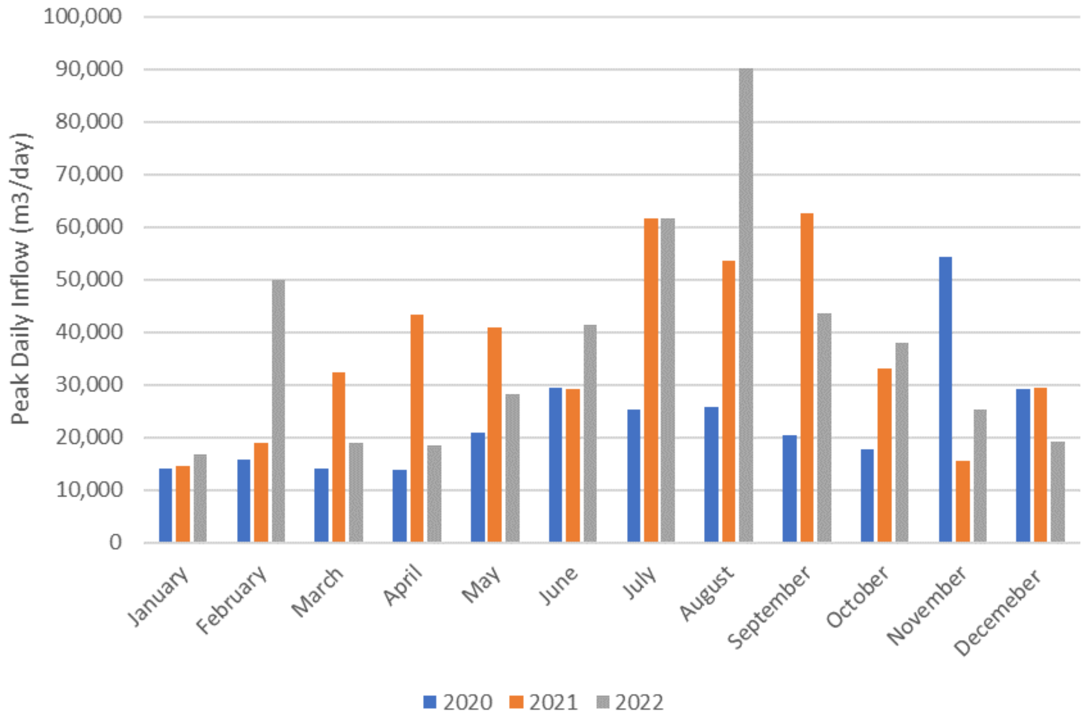


Figure 5-1: Peak daily inflow per month over the last three years

5.3 Climate change and sea level rise

The Tasman/Nelson Region is likely to experience more extreme weather events, which will both directly and indirectly impact our assets in the long term. The following table (Table 5-2) summarises the direct and indirect impacts upon NRSBU's ability to convey and treat wastewater and to achieve our strategic goals.

Table 5-2 Impacts on system due to climate change

Climate Change	Direct Adverse Impact	Indirect Impact
Heavy Rainfall	Pump stations inundated by surface flooding. Reduced pond storage volume.	Increase in wastewater flows from inflow and infiltration. Unable to apply treated wastewater to land for extended periods.
Drought	None.	Reduced wastewater flows which results in reduced revenue for NRSBU. Declining water resources will make wastewater reuse more necessary. Reduced volumes of discharge due to increased evaporation at the ponds.
Rising Sea Levels	Access to the WWTP is cut off. Land for biosolids disposal is reduced. Increased erosion to Rabbit, Bell and Best Islands. Pump stations are inundated from storm surge.	Relocation of communities may result in an increase/decrease of wastewater volume at each pump station and overall. Likely increase in infiltration, and hence flow, due to elevated groundwater levels.

Severe temperature changes	Impact on the biological reactions to treat the wastewater. Strain on existing infrastructure.	Increase in fire risk, which could impact on biosolids disposal to pine forest on Moturoa/Rabbit Island. Increased corrosion in pipes and pump stations due to increased speed of reactions of wastewater in sewers.

We have not completed our own climate change related projections and currently rely on hazard mapping completed by NCC and TDC to understand the infrastructure at risk. The rate of sea level rise is uncertain and depends on the shared socio-economic pathways (SSPs), which predict how future global warming may contribute to climate change and sea level rise.

Currently, it is thought that sea level will rise between 0.4 m and 0.7 m by 2080 (in 50 years' time) and between 0.8 m and 1.8 m by 2120 (in 100 years' time)[1]. Figure 5-2*,* formed by combining images taken from the TDC and NCC websites, shows that Bell, Best and Moturoa/Rabbit Islands are susceptible to sea level rise, as is the coastline along which NRSBU's pump stations are located. Moturoa/Rabbit Island is not only used for wastewater disposal but also shelters Bell Island from further erosion.

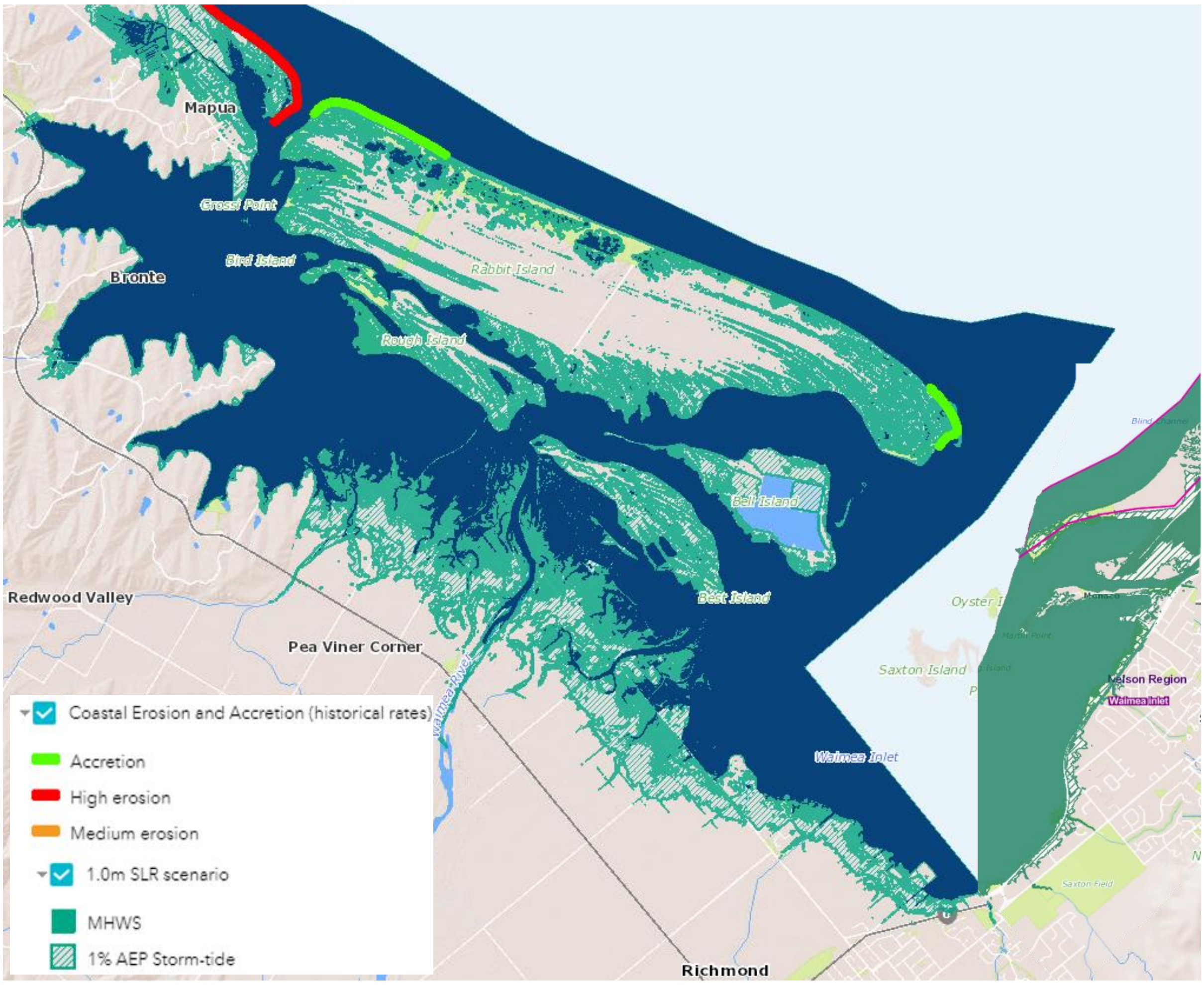


Figure 5-2: Extent of inundation from 1.0m sea level rise shown in green (sourced from NCC & TDC websites)

From a technical perspective, the current WWTP location is thought to be able to be used for a long period (at least to 2080) and therefore it is appropriate to continue to invest in activities on the Bell

[1] https://shape.nelson.govt.nz/climate-adaptation

Island site. We do recognise that taking a "do nothing" approach is not appropriate if we want to continue providing wastewater conveyance, treatment and disposal in the long-term future. We will therefore take an adaptive management planning approach and work towards the following:

- complete a vulnerability study by 2025; and
- secure a site and required designations (second decade) for future relocation of the WWTP.

It is NRSBU's responsibility to monitor and manage its emissions. The following table (Table 5-3) summarises the improvement programme underway which is working towards our goal of implementing and operating infrastructure considering the needs of our community.

Table 5-3: Emissions improvement works

Level of Service	Task	Sub task
Have systems in place	Have systems in place for the ongoing monitoring and reporting of emissions	Undertake annual audit of current emissions, identify target areas for improvement
		Setup framework for ongoing monitoring and reporting
Reduction in emissions	Ongoing reduction in carbon emissions and diesel consumption to follow regulations and align with government targets	Formally include emissions & energy consumption as criteria in all NRSBU decision making
		Set targets for reduction over time (scaled with increase in influent over time)
	Planning for emissions reduction	Investigating technology options
		Implementing lower carbon energy sources
		Longterm planning for capital upgrades to reduce emissions

The projects that we are planning to manage our emissions and the impacts of climate change are discussed in Section 7 (Pump stations), Section 8 (Treatment and Disposal) and Section 13 (Risks).

5.4 Cultural Values

The disposal of wastewater to wai/water is expected to remain unacceptable to mana whenua. It is expected that there will be a stronger focus to increase the quality of treatment and uptake of land-based disposal solutions from the community.

NRSBU understands that the disposal of wastewater to aquatic systems and to areas of wāhi tapu (sacred sites) and mahinga kai (food and resource gathering) is culturally unacceptable to mana whenua. Additionally, NRSBU understands that mana whenua opposes the location of the wastewater treatment plant and adjacent infrastructure (i.e. wastewater pipelines under the estuary from Monaco to Bell Island).

NRSBU is developing its relationship with mana whenua to further understand their values around wastewater by:

- Hosting site visits to Bell Island WWTP and the Biosolids facility
- Holding an annual hui at Best Island offices including a site visit to NRSBU's facilities
- Development of Regional Wastewater Philosophy
- Regular hui on present and upcoming activities

5.5 Population growth

The total population across the districts is expected to increase significantly, which will increase the total flow and load coming to our network from the council contributors.

There is a need to size and plan upgrades to accommodate future population growth as increases in total flows and loads are likely to exceed the existing system capacity and result in overflows. The "do nothing" option is not appropriate as we would be unable to achieve our strategic goal of providing for the needs of our community if our infrastructure is undersized. Additionally, to achieve our goal of beneficial reuse of wastewater, we must identify reuse opportunities and we may need to secure and purchase land as appropriate. Availability of land will become further constrained as the population grows.

Growth forecasts are not NRSBU's responsibility and NRSBU is unable to foresee how the council contributors would accommodate the increased flows resulting from growth within their networks and hence the impact it would have on NRSBU. We are required to provide capacity to meet the current and foreseeable needs of our contributors and as such we rely strongly on our contributors supplying accurate forecasts for their individual needs. We expect our contributors to estimate their demand for the next 30 years, as well as undertaking an annual review of their load and flow demands. To date accurate future flow predictions have been supplied by TDC each year. NCC is still working on its catchment models and has indicated that accurate future flow projections may be available to NRSBU in early 2024.

NCC and TDC maintain Future Development Strategies (FDS), which inform their long-term plans. The expected areas for growth are shown in Figure 5-3. The FDS provides for approximately 16,000 additional houses by 2052 in Nelson City Centre and surrounds, Stoke, Tāhunanui and surrounds, Richmond, and Brightwater.

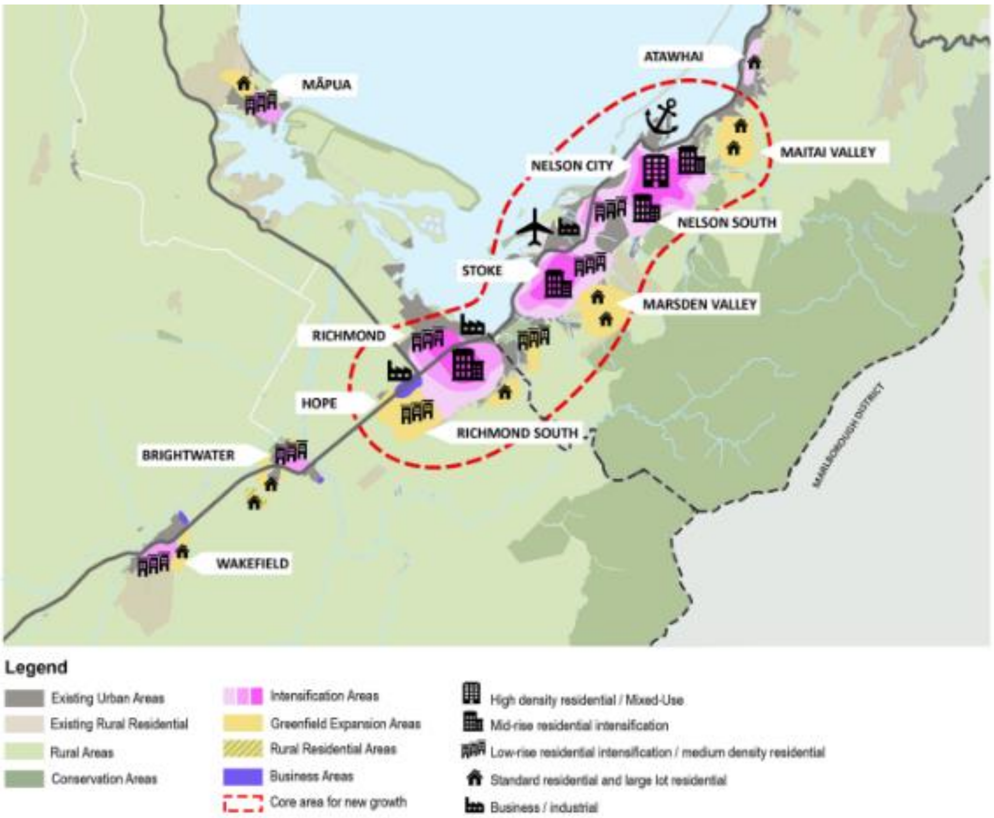


Figure 5-3: Potential growth areas (from Nelson Tasman Future Development Strategy 2022)

We expect that this growth will result in increased flow and load demands in the near future and that this will be incorporated into the Agreements for Disposal of Trade Waste with NCC and TDC. The projects that we are planning to address these impacts are discussed in Section 7 (Pump Stations) and Section 8 (Treatment and Disposal).

5.6 Major changes by contributors

Major changes to discharges by the current contributors are possible and are a risk of which NRSBU is aware. This risk is partly offset by the return on capital charge included in NRSBU's contributors' trade waste contracts.

5.6.1 Changes in volume

Major changes to the volume of wastewater received from NCC and TDC would require significant additional investment and infrastructure that is currently not included in NRSBU's long term plan and budget. Future scenarios could include, but are not limited to:

- TDC decommissions Motueka WWTP and directs flows to Bell Island for treatment.
- NCC decommissions Nelson North WWTP and directs flows to Bell Island for treatment.
- Wastewater flows from Wakefield and Brightwater are no longer treated at Bell Island.
- A significant industry contributor leaves our district or ceases to trade, resulting in reduced load (and, to a much lesser extent, flow).

The estimated change in wastewater volume at the Bell Island WWTP for these scenarios is included in Figure 5-4.

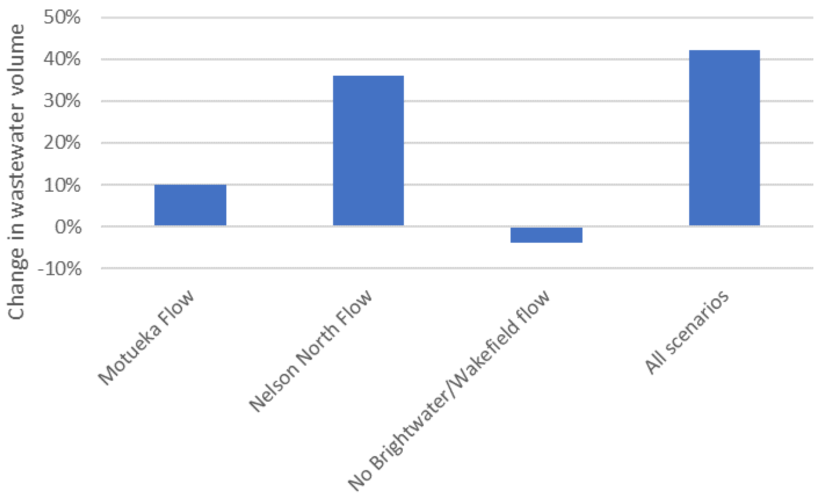


Figure 5-4: Indicative change in wastewater volume at the treatment plant

Any of the above scenarios involving a local authority would be a major change for the relevant council and we have assumed that these would be signalled well in advance with at least 10 years' notice. Where an industry ceases to trade or relocates its operations this is likely to happen at short notice and will have consequences to the NRSBU revenue base. The future projections used in *'Part B: Where we want to be'* have assumed no changes to the current contributor configuration.

5.6.2 Changes in load

The industrial contributors are not major contributors of wastewater by volume, but they do have a material impact on treatment load at the WWTP. Based on their advice, we do not anticipate any increase in load from the industrial contributors in the long-term. The most likely scenario is that one of the contributors leaves, which would decrease treatment loads and NRSBU's revenue. An example of the likely reduction in Biochemical Oxygen Demand (BOD) and Total Kjeldahl Nitrogen (TKN) load from each of the contributors leaving impact is demonstrated below (Figure 5-5).

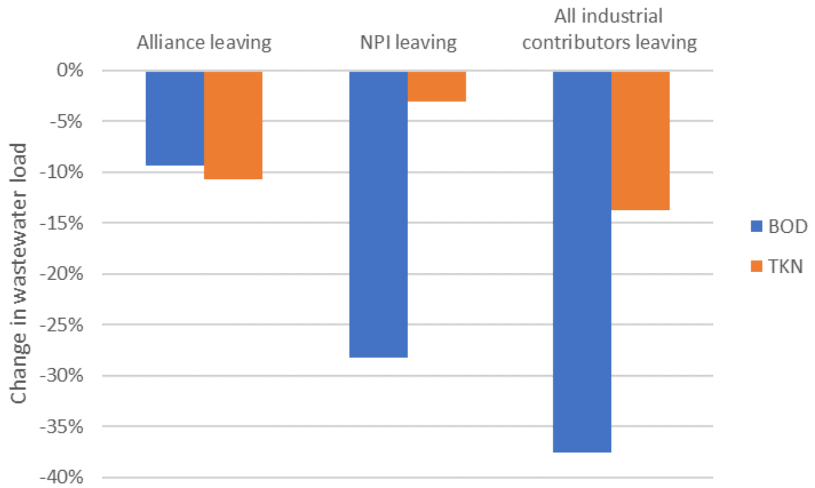


Figure 5-5: Indicative impact on wastewater loads (BOD and TKN)

NRSBU believes that industrial load changes will likely be offset by an increase in residential loads from TDC and NCC and therefore, while there may be a period of load reduction, we do not think the risk is significant, and we are not planning to manage these changes unless they occur.

5.7 Disposal drivers

5.7.1 Land disposal

The disposal of human waste to waterways is unacceptable to iwi and undesirable to the community. The Waimea inlet is not only a key source of kai moana (food) but also a recreational area for residents and tourists, as shown in Figure 5-6. Therefore, there is pressure from the community to move towards land-based disposal options.

Approximately 1300m^3/day of treated wastewater is used to irrigate Bell Island and Greenacres Golf Club (once completed in early 2024). This equates to approximately 10% of dry weather flows being discharged to land currently. In the immediate future NRSBU is working to increase reuse and land application on Bell Island and at Greenacres to 2000m^3/day. NRSBU is actively looking at industrial reuse opportunities and has plans to roughly double current figures via application to land purchased for this purpose on Best Island. This aligns with NRSBU's performance goal of having alternative treated wastewater disposal capacity (in appropriate dry summer conditions) of 10,000m^3/day by 2040.

The "do nothing" option will not enable us to work towards increased land disposal or the beneficial reuse of resources. Therefore, to move towards land-based disposal and re-use of resources we will need:

- Additional land for disposal;
- Infrastructure to transport treated wastewater to the disposal area;
- Changes to the treatment plant to accommodate additional treatment, as required for land-based disposal; and
- Changes to biosolids treatment and disposal due to the increased treatment of wastewater that may be required.

NRSBU is focussing on options that enable us to work towards the beneficial reuse of resources. The projects that we are planning to address changes in disposal drivers and move towards land-based disposal are discussed in Section 8 (Treatment and Disposal).

Figure 5-6: Recreational areas (Bell Island WWTP Application and AEE 2017)

5.7.2 Pathogenic contaminants

Cawthron Institute, in partnership with the University of Tokyo, the Prefectural University of Toyama and colleagues at ESR (institute of Environmental Science and Research), is studying the efficiency of virus removal and the impacts on the environment at various WWTPs, including Bell Island. NRSBU proposes to continue to work with a range of providers with expertise in these fields to increase our knowledge regarding these contaminants and their risks within our system.

Once we receive the findings of this study, we will have a better understanding of our pathogen removal process and the works required to improve these. The sampling programme is now completed and, once the final test results are returned, analysis of the findings can be carried out. Whilst the final results from the study have not yet been received, the initial testing results demonstrate the treatment plant effectively removes viruses from the wastewater.

5.7.3 Emerging pollutants

There is increasing concern regarding the impact of residual drugs and chemicals on our ecosystem. Emerging contaminants include chemicals in pharmaceuticals, personal care products and preservatives. NRSBU, as part of its ongoing monitoring, will be maintaining awareness of the emerging trends in this area and will implement monitoring of the relevant chemicals as they become known as a potential issue. This will include not only chemicals within the influent wastewater (including assessments of drug use), but also contaminants that could contribute to land contamination within our biosolids reuse facility.

5.8 Legislation

Anticipated changes to legislation in the near future are likely to put more onerous restrictions on NRSBU and, in particular, are likely to require a higher quality of treatment before disposal and more stringent monitoring and quality processes.

These changes are intended to increase the level of service, improve service delivery and improve asset maintenance and management, which will better protect the health of the community and the environment and are therefore likely to align with our strategic goals.

The following changes in legislation were expected to occur within the next few years, however at the time of preparation of this AMP the 2023 General Elections had just been completed, with the resulting change in Government, and election policy guidance, there is significant uncertainty as to how this will progress.

- Stronger central oversight of wastewater regulation with Taumata Arowai as the watchdog.
- Alteration to the ways that Local Authorities deliver Three Waters services (previously Labours 'Affordable Waters') - some level of change to delivery of Three Waters services is considered likely, however the scale of change is unknown.
- National Environmental Standards (NES) for wastewater discharges and overflows which will be progressed alongside the Ministry for the Environment's Essential Freshwater programme and are expected to set new requirements for wastewater systems and discharges.
- Replacement of the Resource Management Act (RMA) 1991 with three new pieces of legislation:
  - Natural Built Environments Act (NBA) as the main replacement for the RMA, to protect and enhance the environment while better enabling development
  - Strategic Planning Act (SPA) requiring the development of long-term regional spatial strategies
  - Climate Adaptation Act (CAA) to provide a strategic and long-term approach to using land and the coastal marine area.

Further, to understand the potential implications of some of these changes, the Department of Internal Affairs commissioned a report titled "The Three Waters Review: Cost estimates for upgrading wastewater treatment plants that discharge to the ocean", which reviewed and developed minimum discharge standards. The Bell Island WWTP does not currently meet the proposed quality targets to discharge into an area with poor dilution (e.g. into estuaries or sheltered bays). Significant changes to our infrastructure and processes would need to occur to meet these standards.

5.9 Consumption of resources and production of emissions

The current pond-based treatment system is relatively energy efficient. NRSBU has a responsibility to monitor and manage its greenhouse gas emissions to comply with regulations and align with government targets. There are currently no financial implications from NRSBU's emissions since wastewater treatment is not included in the Emissions Trading Scheme (ETS).

NRBSU currently applies biosolids on Moturoa/Rabbit Island to provide nutrients to the pine plantation, as opposed to landfill disposal of the biosolids.

Changes to the treatment process to deliver higher quality treatment will increase the consumption of resources and the production of emissions. Relocating the treatment plant and/or biosolids application to an alternative site will also increase the consumption of resources and the production of emissions.

It is anticipated that there is and will continue to be a strong desire from the community to minimise the consumption of resources and to recover the resources (water, nutrients, and energy) from the wastewater.

The ‘do nothing’ option, where NRSBU completes upgrades only as required by resource consents, will not enable us to reduce our production of emissions or consumption of resources. To enable this NRBSU plans to:

- Have climate impacts as a decision-making criterion and actively look for ways to improve.
- Use renewable energy (solar power)
- Consider all treatment plant outputs as potential resources and look for reuse opportunities.
- Increase the supply of treated effluent to be used for irrigation on Best Island
- Supply sports fields and recreational reserve spaces with treated effluent for irrigation. Noting that demand for this ‘product’ will be seasonal.
- Supply treated effluent to industry to be used instead of treated potable water with the intention that demand would exist all year around

Part B: Where we want to be

6 Reticulation

6.1 Issues

6.1.1 Condition

The condition of the rising mains is unknown although, with the exception of the original rising main from Monaco to Bell Island, the rising mains are PE and installed in the last 25 years. After the completion of the main rising main duplication project (2024) a detailed inspection of most of the reticulation system can be more readily completed without significant expense or risk of overflow.

Additionally, to mitigate the risk of failure NRSBU is continuing to provide alternate/duplicate pipelines for the remainder of its network, i.e. the injection rising mains from Airport PS and Songer PS, which can accommodate low flows as a minimum and hence facilitate inspection and maintenance of NRSBU's rising mains.

6.1.2 Hydraulic capacity

Incoming flows from our contributors are likely to increase and therefore the capacity of the NRSS needs to increase to suit. We need to develop a good understanding of the hydraulic capacity of the NRSS in order to plan and implement specific hydraulic upgrades of rising mains and pump stations in a timely manner.

NRSBU has engaged Beca Ltd to develop a hydraulic model of the NRSS. This model has been used as a design tool for the duplication project. Additionally, the model can provide an indication of the hydraulic capacity of the NRSS.

No detailed future demand projections have been made by NRSBU as we rely on our contributors to forecast their future demand. Our contributors are responsible for providing these forecast demands, based on their own plans. In the absence of these forecasts, NRSBU is unable to accurately state that the NRSS has capacity to accept future wet weather flows.

6.2 Preferred future state

Our strategic goal is to deliver conveyance (reticulation) that is resilient and minimises adverse impacts on the health of the environment and community. To achieve this goal, we must have a network which has sufficient capacity to cope with peak flows, is readily maintained and has resilience to overcome issues that can foreseeably occur. This will be achieved by:

- Development of a detailed network hydraulic model to assess capacity for current and future demands which is calibrated by reliable recorded data.
- Continued construction of duplicate pipelines so there are two pipelines from each pump station. This will enable inspections and maintenance of the network and increase the capacity to cope with demand.
- Development and implementation of an inspection program for the reticulation network.
- Working with our contributors to promote decreases in inflow and infiltration in their networks and therefore a reduction in the NRSS peaking factor from 10 to 5.

7 Pump stations

7.1 Summary

To implement and operate infrastructure considering the needs of the community we must have pump stations which:

- Have sufficient capacity to cope with peak wet weather flows
- Are resilient to mechanical and electrical failures (have emergency storage and backup power) and natural hazards
- Can be readily maintained.

NRSBU operates five pump stations, which receive flows from the four main contributors (councils and industry). Table 7-1 summarises whether each pump station currently meets the desired levels of service. The issues and planned projects for each pump station, to bring them up to the required standard and enable us to achieve our strategic goals, are discussed in the following sections.

Table 7-1: Summary of existing pump stations

Pump station	Capacity for 2035 PWWF	Emergency storage	Power generation for PWWF	Ease of maintenance (storage or two rising mains)	Protected against 0.5m sea level rise (SLR)*	Protected against 0.5m SLR with 1% AEP storm tide*	Overflow screening
Beach Road	Yes	No	No	No	Yes	Yes	No
Wakatū	Yes+	Yes	No	Yes	Yes	Yes	No
Saxton Road	Yes+	No	No	No	Yes	No	Yes++
Songer Street	Yes+	No	Yes	No	Yes	No	Yes
Airport	Yes+	No**	No	No	Yes	Yes	Yes

+ Future flow requirements still need to be confirmed by contributor(s)

++ Permanent solution still required

* As per NCC and TDC coastal viewers (based on 2019 assessment)

** Storage is available but not owned by NRSBU

7.2 Beach Road (Richmond) Pump Station

7.2.1 Description

The Beach Road Pump Station receives flows from the Tasman District sewage network (Richmond, Brightwater, Wakefield and Hope communities), plus a smaller quantity from NPI (approximately 23 L/s). Flows from this pump station are pumped via a 500 mm OD PE rising main to Saxton pump station.

Pump capacity: The pump station consists of one duty pump with a pump capacity of 176 L/s and two storm pumps with a combined capacity of 430 L/s.

Overflows: The contracted peak flows from TDC are exceeded frequently. These high flows have occurred during rainfall events and have resulted in overflows.

Condition: From visual inspections, the pump station is in good condition.

Resilience: The site has emergency generation capacity of 750kW. Due to capacity limitations this can only operate one storm pump at reduced speed until a new distribution board is installed in 2024 when both storm pumps will be able to operate at full capacity during power outages.

The site has been protected from storm surge by the addition of bunding around the wet well and storm shutters fitted to the pump house.

No emergency storage is available at the site.

Septage Reception Facility:

Also located at the Beach Road Pump Station is the Septage Reception Facility, which receives septic tank waste and other tanked wastes for discharge to the pump station. A screening system was installed in 2023, which removes large solids from the waste stream at source, washes them and discharges into a skip for removal to landfill.

Figure 7-1: Photograph of the Beach Road Pump Station site

7.2.2 Issues and options

TDC's contracted peak flows are restricted by the current pump station capacity and have been exceeded throughout the years during wet weather. The rising main duplication project is being undertaken in order to provide the increased capacity that TDC has requested. Additionally, TDC's flows are expected to continue to increase due to intensification within the catchment. Construction is underway to duplicate the rising main between Beach Rd and Saxton pump stations to cater for these increased flows.

The pump station currently has some resilience to natural hazards such as flooding, however ongoing sea level rise will eventually render the site unsuitable as a primary pumping site, predominantly because of the risk of sea water ingress to the incoming sewer network overwhelming the capacity of the pump station. Practicable resilience works to defend the site have generally been completed but, due to space constraints and the low-lying site, improvements are likely to involve the purchase of additional land at a higher level. The programme of works includes the purchase of land and relocation of the pump station in the second decade.

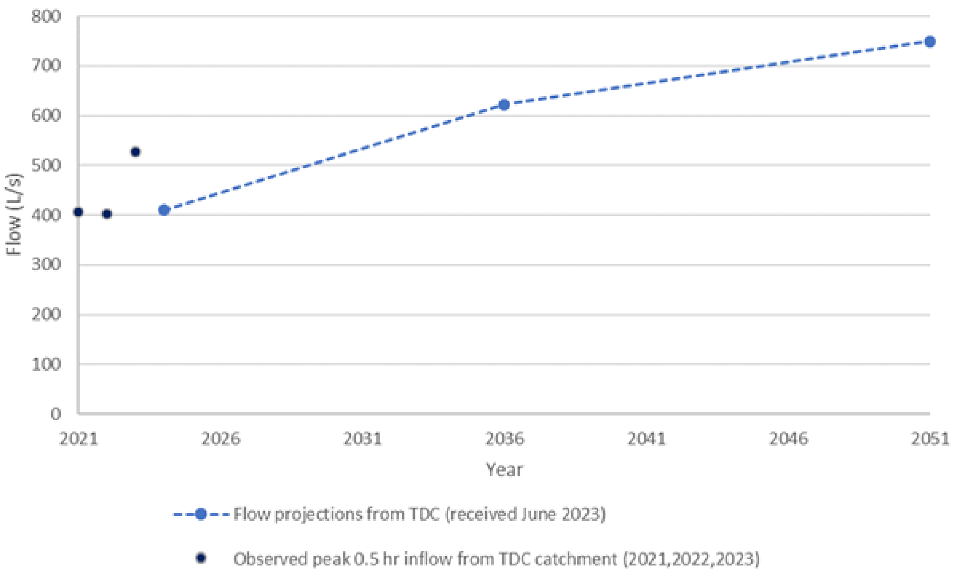


Figure 7-2: Peak inflow for Beach Rd PS
(Note capacity has been restricted pending completion of the pipe duplication project which will provide TDC's requested capacity)

7.2.3 Preferred future state

To achieve NRSBU's long term strategic goals and level of service targets, the following work at the Beach Road Pump Station is programmed:

- Upgrade pump station power distribution boards to accommodate full supply from new emergency generators (from 2023/24)
- Construct additional rising main from Beach Road Pump Station to Saxton Road Pump Station to accommodate 2050-year foreseeable storm flows (by 2024/25).
- Seismic resilience improvements at the pump station (from 2023/24).
- Wet well cover replacement (2023/24).
- Purchase additional land in an alternative location to allow managed retreat in future from the current Beach Road site (from 2031/32).
- Purchase additional land for emergency storage and install emergency storage to hold six hours of ADWF (second decade), noting that this will be at the future site.
- TDC have identified conveyance issues within their network and have requested NRSBU to bring forward the construction of a new pump station to accept the gravity flows from Richmond's northern suburbs. This pump station was due to be constructed in 2039/40, to accept gravity flows from these northern suburbs once the existing Beach Rd pump station moved further inland. This has been brought forward to start design in 2027/28 and construction in 2028/29.

7.3 Wakatū Pump Station

7.3.1 Description

Wakatū Pump Station receives flows from the Wakatū Industrial area (NCC is the sole contributor) and injects into the Beach Road to Saxton Road rising main.

Pump capacity: The pump station consists of two pumps in a duty/standby pump arrangement. The pump capacity is currently 40 L/s and can be increased to 80 L/s by installing larger pumps. There is inadequate space to increase the current pump station capacity beyond this.

Overflows: There have been no overflows at this site as inflows which exceed the pump capacity are buffered in the on-site emergency storage. However, as the site does not currently have an overflow point any overflows in this catchment would discharge from the gravity network upstream of the pump station (the lowest point in the system). The installation of an overflow screen is a requirement of the resource consent for emergency discharge and will be installed below the overflow levels of the upstream gravity infrastructure.

Resilience: The pump station has emergency storage to hold about 140m^3. The pump station currently has no backup power supply, although an emergency generator is onsite. Upgrade works programmed for the pump station controls will resolve this. Work is programmed for completion in 2024.

Condition: From visual inspections the pump station is in a good condition, however the control system shed is not fit for purpose, and the control systems operating the pump station reduce the flexibility of the site. Works to replace the control system shed are programmed for completion in 2024.

Figure 7-3: Photograph of the Wakatū Pump Station site

7.3.2 Issues and options

There is ongoing development in the local catchment (Hill Street) and further growth planned (see Figure 7-4). This will likely increase the flows into the pump station and the size of the pumps will need to be upgraded accordingly. Additionally, the storage available may not be sufficient in the future to provide six hours of ADWF. Options to address these capacity concerns and maintain good performance of the pump station include increasing the capacity of the pumps, installing a back up power supply and installing overflow screening equipment.

Future flow predictions from NCC indicate that due to ongoing development in the catchment for Wakatū the pump station is likely to be at its maximum upgradable operating capacity within the next 10 years. Due to size constraints at the site it is not feasible to further upgrade the wet well to fit even larger pumps or to increase the storage capacity.

Early notification has been provided to NCC, and future plans to establish a new pump station to service the northern end of Richmond provide an opportunity for flow from NCC's Champion Rd catchment to be diverted.

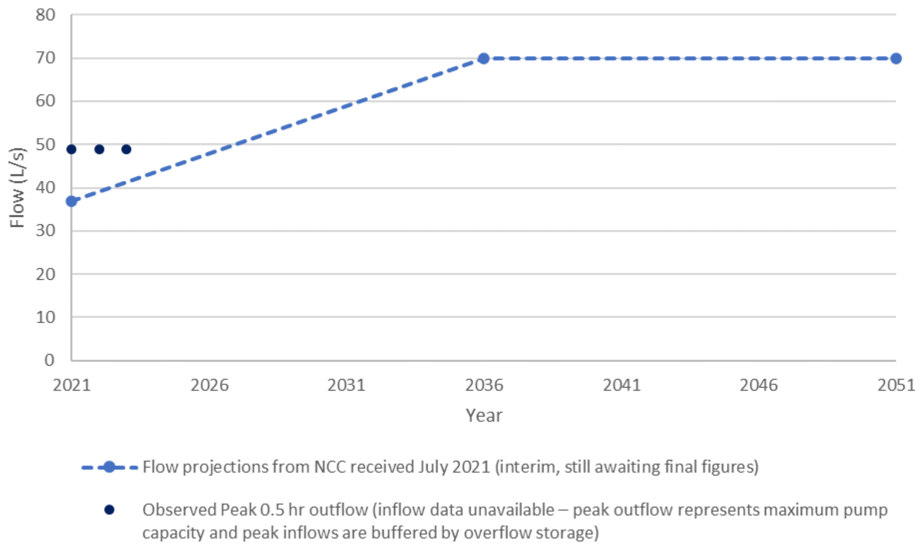


Figure 7-4: Estimated maximum half hourly average flow at Wakatū Pump Station (placeholder values only until NCC provides updated flows)

7.3.3 Preferred future state

To achieve NRSBU's long term strategic goals and level of service targets, the following work is programmed at Wakatū Pump Station:

- Overflow screen and monitoring systems (2023/24).
- Upgraded control building and systems. Connection of emergency generation (2023/24)
- Capacity to accommodate future average and storm flows (2024/25).
- N+1 redundancy for critical mechanical equipment (2023/24).
- Cross-connection into the dual Beach Road to Saxton Road rising mains (2023/24).

7.4 Saxton Road Pump Station

7.4.1 Description

The Saxton Road Pump Station receives flows from NCC's network (gravity inflow) and from Alliance Group, Wakatū Pump Station and Beach Road Pump Station via the incoming rising main. Wastewater flows from this pump station are then pumped via a 710 mm OD diameter PE rising main towards the WWTP.

Pump capacity: The pump station consists of one duty pump with a pump capacity of 192 L/s and two storm pumps with a combined capacity of 920 L/s (from pump curves, not verified).

Overflows: NRSBU has a resource consent (RM165114) for this pump station, which allows "aberrational" discharges to the estuary. This has occurred due to mechanical failure in the past. Overflow screening and monitoring is in place to meet the aberrational discharge consent requirements, but are only temporary. Permanent installations are required at this pump station.

Resilience: This pump station is the only one in the network which receives flows from another NRSBU pump station (Beach Road). It is therefore a critical component in the network and must be resilient to power failure and natural hazards. Currently there is emergency power generation for one storm pump running at slightly reduced capacity, but no emergency storage at this pump station. The pump station has not flooded or been damaged in recent storms; however, it is likely at risk of inundation from predicted sea level rise.

Condition: From visual inspections the pump station is in good condition.

Figure 7-5: Photograph of the Saxton Road Pump Station site

7.4.2 Issues and options

The largest flow into the pump station is from the Beach Road Pump Station and any work to upgrade this upstream pump station will need to be planned carefully to tie into works at Saxton Road Pump Station. Although overflows have occurred, these have been due to mechanical failures. It is known that the pumps are nearing capacity for recent growth in the catchment and for increased flows from the Beach Road Pump Station. This will cause the storm pumps to transition from a duty/standby setting to duty/assist over the next 10 years. As this happens the pump station will lose its N+1 rating. This will require additional expenditure to provide a 4hr change over spare pump – enabling the level of service to be maintained.

As discussed in the previous section, the flows from Beach Road are likely to substantially increase within the next 30 years, leading to an increase in flows at Saxton Road Pump Station. This will be in addition to flow increases resulting from growth in the local catchment, as shown in Figure 7-6.

Overflow screening and monitoring systems are required to meet our consent conditions (resource consent number RM165114). These have been installed to meet the consent conditions, but full screening is planned to be installed next year (2024/25). Backup generation has been installed and is only limited due to capacity constraints in the current power distribution board. This is due to be upgraded in 2023/24.

A detailed condition assessment has not been undertaken, however from visual assessments the pump station appears to be in good condition. There is no emergency storage at the pump station and limited space on the existing site on which storage could be located. NRSBU has an opportunity to purchase additional land to install a storage facility.

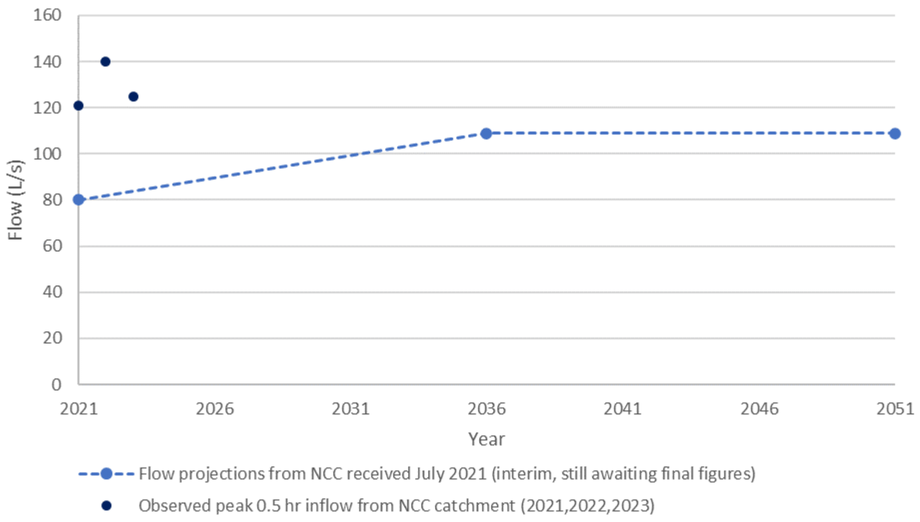


Figure 7-6: Estimated maximum half hourly average flow rate to Saxton Road Pump Station (placeholder values only until NCC provides updated flows)

7.4.3 Preferred future state

To achieve NRSBU's long term strategic goals and level of service targets, the following work is programmed at Saxton Road Pump Station:

- Mechanical overflow screening (2024/25).
- Changes to infrastructure to enable emergency power generation to run the pumps at full capacity (2023/24).
- 4hr changeover spare pump, to ensure levels of service are still met once storm flows require PWWF pumps to operate as duty/assist.
- Connection of dual rising main to Monaco (by 2024/25).
- Acquisition of adjacent land (2024/25) and installation of storage (from 2038/39)
- Security fencing.

7.5 Songer Street Pump Station

7.5.1 Description

Songer Street Pump Station receives flows from the NCC network and injects into the Saxton Road to Bell Island WWTP rising main.

Pump capacity: The pump station consists of one duty pump with a pump capacity of 119 L/s and two storm pumps with a combined capacity of 280 L/s from pump curves, not verified).

Overflows: There have been a number of overflows in the last two years (2021 – 2023). Some occurred due to equipment failure, however a larger number were due to excess inflows. NRSBU has a resource consent (RM165114) for this pump station which allows "aberrational" discharges to the estuary. This consent has a number of specific requirements. NRSBU is compliant with these.

A pump action screen was installed in the old wet well adajent to the Songer pump station in 2023. To achieve the required overflow discharge rate an additional pump was installed downstream of the screen, creating a pumped overflow system.

Resilience: There is emergency power generation onsite capable of running the storm pump, however the generator size is insufficient to also run the overflow screen and discharge pump. The pump station is located near the coast on low lying land and a recently constructed bund protects the station from storm surges and high tides. The site is however at risk from ongoing sea level rise.

Condition: From visual inspections the pump station is in good condition.

Figure 7-7: Photograph of Songer Street Pump Station site

7.5.2 Issues and options

Songer Street Pump Station receives flows from the NCC network and injects into the Saxton Road to Bell Island WWTP rising main. The current contracted flows are greater than the duty pump capacity but less than the storm capacity (Figure 7-8). Some growth is expected in this catchment and the pumps may need to be upgraded.

A detailed condition assessment has not been undertaken, however from visual assessments the pump station appears to be in an acceptable condition. To improve the maintainability of this pump station NRSBU intends to rehabilitate the out of service 300 mm OD PE line to the Airport pump station to provide two rising mains from Songer Street pump station.

There is a small volume (50m^3) of emergency storage at this pump station. More emergency storage could be achieved by retrofitting the existing site with additional storage capacity. Backup power generation for the storm pumps has been installed, however it is insufficient to operate the new overflow screen and overflow discharge pump at the same time as the site's storm pumps.

The pump station is located on low lying land, which is susceptible to coastal inundation. NRSBU has constructed an interim bund to protect against storm surges and the pump station has not been damaged by recent storms; however, as the frequency and severity of these storms is likely to increase, further works will be required to seal the pump station and protect it from future sea level rise.

The location and longevity of Songer Street Pump Station needs to be assessed regarding sea level rise, including consideration of managed retreat.

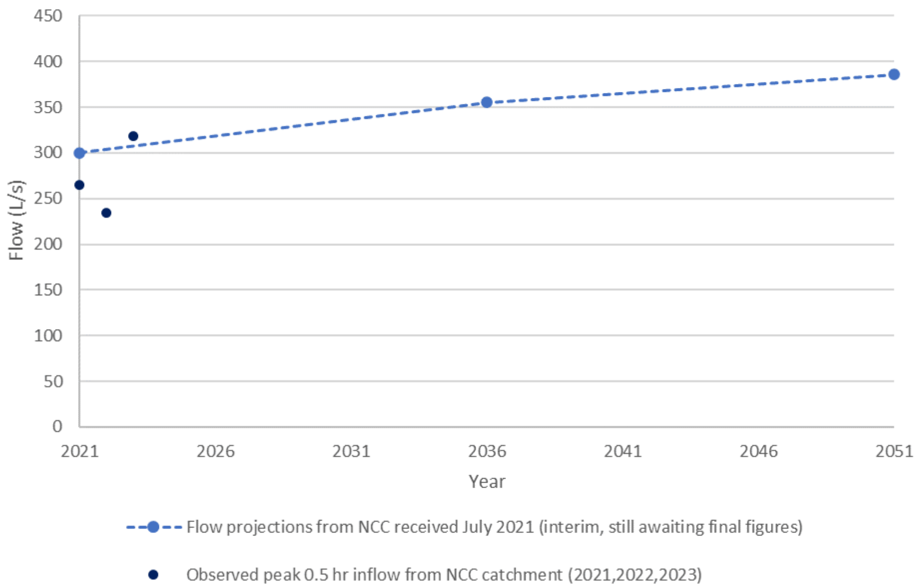


Figure 7-8: Estimated maximum half hourly average flow rate to Songer Street Pump Station (placeholder values only until NCC provides updated flows)

7.5.3 Preferred future state

To achieve NRSBU's long term strategic goals and level of service targets, the following work is programmed at Songer Street Pump Station:

- Emergency generation to operate the overflow screen (from 2023/24)
- Secondary discharge route to Airport PS (from 2025/26)
-
- Inter-pump station automation system.
- Security/ Health & Safety fencing.

7.6 Airport Pump Station

7.6.1 Description

The Airport Pump Station receives flows from NCC (Tahunanui catchment) and injects into the Saxton Road to Bell Island rising main.

Pump capacity: The pump station consists of two duty pumps with a combined pump capacity of 183 L/s and one storm pump with a capacity of 410 L/s.

Overflows: There has been one small overflow at this pump station within the last two years (2021 to 2023) due to operational errors on the rising main system.

NRSBU has a resource consent (RM 165114) for this pump station, which allows "aberrational" discharges to the estuary. This consent has a number of specific requirements with which NRSBU is compliant.

A pump action screen was installed on the overflow at the pump station in 2022. Overflow discharge from this screen flows into the Waimea Inlet via gravity.

Resilience: There is no emergency storage at this pump station. Emergency power generation is currently available to operate the storm pump at reduced speed. The pump station is located near the coast on low lying land but has not flooded or been damaged in recent storms.

Condition: From visual inspections the pump station is in a good condition. The upstream pipework was inspected and replaced in 2023.

Figure 7-9: Aerial photograph of Airport Pump Station site

7.6.2 Issues and options

The Airport Pump Station only has one storm pump, but the projected future flows are less than the current storm pump capacity, this presents a resilience issue and the AMP includes replacement of one duty pump with a new storm pump

A detailed condition assessment of the pump station has not been undertaken however from visual assessments the pump station is in a good condition.

There is no emergency storage at this pump station, however there is potential storage infrastructure on the site in the form of an old digester and clarifier (currently owned by NCC). NRSBU plans to acquire this infrastructure and convert it into a storage facility that is easily usable by NRSBU.

An emergency power generator is installed at the pump station, however the site's power infrastructure is not capable of conveying the full load from the generator. Future works include upgrading the power distribution to enable this.

The accessway to the pump station is located on low lying land, which is susceptible to coastal erosion. In the August 2022 storm event further damage occurred to the embankment beside the access road. Emergency works were undertaken to repair some these areas and protect against further erosion. It is anticipated that with sea level rise, further works will be required to seal the pump station, improve flood resilience and protect the site access road.

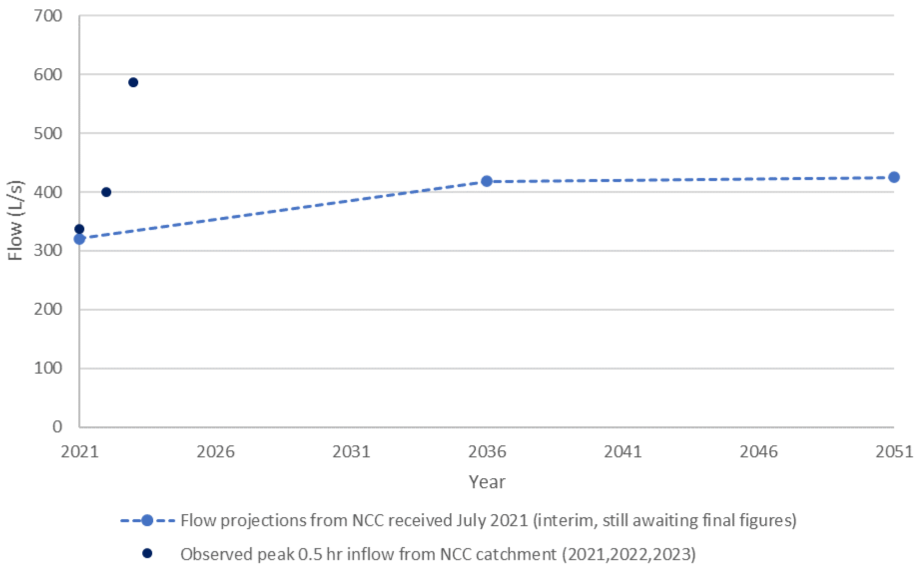


Figure 7-10: Estimated maximum half hourly average flow rate to Airport Pump Station (placeholder values only until NCC provides updated flows)

7.6.3 Preferred future state

To achieve NRSBU's long term strategic goals and level of service targets, the following work is programmed at Airport Pump Station:

- Changes to infrastructure to enable emergency power generation to run the pumps at full capacity (2023/24).
- N+1 redundancy for critical mechanical equipment (from 2023/24).
- Inter-pump station automation system.
- Security fencing.
- Rehabilitation of original rising main to Monaco (2026/2027)

8 Wastewater treatment and disposal

8.1 Overview

In general terms, the wastewater treatment process at the Bell Island plant consists of the following (refer also to Figure 8-3):

- Flow enters the WWTP though inlet screens and a grit chamber. Flow in excess of the capacity of the screens is bypassed directly to one facultative pond;
  - Solids from both the screens and grit chamber are sent for disposal at York Valley landfill.
- Flow in excess of the grit chamber capacity is bypassed directly to one facultative pond;
- After the grit chamber, flow in excess of the capacity of the primary clarifier is bypassed directly to the facultative ponds.
- All flow which passes through the grit chamber and any subsequent processes is split between the three facultative ponds in parallel;
- After the primary clarifier, flow is directed to the Activated Sludge (AS) treatment stream. The AS treatment stream comprises of:

- an activated sludge aeration basin and;
- a secondary clarifier.

- A bypass line is provided to the facultative ponds after the primary clarifier to convey flow in excess of the capacity of the activated sludge aeration basin;
- Flow exiting the facultative ponds passes through two maturation ponds in series, then on to the outfall discharge which operates during the first three hours of the outgoing tide (with a proportion discharged to land when conditions allow);
- Sludge from the primary clarifier is discharged directly to the sludge holding tank;
- Activated sludge from the secondary clarifier is split into Return Activated Sludge (RAS), returned to the aeration basin, and Waste Activated Sludge (WAS);
- WAS is thickened by the DAF system and combined with the primary sludge in the sludge holding tank;
- Sludge is fed from the holding tank to the ATADs (Autothermal Thermophilic Aerobic Digesters) and then into the biosolids storage tank at Bell Island; and
- The biosolids are then pumped to storage tanks at Moturoa/Rabbit Island for subsequent disposal by application to land composed of forestry blocks.

Figure 8-1: Bell Island WWTP (2022)

Figure 8-2: Main components of the WWTP (from Bell Island WWTP Application and AEE 2017)

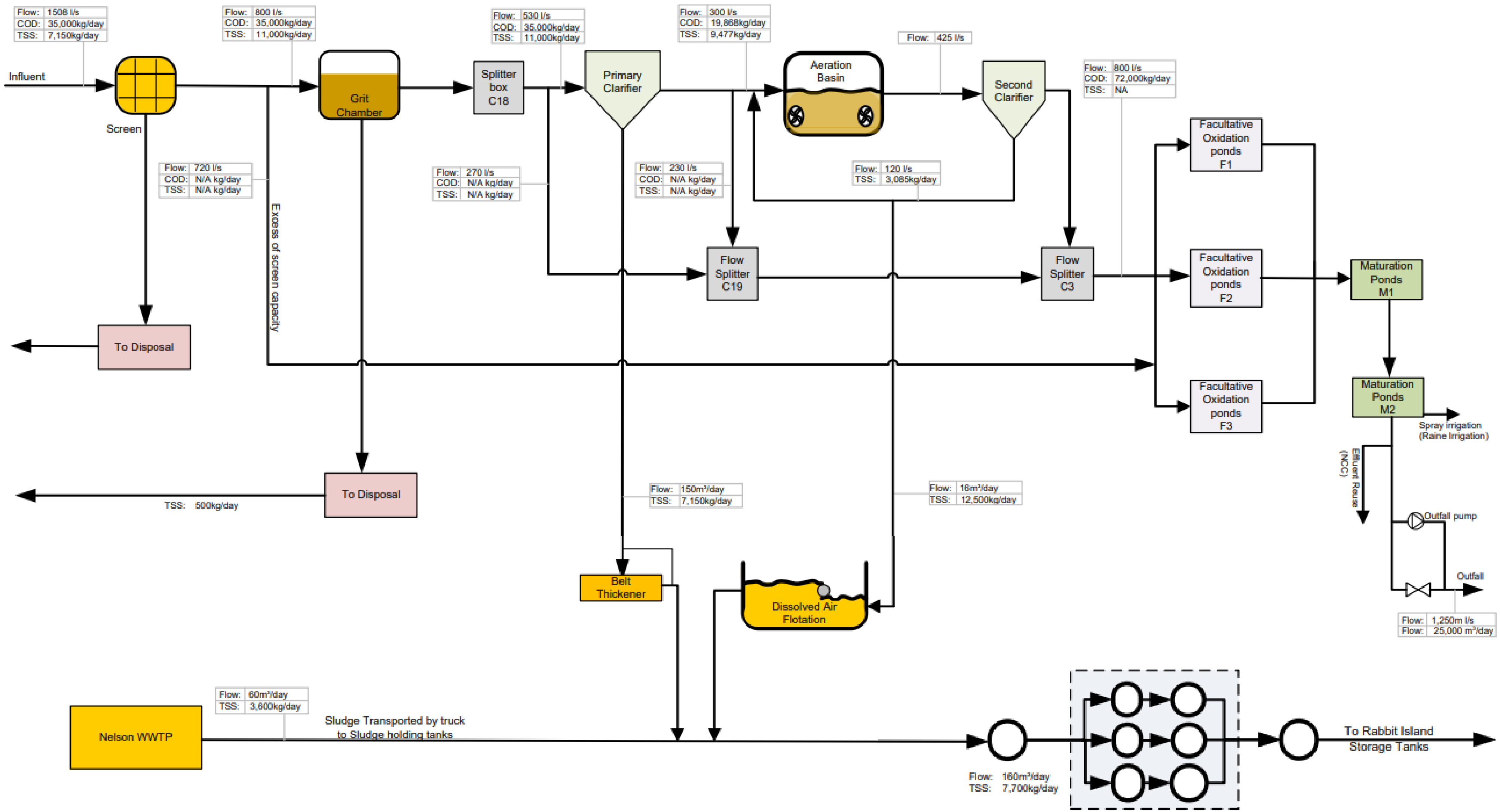


Figure 8-3: Schematic of Bell Island WWTP

8.2 Wastewater treatment plant headworks

The treatment plant consists of an inlet equipped with two grit removal milliscreens. The inlet has capacity to accept up to 1,508 L/s, however the screens have no redundancy at peak flow and the grit chamber only has a capacity of 800 L/s. Flows greater than this are bypassed directly to Facultative Oxidation Pond F1. This can result in excess oxygen demand in the pond and serious odour and treatment issues.

The preferred future state is to increase the capacity at the inlet to have redundancy for peak wet weather flows. Works include revision of the screening technology with an additional screen added to achieve N+1 capacity. This will protect downstream infrastructure from unscreened flows, provide redundancy during peak wet weather flow, and increase maintainability at the inlet.

Additionally, the bypass configuration should be changed to distribute flow between all three facultative oxidation ponds to reduce the possibility of odour issues and increase the resilience of the ponds (2031/32). This upgrade is likely to consist of a new pump chamber and pressure discharge line connected to all three facultative ponds.

8.3 Effluent treatment

After passing through the primary clarifier, flows can be:

- Directed through the aeration sludge basin and secondary clarifier to the oxidation ponds.
- Passed directly to the oxidation ponds.
- Spilt between the aeration basin and the oxidation ponds.

The hydraulic capacity of these units is given in the table below, Table 8-1:

Table 8-1 Existing hydraulic capacity (as per Bell Island WWTP Capacity Assessment Report 2014)

Process	Peak Flow (L/s)
Primary Clarifier	530
Aeration Basin	225
Secondary Clarifier	225

The current diurnal peak dry weather flows exceed the secondary treatment capacity listed above and result in wastewater flow being discharged directly to the ponds every day. The consequence of this is that plant performance is at risk and the ponds are at risk of creating odour issues and may exceed our consent conditions.

The preferred option to deal with these issues is to install a complete second treatment stream utilising Membrane BioReactors (MBR). This would increase the capacity to accommodate current and future diurnal flows and increase maintainability as flows could be diverted through the two secondary treatment streams without being bypassed to the oxidation ponds.

Added advantages of the addition of an MBR secondary treatment stream include treatment efficiency, flexibility and maintainability, along with the MBR output being able to be utilised as reuse water for conveyance offsite.

Design and construction of this upgrade is programmed starting from 2024/25.

The capacity of the WWTP is largely governed by the pond system, which comprises of three ten hectare facultative oxidation ponds (FOP) in parallel and two ten hectare maturation ponds in series. The typical retention time for wastewater through these ponds is greater than 30 days. The WWTP has traditionally been operated to meet the target biochemical oxygen demand (BOD) loading rate for the FOPs. This rate varies through the year, with lower rates in winter months. The FOPs have no spare capacity during the winter months but have additional organic load capacity during other times of the year. The current consent conditions for the quality of treated wastewater discharged to the Waimea Inlet are provided in RM171238. These consent conditions have the effect of reducing the capacity of the ponds.

Options to ensure that we have capacity in the ponds throughout the year to meet these conditions include:

- Ongoing, more frequent desludging of the ponds.
- Renewal of pond mixers.
- Installation of electrically powered recirculation and seeding pumps.
- Improve scum removal.
- Improve flow distribution system.
- Increase capacity to allow distribution of storm flows to all three ponds.
- Investigation of suspended solids removal options, including small onsite trials of different options.

8.4 Effluent disposal

8.4.1 To Waimea Inlet

Treated wastewater is discharged to the Waimea Inlet on the first three hours of an outgoing tide. The outfall system consists of a 1200 mm diameter concrete pipeline (498 m long) with two HDPE diffuser strings (119 m long and 95 m long) and outlet riser pipes (100 mm diameter) spaced 1.7 m apart along the diffuser. This pipeline is attached to a tidal storage basin at the WWTP. As per the resource consent (RM171238) the annual average daily discharge of treated wastewater to the inlet shall not exceed 20,000 m^3/day, while the maximum volume of treated wastewater discharged to the Inlet over any 24-hour period shall not exceed 25,000 m^3. Figure 8-4 displays the average inflow into the WWTP compared to the total discharge rate (to Waimea inlet and irrigation). The differences between average inflow and average discharge are due to the removal of biosolids and the evaporation from/rainfall onto the ponds (in all except very wet years, discharge is less than inflow).

In each of the past three years (2021, 2022 and 2023), the consented maximum daily discharge to Waimea Inlet has been exceeded due to extreme rain events, either in intensity or simply in duration, where the pond capacity to store and buffer peak inflows has been exceeded and NRSBU has been forced to seek permission from TDC to discharge more than 25,000m^3 in a 24-hour period (on two outgoing high tides). Climate change, and the associated weather extremes, is likely to increase the frequency of the pond buffer capacity being exceeded, compounded by increasing inflows due to growth. The pipeline duplication project will convey additional wet weather flow which is currently overflowing from our contributor's network to Bell Island so we are expecting a step change in peak WWTP inflow next year. Increased land application will not affect peak discharge flows as it will not be possible to apply treated wastewater to land during wet weather.

A minor correction to the resource consent condition is being sought to allow exceedance of the discharge limit during abnormal operations. NRSBU is also planning to improve its discharge pump capacity so that the higher flows can still be discharged during a short time period on the first three hours of the outgoing tide.

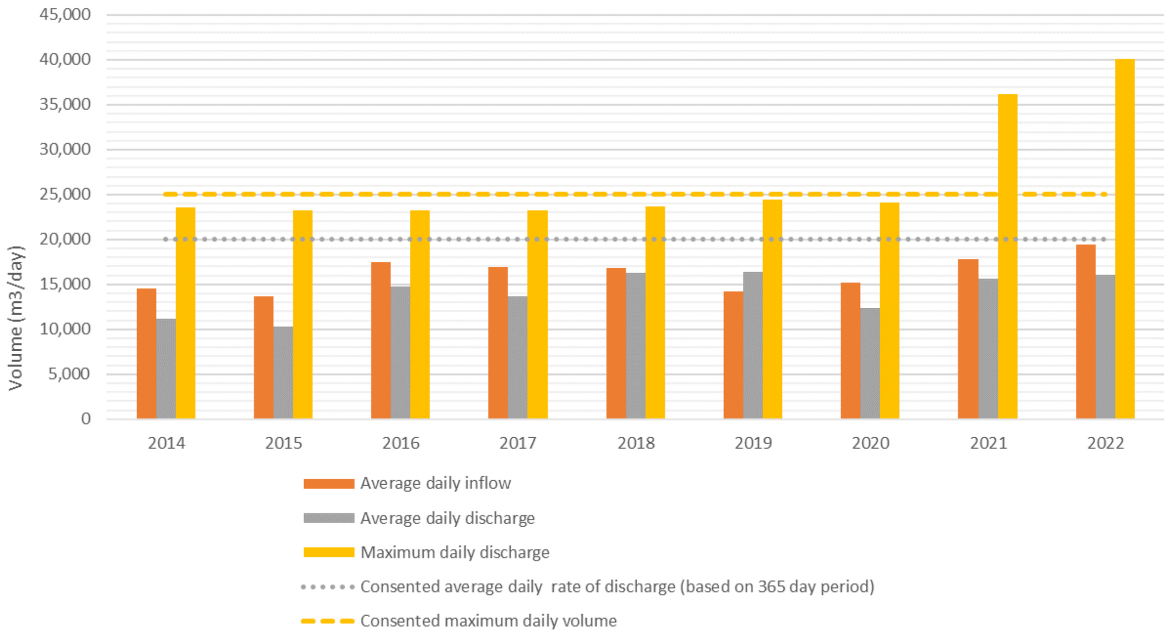


Figure 8-4: Bell Island WWTP inflow and outflow per year

Extended wet weather flows can result in very high flow into the WWTP; therefore the ponds are vitally important in providing storage during wet weather events to ensure that we do not exceed our daily discharge consent conditions. An assessment of the ponds volume at certain water levels has not been completed and is required to provide an understanding of the necessary storage volume to comply with consent conditions. Additionally, during lower summer flow rates there have been instances of BOD and TSS concentrations nearing compliance levels.

Options under consideration to address meeting our consent requirements include 'do nothing' (not a viable option), reduce peak wet weather flows (dependant on our council contributors and outside of NRSBU's control), increase the pond storage volume, and/or reduce the proportion of effluent discharged to the estuary, as well as increasing the suspended solids treatment of effluent. The preferred option is to develop an upgrade plan and implement partial treatment to meet consent requirements while developing land disposal systems to reduce the amount of effluent discharged to the estuary.

8.4.2 To land

NRSBU currently has 1290m^3 per day of capacity to dispose of treated effluent to land on Bell Island and to Greenacres Golf Course on Best Island. This land application is limited to suitable weather and ground conditions, so application is normally only able to be carried out between late spring and early autumn.

Over the 10 year AMP period a number of additional disposal options will be brought online. When combined this could provide capacity for diversion of up to 12,000m^3/day away from discharge to estuary during dry summer periods. This volume, if achieved, would allow the Bell Island treatment plant to not discharge to the estuary during normal summer inflow conditions, meeting NRSBU's level of service.

8.4.2.1 Bell Island

NRSBU has a resource consent (RM171256) to discharge treated wastewater onto land on Bell Island via irrigation. Up to 1,040 m^3/day may be irrigated to an area of approximately 20.5 ha. This provides

NRSBU with an alternative discharge to the Waimea Inlet when weather and ground conditions are suitable.

A consent is being sought to expand the land irrigation on Bell Island to include currently un-irrigated areas of pasture and the forestry on the Western end of Bell Island. The 10 year AMP budget allows to install a new filtration and pumping system from the end of pond M5, along with a distribution main to the western end of the island. Irrigation will be progressively connected to the distribution main over the 10 year AMP period.

The expansion of irrigation on Bell Island could increase the irrigable area to roughly 40 Ha. At this size disposal of 2000m^3/day is achievable (using the current consent application rates) during suitable conditions and, subject to consent approval, increased application rates could expand this number to 4000m^3/day.

8.4.2.2 Best Island

Further, NRSBU purchased a 64-hectare block of farmland on Best Island (adjacent to Bell Island) in December 2019. This land was purchased with the strategic goal of exploring alternatives to discharging to the Waimea inlet. Although still in the early stages of investigation, initial reports indicate the site should be suitable for irrigation of up to 10mm per day (in peak summer conditions). This could equate to disposal to land of up to 4500m^3 daily in suitable conditions.

As NRSBU moves away from discharging treated wastewater into the estuary, further land purchase will be required.

8.4.3 Alternative Disposal

Treatment to a higher standard may be required to provide non-potable water for use by water-intensive industries and/or for use to irrigate land not owned by NRSBU.

NRSBU has an agreement to provide Greenacres Golf Course with up to 250m^3/day of UF treated effluent. In 2023/24 conveyance pipework will be installed to allow Greenacres to irrigate following UV treatment. In time this is likely to increase to 500m^3/day.

An MoU is in place with Nelson Pine Industries to investigate opportunities for water re-use at their Lower Queen St MDF plant. It is anticipated this would provide re-use of 1000m^3/day of UF treated effluent daily, year-round. NRSBU is looking to identify other industries who could use treated effluent in place of potable water or groundwater without the weather dependencies of land application.

Completion of the re-use pipeline from Bell Island WWTP through to Saxton Fields will allow the supply of re-use water to the sports fields, for irrigation use during summer. Additional treatment at the point of application will be required. NRSBU anticipates that up to 3000m^3/day could be applied to the sports fields in suitable conditions.

8.5 Biosolids treatment and disposal

8.5.1 Overview

Biosolids is sewage sludge which has been treated and/or stabilised. Biosolids disposal is via spray irrigation over 850 ha of plantation forestry on Moturoa/Rabbit Island. The land is administered by TDC. NRSBU holds a permit for discharge of biosolids to land (NN940379V3), which expired in November 2020. An application for renewal of the consent was lodged in 2020 and NRSBU is able to continue to operate while the new resource consent is obtained. Ongoing research into the application of biosolids on the Pinus Radiata plantation has shown increased tree growth of approximately 30% (due to the plantation growing on low fertility sandy soil) and increased economic return from the forest (by approximately $480/hectare). The application of biosolids on Moturoa/Rabbit Island is a beneficial reuse of an end-product and enables NRSBU to have an economically sustainable wastewater system.

8.5.2 Biosolids treatment system.

The Biosolid ATAD treatment system was constructed in 1996 and has been modified and repaired a number of times during its life. The system is nearing the end of its life and either significant renewal works will be required or a replacement system will need to be installed.

The system has operated effectively and has achieved the discharge requirements from a treatment quality perspective, but the treatment system produces biosolids that have a particular odour associated with them. This odour causes some complaints on Moturoa / Rabbit Island when the biosolids is irrigated.

The system also uses a significant amount of electrical energy and requires significant maintenance on an annual basis.

In addition to the biosolid odour, energy use and maintenance, the ATAD treated sludge is very difficult to dewater and, as such, the ATAD treatment process significantly reduces the options available for NRSBU to reuse biosolids other than for irrigation on Moturoa / Rabbit Island.

One of NRSBU's ojectives is to have alternative disposal options to the current disposal on Moturoa / Rabbit Island. The strategic plan also seeks to increase the value of biosolids for reuse in a productive way.

The AMP includes allowance to construct an Anaerobic Digestion system to replace the ATAD sludge treatment system during this AMP period, with design starting in 2028/29 and construction starting in 2030/31. This new Anaerobic Digestion system will allow dewatering of biosolids, will reduce electrical energy consumption, and will allow energy to be produced from the biosolids. The system will continue to allow biosolids to meet the treatment quality criteria, but will result in a number of benefits and will support the transport of biosolids to other locations for reuse or disposal.

8.5.3 Biosolids Application Facility (BAF)

The Biosolids Application Facility (BAF) on Moturoa / Rabbit Island consists of a compound covering approximately 2,000 m^2 and containing four biosolids holding tanks (combined capacity of 1,040 m^3) shown in Figure 8-5. On site there are also two portacoms and an equipment shed, which are owned by the biosolids application contractor. Proposed improvement works for the site include:

- Covers on the holding tanks to minimise odour (2023/24).
- Collection and reuse of stormwater for cleaning holding tanks (2024/25).
- Dedicated washdown area where washdown water is collected and pumped to holding tanks (2024/25).
- Improved communications and data connections with other NRSBU assets (2023/24)

Figure 8-5: Biosolids Application Facility on Moturoa/Rabbit Island (March 2022)

Figure 8-6: Biosolids application on Moturoa/Rabbit Island (March 2022)

8.5.4 Disposal effects

The Moturoa/Rabbit Island facility has been researched extensively and monitoring has shown less than minor adverse effects on soil, groundwater, coastal environment and water quality. The only adverse effect currently known after over 24 years of operation is occasional nuisance odour issues. We believe that a 'do-nothing' approach is not a viable option to reduce odour complaints and meet our levels of service. Therefore, our preferred option is to develop a system to increase the quality of biosolids produced and improve identification and management of conditions where odour complaints are likely in order to avoid discharge in vulnerable areas during these conditions.

Currently, an application (app) is being developed that assists the biosolids operations staff to select an effective site for application on Moturoa/Rabbit Island based on weather conditions . This app is intended to not only assist with selecting the best site each day, but will also record the decision so that a clear track record is available electronically.

8.5.5 Natural hazards

Moturoa/Rabbit Island is a plantation forest and is therefore at risk of forest fires. At present there is no other alternative biosolids disposal method. By doing nothing we are at risk of being unable to dispose of biosolids, which would have consequential issues for the operation of Bell Island WWTP. Furthermore, Moturoa/Rabbit Island is vulnerable to sea level rise. The continued use of a 50m buffer from mean high water springs (MHWS), as per the consent conditions, is likely to impact the amount of land available for disposal of biosolids due to future sea level rise. Ultimately, there is a risk that the disposal area will be insufficient and/or unavailable in the future. Options to mitigate these risks include:

- carry out hazard assessment to understand risk and timeframes,
- purchase additional land for biosolids disposal,
- change treatment process and identify way to create a product from biosolids sold and/or used in different application.

9 Financial projections

9.1 Capital budgets

The forecast capital expenditure over the next 30 years has been provided in Figure 9-1. These works have been categorised by strategic objective to make clear the budgets required to achieve our vision.

It should be noted that money has been allocated for the purchase and designation of land for a future WWTP (2033/34). The relocation of the WWTP is likely to be required within the next century due to community drivers, discharge requirements and sea level rise. Finding and designating an appropriate site in the future may be more difficult and expensive if not purchased now.

The capital budgets beyond the decade (from 2034/35-2053/54) have been averaged over 5-year timeframes. A large amount of spending in the five-year period 2034-39 is for the implementation of a pipeline from Beach Road clockwise to the WWTP (Stages 1 and 2). The period between 2039-44 includes costs for the completion of the pipeline from Beach Road clockwise to the WWTP (Stages 3 and 4) and also for implementation of biosolids drying and the purchase and designation of land for future effluent land disposal.

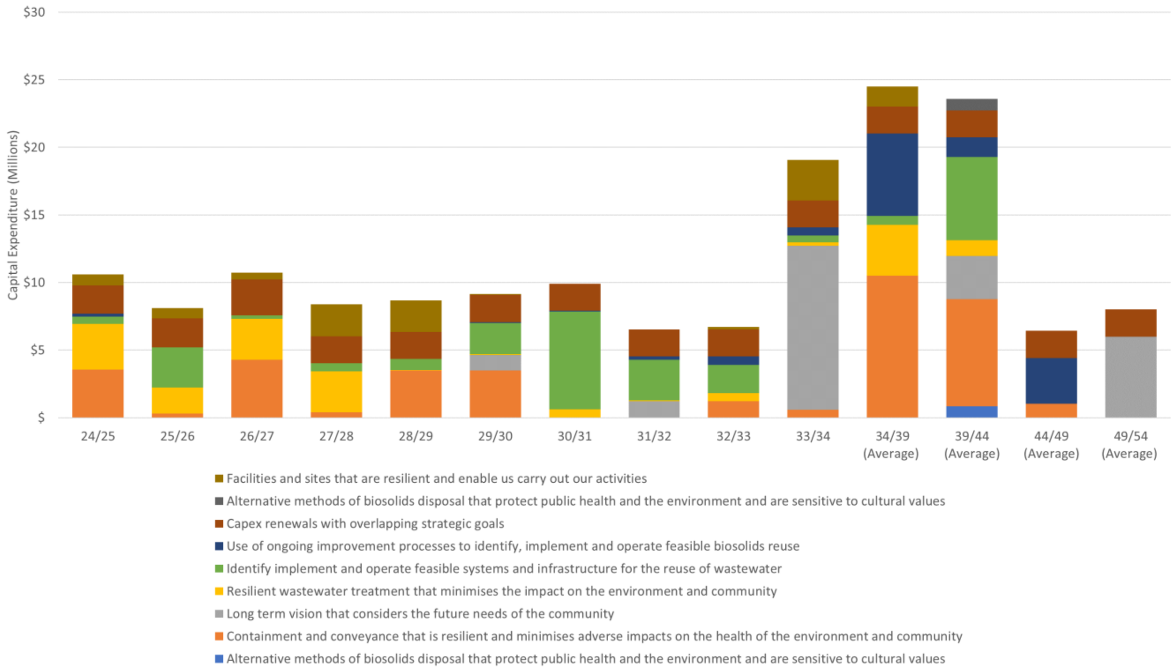


Figure 9-1: Capital budget forecast for the next 30 years

The capital expenditure has also been categorised by renewals, level of service and growth and is provided in Appendix D. Over the next 10 years our spending is driven by meeting our level of service, while infrastructure driven by growth becomes significant after 2030.

9.2 Operating budgets

NRSBU's operational expenditure forecast (excluding inflation, depreciation and interest) over the next 30 years is shown in Figure 9-3. Activities have been split into management, financial costs and depreciation, power, new processes, maintenance, monitoring and general. Over the next 10-year period the operational costs are approximately $70.6 million, with the split between these categories shown in Figure 9-2.

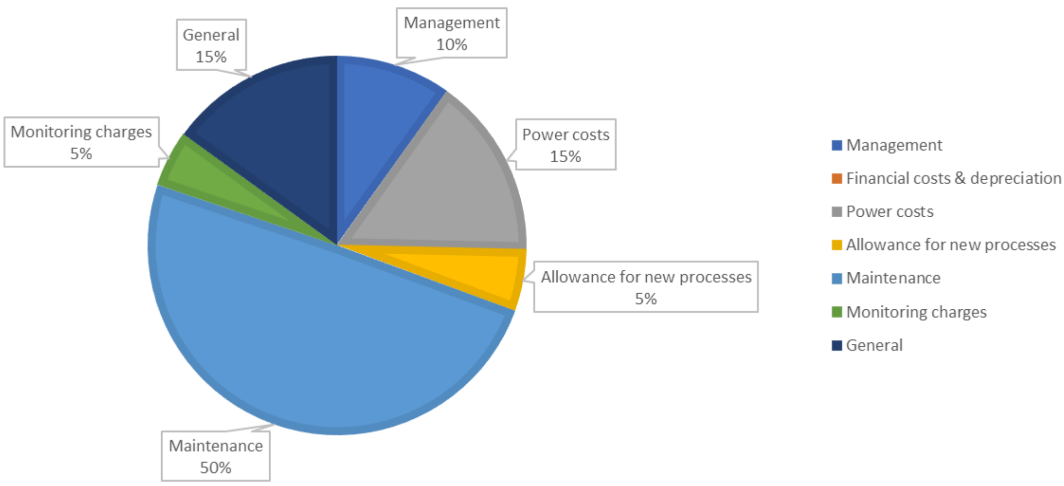


Figure 9-2: Operational budget for the next 10 years per category

Operational costs begin to increase from 2024/25 with the implementation of duplicate infrastructure at the WWTP and higher quality treatment processes to enable the reuse of wastewater (ultrafiltration and nutrient removal). An increase in power costs driven by an increase in flows is also expected to occur, however power costs are forecast to have a significant decrease in 2026/27 on the basis of the solar plant on Bell Island coming online (noting that at the time of preparing this document the solar plant is still at the feasibility and consenting stage). This is a result of the Virtual Power Purchase Agreement negotiated between NRSBU and Infratec (solar plant owners) providing a discount on some of the power consumed by NRSBU's infrastructure.

Constant general, management, maintenance and monitoring costs have been assumed in the operating budget, however in reality these are likely to increase through changes to consent requirements and legislation, as well as due to inflation.

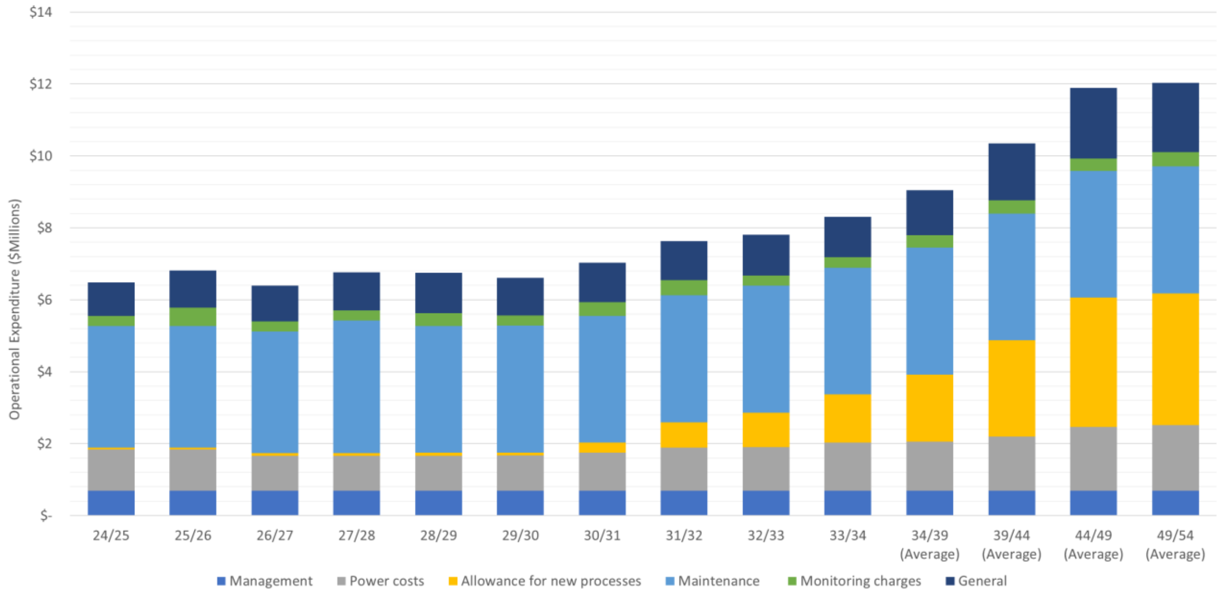


Figure 9-3: Operational budget forecast for the next 30 years

9.3 Funding sources

NRSBU has Trade Waste Agreements with its four major contributors and recoups its expenditure through fixed and variable charges as follows:

- Fixed charges based on flow and load quotas which account for return on investment and depreciation.
- Variable charges for operational expenditure. This is an interim charge based on the previous month's recorded flows and loads and on unit prices. The unit prices are determined from NSRBU's current year's budget and previous year's flows and loads. At the end of each financial year there is a calculation to reconcile costs based on the current year's flows and loads and the actual expenditure.

There are ten cost centres in the model for recovery of costs, with an agreed allocation of flows and/or loads for sharing the costs for each of the centres across the contributors. There are penalty provisions for breaching the flow or load quotas. The cost centres are:

- Pumps, pipes and biofilters
- Septage receiving facility
- Screens
- Primary clarifier
- Aeration basin

- Secondary clarifier
- Ponds and outfall
- Biosolids
- Nutrient removal
- General

As shown in Figure 9-4, the charges for contributors have begun to increase over the last two years and are expected to increase further. Increases to operational costs are as a result of inflationary pressures as well as increasing system capacity and improvements to treatment and re-use. Financing costs have also increased, primarily driven by climbing interest rates but also as a result of increased depreciation as a result of capital expenditure.

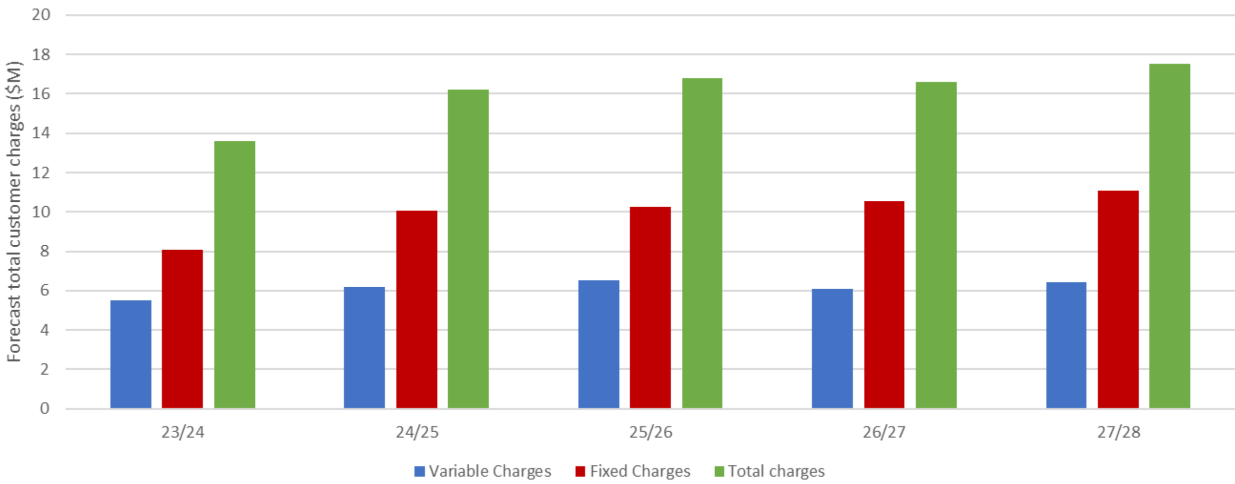


Figure 9-4: Total charges for contributors

9.4 Debt forecasts

Debt and depreciation forecasts are provided in Figure 9-5 and Figure 9-6 respectively. After 30 years, interest and depreciation (as operating costs) are estimated at approximately $26M pa. As depreciation is currently the only payment against principal, there could be options in the future to increase the principal repayment to reduce the amount of interest.

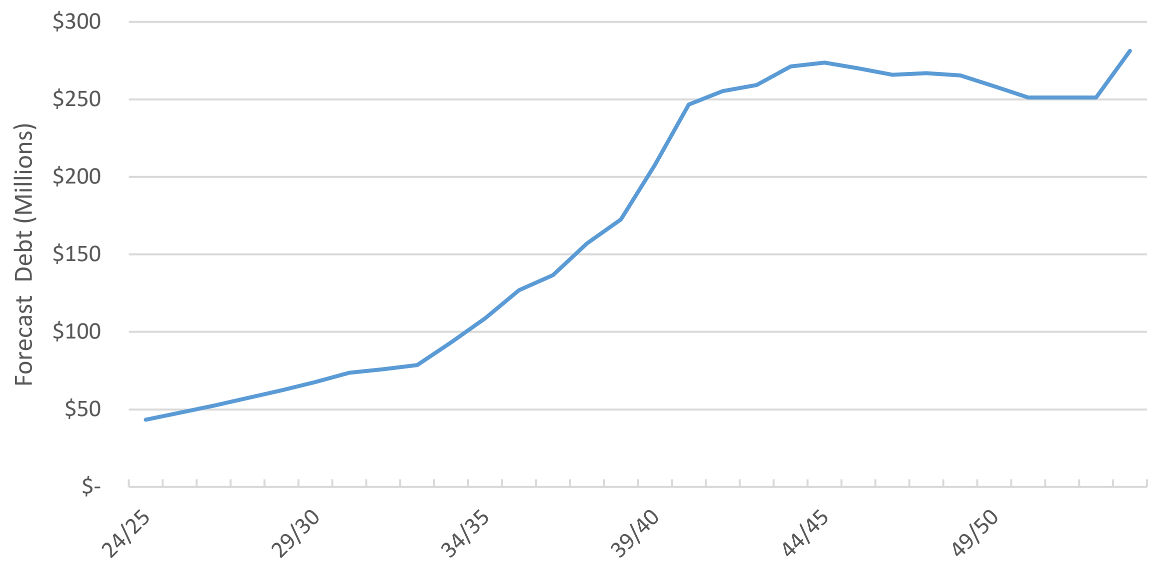


Figure 9-5: Forecast debt over the next 30-year period

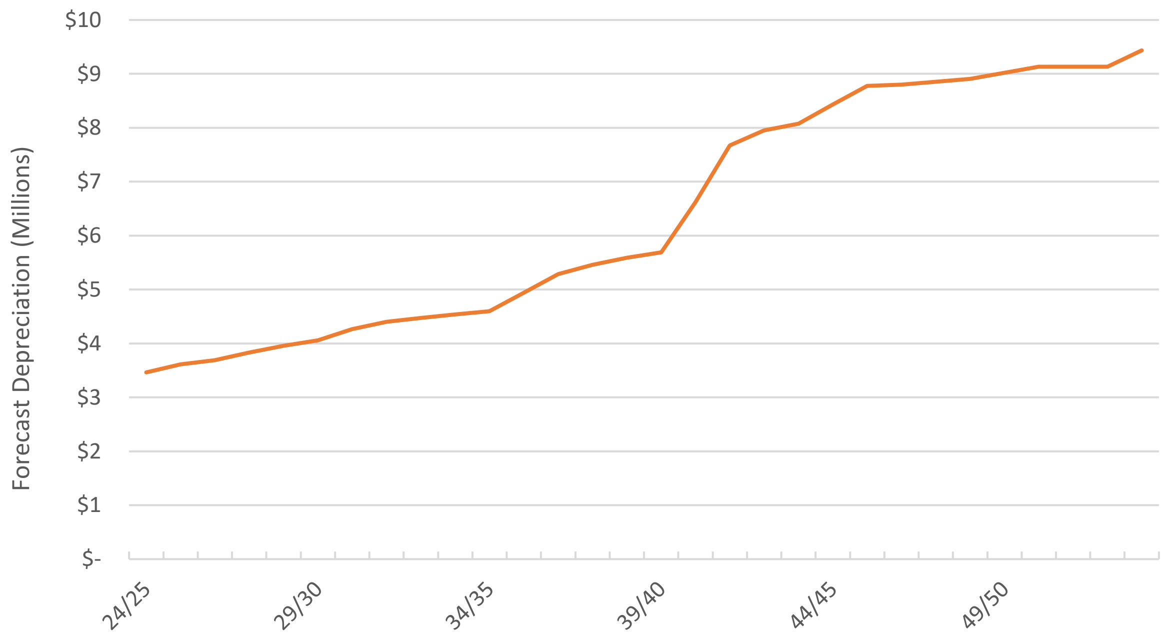


Figure 9-6: Forecast depreciation over the next 30-year period

9.5 Assumptions and confidence in the forecasts

Key assumptions with these forecasts and the associated risks are provided in Table 9-1. These expenditure forecasts are based on very high-level cost estimates and significant assumptions about future contracted flows, therefore there is high uncertainty about the accuracy of these estimates. The confidence level of these forecasts will be improved once full business cases for the proposed projects have been completed.

Table 9-1: Key assumptions and risks

Assumption	Risk
All contributors remain	One or more contributors leave and any shortfall is not made up by others.
Growth will occur at the rates and in the areas predicted	If growth occurs faster and is more than predicted there is a risk that the programme of works will have to be fast-tracked and will be difficult to deliver on time. If growth is less than predicted, infrastructure may not be required.
Predicted contributor flows are accurate	Due to uncertainty about the future flows from contributing catchments, inaccurate flow forecasts could result in upgrades and expansions being completed in the wrong areas, at the wrong time or significant under capacity for growth in catchments.Overestimation of future flows could result in over-capitalisation and underestimation would result in overflows.
Renewals are like for like and do not change the replacement cost of the asset portfolio	Significant changes in cost will result in budget constraints and difficulties in delivering the programme of works.
No significant emergency event occurs	Unable to deliver programme of works due to disruptions and costs from an emergency event.
Assets will be replaced at the end of their predicted life	Overestimation of remaining asset lives and underestimation of renewal budgets.
Interest rates will be similar to the predicted rates used in these forecasts	A significant increase would impact our delivery of the programme of works within the forecast budgets.

Part C: How we manage what we have

10 Our people

10.1 Governance structure

NRSBU is a joint committee of NCC and TDC and is comprised of:

- Two NCC representatives (one must be an elected member of council);
- Two TDC representatives (one must be an elected member of council);
- One Independent Member appointed by the two councils;
- One Iwi Representative; and
- One Industrial Contributor representative appointed by the Major Industrial Contributors (does not have voting privileges).

Appointment of both the independent member and iwi member is timed to provide continuity across changes from local government elections.

10.2 Organisational structure

NRSBU's organisational structure is detailed below in Figure 10-1 and is considered appropriate for the scale of the operation.

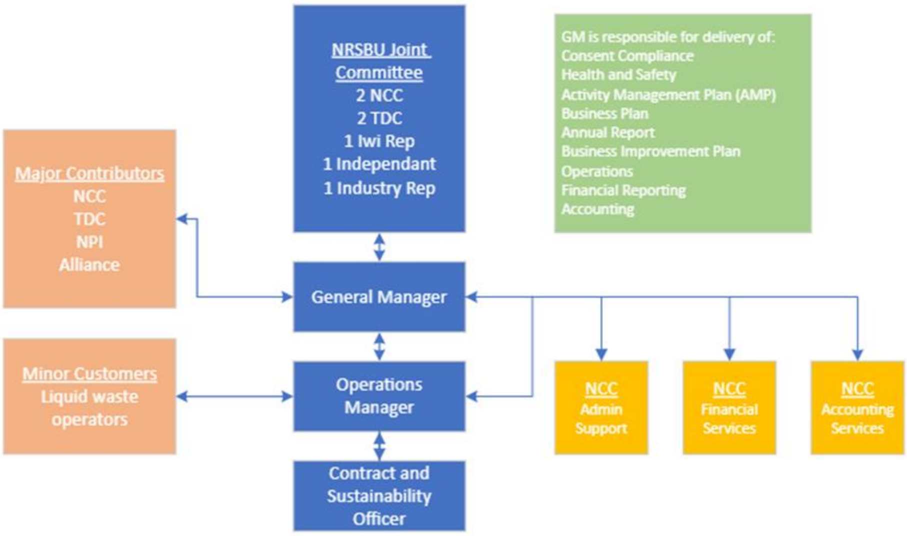


Figure 10-1: NRSBU's organisational structure

NRSBU employs a minimum number of staff required to manage the business, via NCC as the administering authority. The number of employees is kept small, as NRSBU continues to use NCC's human resources and administration support to facilitate operational efficiencies.

The remainder of the staff required to operate the assets are procured using a long-term operations contract, currently held by Nelmac. The operations contractor's staff have multiple points of contact with NRSBU staff. Additional specialist maintenance and consulting services are procured as required.

Staffing capacity for NRSBU is reviewed annually and it is anticipated that additional NRSBU staffing capacity will be required to support the delivery of the significant capital and renewal works programme contained within this AMP.

10.3 Employees

Our objective is to effectively manage our people so that we can undertake our activities to a high-quality standard and in a timely manner. NRSBU will have the appropriate staff to undertake its organisational, asset and operational management activities internally.

Currently, we do not have a formal skills register or a resourcing plan for our staff. This creates a risk that we do not proactively fill any gaps within our business as they arise. Additionally, as we rely largely on external contractors, there is a risk that we do not have control over their resourcing and training.

To manage staffing capabilities and levels more effectively, our intention is to have:

- People with the required skills and knowledge.
- A skills register which details the gaps in our business and knowledge.
- A forward works programme with an estimate of the staffing capacity required by NRSBU to deliver the programme of works.
- A training and development plan.
- A succession plan.
- An internal training programme.

10.4 Health and safety

NRSBU is committed to ensuring that everyone gets home safely and that there is ongoing improvement in our current practices. NRSBU health and safety functional activities are managed using NCC's systems and policies and NRBSU fully subscribes to the vision for a Zero Harm Culture.

Day to day health and safety is primarily managed by the operations and maintenance contractors. Monthly meetings are held between NRSBU and the two main contractors, Nelmac and Nelson Marlborough Waste, where health and safety is the first item on the meeting agendas. NRSBU undertakes internal six-monthly health and safety site audits and periodically commissions external health and safety audits. Issues that are identified by these audits become improvement projects. Additionally, there is an active health and safety improvement register, which is frequently revised and updated.

NRSBU's intention is to maintain the current system for managing health and safety. It is considered appropriate as it utilizes the expertise of the operational staff at each of the sites while enabling independent audits and continuous improvement.

11 Our community

A successful approach to working with our community is one which creates engaging and meaningful conversations, so we understand the needs and wants of our community.

Currently we manage our relationship with iwi by having an iwi representative role on the Joint Committee and by encouraging the Regional Wastewater Philosophy work. From 2020 an annual Hui has been hosted in November each year by NRSBU to encourage dialogue between NRSBU and Iwi.

To encourage greater understanding between NRSBU, NCC, TDC and iwi on the current operational status of wastewater management in the region NRSBU will facilitate an ongoing quarterly hui with operational managers and iwi representatives. This will provide an opportunity to discuss day to day scheme performances, as well as higher level discussions on upcoming capital and renewal works. This approach allows iwi to indicate any projects in which they may have particular interest or concern and to arrange further interface with the project teams to facilitate early iwi involvement – particularly where resource consents are required.

NRSBU has a website which is regularly updated, and provides details on the Business Unit, scheme performance, consent compliance, upgrade works, etc. The website forms one of the primary interfaces for the Business Unit with the public.

We have not proactively engaged with the wider community and there is a risk that our vision and strategic goals do not reflect the community's wants and needs. here is also a risk that the public are only exposed to negative events such as odour complaints and sewage overflows that are reported in the media and do not understand our mitigation practices. We hope that the Regional Wastewater Philosophy project will provide us with the opportunity to consult with the community on our long-term vision and objectives.

To effectively manage our relationship with our community we must be transparent and increase the public's knowledge of our day to day activities and future goals. To achieve this, we:

- Hold an annual Hui and public open days.
- Have a current and informative website, which NRSBU staff can update.
- Publish articles in council publications.
- Develop a regional infrastructure plan for wastewater services.
- Hold two monthly management meetings with council asset managers.
- Have an NRSBU staff member sit within NCC and TDC offices at least one day per week to facilitate regional conversations and foster ongoing communication.
- Hold quarterly meetings with our contributors in advance of the quarterly Joint Committee meetings.

12 Assets

This section outlines how we manage our assets – how we monitor their current state, how we approach operating them, how we maintain them and how we plan to replace and upgrade them.

12.1 Understanding our assets

This section outlines the systems we have in place to understand our assets. Having an accurate understanding of the state of our assets is the foundation to managing them into the future.

12.1.1 Asset performance

Successful performance monitoring will provide an accurate and detailed understanding of the performance of the system and inform maintenance and renewal programmes. The preferred system would involve integrated systems, which notify us of any issues and enable us to visually see trends in monitoring data.

Our key performance areas for our trunk mains and pump stations are detailed in Table 12-1 while the performance measurements for our treatment and disposal facilities are detailed in Table 12-2.

Table 12-1: Reticulation and pump station performance

Key performance area	Performance measurement (for all PS)
Overflow occurrence	High level alarms alert the duty operator immediately if wet well levels are nearing overflow. Level sensors indicate if overflow levels were reached.
Pump failure	Pump failure alarms alert duty operator immediately.
Meter accuracy/trunk main integrity	Flow mass balances calculated in spreadsheets.
Pump efficiency	Manually logged on maintenance sheets: • daily check of instantaneous flow and power consumptions • weekly pump run test
Average and peak flow handling	Flow meters on all inlet pipes and PS discharges.
Trunk main blockage	The Bell Island to Moturoa/Rabbit Island biosolids transfer pipe is monitored daily for pressure, to indicate when pigging is required. Pigging is undertaken three times per week. The primary sludge lines at the WWTP are monitored daily and pigged. Other pipes are not monitored specifically.

Table 12-2: Treatment and disposal performance

Key performance area	Performance measurement
Quality of discharged effluent and biosolids	Weekly sampling.
Flow handling	Flow meter on outlet pipe. Daily outflow graphs calculating annual rolling mean.
Aerator efficiency	Dissolved Oxygen monitoring. Current draw by the motor.
Odour	Odour complaints monitoring.

The challenge with our current performance monitoring is that the data collected is not held by NRSBU in a single system, which makes it challenging to visually see trends in the data and create automated reports. Further, the data is not all collected in a coherent manner, i.e. rather than recording multiple related parameters at the same time, the various parameters are recorded at differing times which makes it very difficult to interpret the results.

Additionally, as the treatment data is generally not input into the system on site by the operator, there is a risk that the data has been interpreted incorrectly.

We are in the process of improving our performance monitoring by implementing the following works:

- Upgrading SCADA and information systems, particularly at the pump stations, to give representative and usable data.
- Developing our use of Infor and ensuring that data is entered into the system seamlessly and intuitively and in a way which will permit adaption to new Entity data standards and systems.
- Creation of additional dashboards to give visibility to real-time and trending information and to use the information collected to operate smarter.

- Creation of data collection apps to enable operators to input data directly from the field without double handling. Addition of prompts regarding expected result ranges to reduce the risk of error and encourage immediate confirmation of any unusual readings.
- Automated processing of off-site lab data to remove the risk of transcription errors.

12.1.2 Asset condition

The preferred approach to understanding our asset condition would involve the completion of a detailed asset condition survey of our critical assets and the ongoing management of an asset condition register, which would be updated incrementally by staff during routine visual inspections.

Currently, we take a risk-based approach to condition monitoring as we are unable to conduct CCTV assessments as our assets cannot be easily drained. NRSBU considers the recently installed trunk mains (i.e. HDPE) to be in a good condition whereas the condition of the concrete pipeline from Monaco to Bell Island and the pipeline from Bell Island to Moturoa/Rabbit Island is not well known. Additionally, where possible, visual assessment of the assets is conducted including:

- Routine visual assessments of the pump station chambers conducted by Nelmac staff.
- Visual assessment of the storage tanks at Moturoa/Rabbit Island when they are emptied and washed down by Nelson Marlborough Waste Management.
- Visual assessment of the assets at the WWTP during day to day operations.
- Annual emptying of the primary clarifier, aeration basin and secondary clarifier to inspect the condition of the structures and to allow visual inspection of the aerators, mixers and scraper mechanisms.

The risks with this approach to condition monitoring mean that we do not have an accurate baseline condition of our assets and must be prepared to replace the assets quickly if they no longer perform as required.

Our intention is to continue to with a risk-based approach to condition assessment and complete CCTV assessments of only the critical assets where the condition is unknown. The programme of works for the next 30-year timeframe will increase redundancy, which should enable assets to be replaced with less impact on the system.

12.2 Operating our assets

NRSBU’s intention is to operate our assets in a way that is sustainable with minimal social and environmental impact. We strive to have the right people and operation systems in place so that our processes are always compliant with resource consents and continuously improve to ensure optimisation.

NRSBU has two main operational contracts; one for biosolids disposal and another for the remaining activities. Table 12-3 summarises the NRSBU maintenance and renewal contracts and the contractors’ responsibilities.

Nelmac has a maintenance and operations contract with NRSBU. The contract (Contract No. 25833) outlines the activities required by the contractor and includes operations and maintenance of the treatment plant and the pump stations, along with renewals and some capital upgrades.

Nelmac provides seven staff on Bell Island, comprising three wastewater operators, a trainee operator, a laboratory technician, two maintenance fitters and an NRSS operations and maintenance supervisor. The operations are supported by a scheme project manager, part time activity engineer and contract manager.

The scheme pump stations are also operated by the dedicated NRSS operations and maintenance staff.

NRSBU has engaged the services of a specialist technical advisor with expertise in process management to provide advice and guidance to both NRSBU and Nelmac. The technical advisor is supplied by Stantec and also provides expert feedback and guidance around sampling results and consent compliance.

The maintenance and operations contractor also provides some specialist services to the scheme via subcontractors, including electrical and control services, as well as biology expertise for the treatment plant.

The contract is established as a cost reimbursable contract with Target Outturn Costs. This removes risk from the contractor's pricing, and drives strategies and responses that represent a 'best for scheme' approach. This collaborative contact format also provides a pain share/gain share approach.

As the operational staff are entirely dedicated to the scheme the risks associated with staff resourcing conflicts during weather events is minimised.

There are unique processes at the Bell Island and Moturoa/Rabbit Island facilities and as this knowledge of the plant is developed over time there is a risk that this expertise is lost with a change of staff and/or contractor.

Nelson Marlborough Waste has the current biosolids disposal contract (Contract No. 25834) and has been operating the Moturoa/Rabbit Island land application facility since 1996 (the previous contract was held by Astro Environmental, which is now part of Nelson Marlborough Waste). As the application process is a niche skill, Nelson Marlborough Waste is normally the sole tenderer when the contract is up for renewal. The contractor owns the mobile operations equipment and is responsible for its maintenance. The major risk with this contract is the loss of skills and expertise that could result in a change of contractor; however, we do not believe any significant changes are required to this contract.

Table 12-3: Maintenance and renewal contracts

Service Area	Contractor	Expiry Date	Contract Number	Responsibilities
Reticulation (truck mains and outfalls) **Pump Stations** **Treatment Plant**	Nelmac	30 June 2025 (with two extensions available, each two years)	25833	Operation and maintenance of all equipment and facilities at the WWTP. Disposal of all wastes generated, including screening residuals. Transfer of treated biosolids to holding tanks on Moturoa/Rabbit Island. Operation, maintenance and management of all equipment and facilities upstream of WWTP including: • NRSBU pump stations • NRSBU pipelines.
Biosolids Disposal	Nelson Marlborough Waste	31 October 2026	25834	Spraying of biosolids. Operation of biosolids storage tanks. Operation, maintenance and management of Biosolid Application Facility on Moturoa/Rabbit Island.

12.3 Maintaining our assets

A risk profile approach to maintaining assets is preferred. Having a prioritised maintenance schedule, which is based on the condition (age), repair time and criticality of the asset results in a maintenance programme which is cost effective. Ideally maintenance contracts will be structured in a way, which encourages staff to be proactive in maintaining assets to the required quality.

The maintenance and operation contractor is responsible for the programmed maintenance of the rising mains, pump stations and treatment plant, reactive maintenance, renewals and some capital works. The contract model means NRSBU is responsible for all costs associated with these activities.

NRSBU does have a defined maintenance programme and a schedule of minimum spares, however this is known to not be complete due to historical data collection and storage failures. There are a number of asset classes that have preventive maintenance schedules including the air compressors, pumps, backflow preventers, air release valves, aerators at the treatment plant and ongoing pigging of the biosolids pipeline. Spares (stored at Bell Island WWTP) are held to support reactive response to failures for certain items at the treatment plant and storm pumps for the pump stations, along with enabling easy 'swap out' maintenance for items such as air valves. The operation and maintenance contractor is responsible for maintaining the inventory, however, this may not be up to date.

There is the potential for large costs to be incurred with reactive maintenance and loss of plant efficiency. As there is a reliance on the expertise of the contractors to spot issues there is a risk that some issues are not spotted during routine operational inspections. With the current approach to maintenance, critical assets are prioritised but there is a risk that if an asset requires major work and is not able to be repaired/replaced in an appropriate timeframe it could impact our contributors. Additionally, if the inventory of spare assets is not maintained there is a risk of replacement spares not being ordered to maintain the inventory.

We plan to accept the risk of unplanned failures occurring as we believe this is an efficient approach for the system. However, we will minimise the impact of these failures by ensuring that critical assets have N+1 redundancy. The general approach to maintenance will remain reactive, however we will take a criticality approach and identity preventative maintenance schedules for critical assets.

As the scheduling of maintenance is driven by pre-programmed schedules created in Infor there are risks that there are assets that are either not captured in Infor, have the wrong maintenance requirements or pre-programmed schedules will not receive the correct level of preventative maintenance. A significant amount of work has been completed over recent years to improve the coverage and accuracy of asset data, with the intent that this will be uploaded into Infor. The upcoming changes to Affordable Waters has provided some uncertainty around hierarchy requirements and database systems, which has delayed this package of work.

Recently NRSBU has started to order new large pumps with vibration sensors built in, to support proactive maintenance. Work has yet to be undertaken to establish the processes and systems for analysing the vibration data, defining the intervention specification and seeing that implemented.

12.4 Replacing our assets

A good approach to asset renewal is one which is risk based and considers the likelihood and consequence of failure, the asset condition and performance and the overall life cycle costs of the asset. As discussed in the previous operations and maintenance section, the criticality of assets will inform renewals.

Currently, renewals occur on an ad-hoc basis. The identification of assets that require replacement is generally triggered by the failure of the assets or an issue that is likely to result in imminent failure. With the current arrangement, inspections generally only occur for operational purposes. There is a risk that as the intention for these inspections is not for renewal planning the performance and condition of the system is not considered as a whole and issues may be missed. Therefore, with the current approach for renewal planning there is a risk of avoidable maintenance expenditure, unforeseen budget surprises, premature failure and reliability impacts where not covered by N+1 (e.g. screening chamber).

Our intention is to have a three-tiered approach to renewal planning which could be as shown in Figure 12-1.

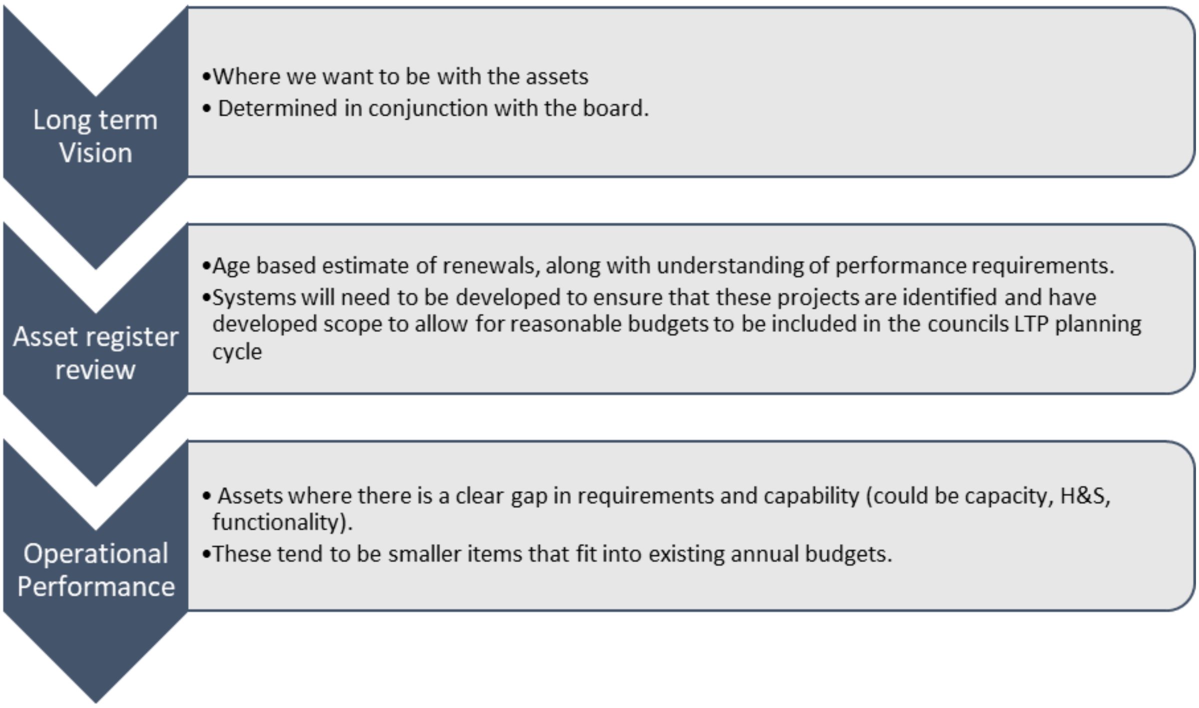


Figure 12-1: Three-tiered approach to renewal planning

To effectively manage our assets, there is a need to develop a dashboard and/or use Infor to inform asset renewals, which will be the responsibility of the Activity Engineer. Maintenance inspections reports and condition assessment schedules (which are yet to be developed) will also be incorporated into one system so that a lack of inspection will also alert a risk of failure. A traffic light system will be developed to visually see which assets are at risk of failure including intentional and unplanned deferred replacement and pending replacements.

Renewals projects may be constrained by budgets as historically annual renewals have been low. NRSBU can modify project timeframes to smooth expenditure within this budget cap and ensure that prioritised projects have adequate budgets. NRSBU will continue to focus on a planning process that identifies projects and develops scope sufficiently to allow reasonable budgets to be developed, covering at least the three-yearly council LTP planning cycle.

12.5 Upgrading our assets

The preferred approach to upgrading our assets is one which identifies and prioritises projects that align with our strategic goals. Upgrades to ensure that levels of service continue to be met and those required to accommodate growth need to be clearly identified.

Historically upgrades were driven by either the customer requiring more capacity or changes in consent conditions. The strategic approach informing upgrades is usually discussed with the Joint

Committee in advance and these projects generally require a higher level of justification. Large projects (e.g. land purchase for a new WWTP site) must be signed off by the Councillors of each Council. Any changes in capital and operational costs are handled through the cost allocation model.

The risk with the current approach is that, due to the cost allocation model, projects are driven by the contributors' capacity requirements and/or achieving compliance. There is a risk that if our contributors are not on board with our strategic goals and where we want to be in the future, projects will not be approved and funded. We intend to address this risk by ensuring that the Joint Committee supports our vision and level of services so that it is clear which projects are required to deliver the vision and meet the levels of service . Additionally, we will have a staged approach that develops concepts and engineering estimates to inform budgets with adequate lead time.

13 Risks

13.1 Our key risks

We have a number of key risks that we do not have an appetite to accept at their current level. We are actively managing these risks through projects that are either underway or proposed. These projects are expected to reduce the risk to an acceptable level, although for some risks this may take a long time to achieve. These key risks are summarised in Table 13-1 below. Our overall approach to managing risk is discussed in the following section.

Table 13-1: Key NRSBU Risks

Risk	Cause	Current Mitigation	Future Mitigation
Disruption to treatment processes in the ponds, creating odour issues.	Concurrent excess load from industries	Contributor contracts with penalty clauses Online monitoring and regular contributor sampling	
Break/leak in network Making an incorrect assumption about the presence or absence of an asset, based on faulty data. Significant inefficiencies for operations and maintenance staff finding information.	Unreliable asset attribute information in Infor Poor asset information in GIS	Operations manual hardcopy with information, staff/contractors experience Flow meters at pump station, mass balance (5%)	As-built plans of high quality and all asset locations known. Improved GIS system in progress. Use of Infor and other asset management tools, to streamline the use of asset data.
Unable to treat wastewater due to ageing and under capacity power supply	Lack of resilient power supply to Bell Island.	Bell Island can cope a few hours without power. Generator at inlet (3 x emergency generators for resource consent)	Inlet emergency power supply is now completed. Power supply for the aeration basin and ATAD areas is installed, and will be connected during 2024. Look at alternative power supply options, including alternative alignment to the current estuary location.

Risk	Cause	Current Mitigation	Future Mitigation
Breaks in the network causing overflows Increased maintenance cost, increased “down time” Compliance liabilities, due to avoidable non-compliance event	Deteriorating condition of aging infrastructure.	Weekly flowmeter mass balance checks by contract supervisor and asset engineer to show signs of leaks Duplication of pipelines improves ability operate system while inspecting and maintaining assets.	Additional duplication of pipelines proposed to further improve ability operate system while inspecting and maintaining assets. A programme developed for risk-based condition assessments of the pipeline, especially the old line from Monaco to Bell Island (desktop assessment completed, physical investigations planned).
Overflows Decrease revenue due to drought and lack of flow volume Moturoa/Rabbit island closed or restricted discharge due to fire risk Damage to infrastructure	Extreme weather.	Financial washup Rising main capacity upgrade Pump more than contracted flows There are two biosolids application vehicles at either end of Moturoa/Rabbit Island if one cannot be accessed due to fire risk. Bunds at Beach Rd to seal openings at building and around wet well. Bunding at Sonder St PS	Redundant storm pumps for all pump stations (work in progress). Development of emergency storage on the mainland at the terminal pump station(s), to improve maintainability and attenuate some peak flow.
Overflows from pump stations	Insufficient power generation.	Standby generators for storm pumps, but at reduced capacity	Changes to pump station power infrastructure to allow full generator capacity to be utilised is planned.
The aeration ponds have to be used for emergency storage of biosolids, with odour issues and removal costs. Alternate disposal options have to be sourced under duress	Disruption to land disposal sites (both at Rabbit and Bell Island).	Storage tanks at Moturoa/Rabbit Island	Begin process to source other land or alternate acceptable disposal options (including required plant upgrades).
Risk to the public and environment from overflows	Insufficient capacity in the network for actual wet weather flows.	Overflows upstream in the contributor network Improvements to trunk main and pump capacity. Overflow screening	Further planned improvements to trunk main and pump capacity. Improved communications between NRSBU and contributors.

Risk	Cause	Current Mitigation	Future Mitigation
Avoidable non-compliance through staff inaction or inappropriate action.	Insufficient staff continuity, training, and retention.	Additional resources provided through Secondment and/or external contractors	Engagement of NRSBU direct staff.

13.2 Our risk management approach

NRSBU aspires to manage risks in a rational, systematic way that ensures the right effort is put against the right risks. An appropriate risk management approach should provide:

- A way for people to have visibility of the risks that are relevant to them.
- Identification of risks that are deemed unacceptably high and progress against reducing those risks to an acceptable level.
- Visibility of those risks that will not be mitigated further but are still significant.
- A scalable process that works at the project, operational, and organisational levels.
- A live process that remains up to date.
- An iterative approach that supports continuous improvement.
- Communication and consultation with people from different areas of expertise to define and evaluate risks.
- Consideration of emerging risks, the limitations of information and the biases of those involved.

Aligning to the ISO risk standard (31000) is a means of achieving this.

NRSBU has a Risk Management Plan (RMP), which includes a very comprehensive risk register. The plan is based on ISO 31000 principles, but it exists as a static document that is not incorporated into the operation of the business. For example, the register states that risks, which are scored as extreme or high should be reported to the Joint Committee, however currently this is not captured in a structured way. NRSBU plans to update the RMP and incorporate it formally into reporting procedures.

The current approaches for communicating risk within the organisation include:

- Management conversations with the Joint Committee when discussing strategic projects.
- Informal conversations with the Joint Committee regarding meeting agenda items such as health and safety, quality, environmental performance and operational issues and constraints.
- Monthly management conversations with the operations and maintenance contractor.

The risk conversations that happen in the Joint Committee and operational meetings become part of the meeting minutes under their relevant headings. These are then tracked until they have been addressed.

NRSBU has identified the following risks from its current approach:

- That an important risk item could fall through the cracks if it is not covered by an existing agenda heading.
- That without linkages between the risk register and an improvement programme, work items may struggle to have adequate planning or budget and not be resolved in a timely manner.
- That projects that address an important risk for a moderate budget may not be given the attention they deserve compared to higher profile risks, as structured risk workshops are not currently held.

These risks will be addressed by developing a new risk management plan that is aligned to ISO 31000 and integrating that into the business. In the interim a draft risk management plan has been developed, based on the legacy risk register from the previous AMP. This will become part of the risk management plan once developed.

As well as the overall risk management plan, detailed risk management plans for specific aspects of the business will be developed, including:

- Business risk management plan – this to consider income variability and the influence on overall budgets particularly from industrial clients.
- Odour risk management plan – existing but needs to be developed further.
- Sea level rise and climate change risk management plan – consider the implications from sea level rise and change in weather patterns on operations and site viability.

13.3 Critical assets

Understanding asset criticality is foundational to a risk-based approach for managing assets. The preferred approach for asset criticality provides a clear framework for describing the consequence of asset failure, from low to extremely high and applies that framework at an appropriate level of detail. This framework would give balanced weighting to different kinds of consequences such as environmental, public health, and financial. It would also scale to describe whole sites down to individual assets and components within those sites, as required. The critically of a site and its assets would then be incorporated into operation, maintenance and renewals planning.

Currently, our approach to determining the critically of our assets is based on staff experience about the consequences of failure. The assets identified as most critical are:

- Trunk mains.
- Pump stations.
- Power supplies (both onsite generation capacity and supply from the mainland).

NRSBU's planning for resilience, described in the following sections, is focused on these critical assets.

The main gap between our current approach and the preferred approach is the lack of documentation. This makes it difficult to take a systematic approach to anticipating failure, especially in critical control and electrical systems. Additionally, the lack of documentation and a consistent approach in assessing critically makes it harder to communicate critically across our maintenance and operation contractors and members of the Joint Committee.

There is a risk that criticality is not incorporated in our decision making for prioritising maintenance work and capital projects.

Our intention is to develop our approach to criticality as part of improving our risk management processes. We plan to reduce the criticality of certain assets by ensuring redundancy in the system though duplication and bypass facilities. We accept that though some of our assets will remain at a high level of criticality (e.g. civil infrastructure) the overall risk of failure of these assets is low.

13.4 Resilience

Resilience has increasingly become a focus at all levels of governance. Resilience requires consideration to be given to how infrastructure, natural systems or social fabric will respond to both incremental change and infrequent shocks in a manner, which enables disruption to be minimised. This is becoming increasingly important as communities respond to climate change and we become more aware of our vulnerability to natural disasters such as extreme storms, earthquakes and volcanic eruptions.

From IIMM 2015, resilience is defined as follows (New Zealand Treasury, National Infrastructure Unit, 2011):

“the concept of resilience is wider than natural disasters and covers the capacity of public, private and civic sectors to withstand disruption, absorb disturbance, act effectively in a crisis, adapting to changing conditions, including climate change, and grow over time.”

Resilience of a system can be defined as the:

“the ability of systems (including infrastructure, government, business and communities to proactively resist, absorb, recover from, or adapt to, disruption within a timeframe, which is tolerable from a social, economic, cultural and environmental perspective.” (Money et al, 2017).

The NRSBU aspires to a risk-based approach for resilience. This involves assessing the hazards the scheme is exposed to and how vulnerable the scheme is to them, along with the criticality of the assets involved. Improving resilience goes hand in hand with detailed risk assessments, which evolve over time.

A cornerstone philosophy of our approach to resilience is to ensure that all highly critical assets have appropriate redundancy or alternate backup. Projects to support this include duplication of our rising mains and ensuring N+1 redundancy for pump station storm pumps and WWTP headworks assets.

The perceived critically of an asset is incorporated into our operations and maintenance planning informally, and into the design of our major capital upgrades, however this is not documented. Resilience considerations were also built into the design of the treatment plant at the time of construction, but these have not been subject to review since.

Even after these projects, some parts of the process will still have a degree of exposure and vulnerability. A criticality review with the Joint Committee of NRSBU on a bi-annual basis is advised to determine if any of these risks are unacceptable. Improvements in our approach to risk management will support this.

We currently have an existing Business Continuity Plan, which describes how to respond to an emergency event that presents immediate threats to life, critical physical assets or a sewage spill into the environment. It also details how to restore services to normal operations following an emergency event or disruption of services. This plan was last updated in July 2016 and is due to be updated again.

As described above, the main gap in the current practice is the informal consideration of resilience rather than through a structured approach. Sources for progressing this include the 2015 guidance on developing levels of service for wastewater seismic resilience, the Building Importance Levels defined in the Building Regulations 1992 and recent work for NCC on natural hazard infrastructure loss modelling by Aon/Tonkin and Taylor.

This would facilitate discussion of moderately (but not highly) critical assets such as the large diameter concrete pipes used within the WWTP site, which have not been considered for seismic or other resilience issues so far.

13.5 Lifelines

NRSBU provides a lifeline utility service, as defined under the Civil Defence Emergency Management Act 2002.

NRSBU relies on the relevant NCC staff to make it aware of any civil defence or lifelines planning requirements over and above its current approach.

13.6 Affordable Waters Reform

The Affordable Waters Reform is a reform that will change the governance of water, wastewater and stormwater activities within New Zealand. The reform will aggregate these activities into larger regional entities with focus with a specific focus on delivery of these services.

The NRSBU and its assets will be included in this reform and therefore significant change to the governance of the NRSBU will occur during the term of this Activity Management Plan.

At the time of preparing this AMP the Government is undergoing change as a results of the General Election. The Affordable Waters Reform is anticipated to be repealed by the incoming Government, however any proposed alternative approaches are not yet known.

This plan has therefore been drafted on a business as usual basis focussing solely on the needs of the NRSBU and its assets.

14 Systems

14.1 Asset management systems

Asset Management Information Systems provide an understanding of assets to optimise lifecycle costs, identify required work, record completed work and cost of work. It benefits general management, long-term planning and data analysis. NCC has a number of information systems that the Business Unit uses including Infor IPS, GIS and SCADA. The systems are described in more detail below.

14.1.1 Current system

NCC has the Infor IPS Asset Management System (formally known as Hansen), to which NSRBU has access. Similar to the GIS system, the IPS system is used to store data on all infrastructural assets (with the exception of land transport) but in a non-spatial manner. All asset information is stored in Infor and linked with GIS.

It provides a single platform for the optimization of assets and has been implemented to improve the efficiency, flexibility, and accuracy with which we currently plan for our assets. IPS is an SQL driven web-based product capable of integrating with most of Council's existing information systems.

The IPS system can assist to:

- conduct asset condition analysis,
- carry-out replacement cost valuations and calculate changes in asset book values,
- carry-out optimized decision making on renewal programmes and
- plan and schedule effective maintenance programmes.

The asset database in IPS can be updated from various sources:

- Operations & Maintenance works
- Asset inspections
- Capital projects

NSRBU has not kept the information in Infor up to date as assets are rehabilitated and renewed/replaced or new assets are constructed. This issue is being addressed by site auditing of assets which will be followed by a data validation exercise. NSRBU's contractor Nelmac has a live interface with Infor. Any work associated with unscheduled maintenance is entered into an Infor work order by the contractor.

14.1.2 Preferred asset management system

The main gap between our current approach and the preferred approach are the multiple different management systems and lack of processes. Currently, data collected from our operational and maintenance contractors is held separately to our system so there is risk regarding ownership of collected data. There are limited specifications regarding which data should be collected and processes to audit this information resulting in uncertainty of the completeness and reliability of this data.

To address these issues and risks NRSBU is currently progressing the following actions:

1 Develop a GIS system to show NRSBU assets irrespective of their location (inside NCC or TDC Territories) and to an appropriate level of detail.

2 Link GIS features to asset register and index as-built plans.

3 Improve dashboarding for operations and maintenance data and asset condition and renewal data.

4 Define integration requirements for asset management system.

5 Develop 3D model of the site(s) and assets into a BIM model.

6 Implement real time data entry from field.

14.2 Environmental management systems

The preferred environmental management system (EMS) for our business would:

- Connect the existing processes and tools we use to track progress towards our strategic goals and manage compliance with our statutory and voluntary obligations.
- Enable us to better identify and track opportunities for us to continually improve our performance as well as opportunities to make positive environmental impacts.
- Ensure the environmental concerns or expectations of our stakeholder (employees, contributors, iwi, communities, and shareholders) are considered in our decision-making processes.
- Help us to be better prepared for environmental incidents by ensuring we know the environmental context of each of our assets and all of the environmental receptors at risk in the event of an incident.
- Increase awareness of environmental obligations and opportunities within our organisation and ensure we have the right resources and competent people to manage these.
- Improve how we communicate our environmental performance both within and outside of our organisation.

Currently, our environmental management system is the framework created by our resource consents. The process to obtain the consents considered the environmental impacts we have that are covered by the RMA, set some limitations on our activities, put in place a monitoring programme and provides feedback on performance. As an environmental system, this approach provides some basic safeguards but does not encourage continuous improvement beyond compliance minimums. In addition, our current approach only captures some of our regulatory compliance obligations (not those in permitted activity rules, or legislation other than the RMA) and it does not assist us in managing our other compliance obligations (e.g. expectations of our contributors, neighbours, local iwi and wider community, or voluntary commitments). It is ineffective in identifying environmental, social or legislative changes that may impact our business in the future.

The risks of the gaps between our current and preferred approach are that we are currently only managing our regulatory compliance obligations, however, failing to meet some of our voluntary or community commitments may also represent a significant risk for us in terms of reputation or a social licence to operate. Our preferred approach would allow us to capitalise on opportunities and be better prepared for abnormal operating conditions, planned operational changes, or legislative shifts that may impact how we mange on environmental impacts (e.g. changes affecting or increasing our ability to reuse treated wastewater).

We plan to undertake EMS improvement projects that will address the following risks:

- Follow the principles of ISO14064-1:2018 Specification with guidance at the organisation level for quantification and reporting of greenhouse gas emissions and removals.
- Undertake an audit of the current emissions and have systems in place for the ongoing monitoring and reporting of emissions.
- Formally include emissions and energy consumption as criteria in all NRSBU decision making using SCCID process and set reduction targets.

14.3 Quality systems

NRSBU aspires to a quality system that over time, delivers improved efficiency, fewer mistakes, and an improved client experience. This quality system will:

- Follow the principles of ISO9001:2015 Quality Management Systems.
- Provides the tools, systems and processes we need to deliver a great job to our clients.
- Ensures our documentation is properly controlled so that our procedures, policies, etc, are the “one source of truth”, and that this can be readily accessible for all users (such as on the intranet or a central server).
- Allows for the review of new processes and content before they are added into our source of truth.
- Uses the Plan-Do-Check-Act cycle (the tool used in ISO9001:2015- Quality Management Systems, shown in Figure 14-1 below) to foster continuous improvement and lift our business performance over time.
- Includes a risk-based approach, to avoid us over-documenting our low risk processes.
- Over time, delivers improved efficiency and less mistakes, and an improved client experience.

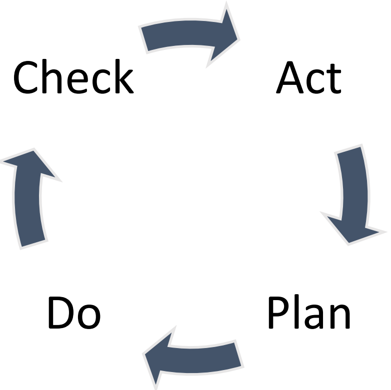


Figure 14-1: The Plan-Do-Check-Act Cycle

Currently, NRSBU has the following systems that provide quality control:

- An O&M plan that includes operator checklists.
- A near miss system for operational misses as part of the operational contract with Nelmac. This involves a monthly agenda item on the operational meeting, covering quality (reporting/admin etc.), environmental and health and safety. Once raised, issues become agreed action items in the meeting minutes and are then tracked via the actions list until resolved. A significant event will trigger a specific review meeting and detailed follow-up reporting.
- The work order system which is used to record improvement opportunities that are agreed for actioning at the Operations Management meeting.
- The NCC document management system, which is used for storing some information, while other datasets are stored locally.

The biggest risk from the gaps between our current and preferred system is the intellectual property staying with the operational contractor because there is no consolidated place for saving all process and operational information (e.g. an intranet) that works for all parties. These risks will be addressed with the development of an integrated asset management system with maintenance checklists and operating procedures linked to each assets and process.

14.4 Financial systems

This section describes NRSBU's financial systems under the headings of treasury and budgeting, valuation, insurance, and procurement.

14.4.1 Treasury and budgeting

Important background to the treasury and budgeting approach is NRSBU's financial strategy, which can be summarised as:

- Contributors should be charged to recover the operational costs that they generate.
- Contributors should be charged the funding costs of the Capital employed to support their quota.
- Asset renewals should be primarily funded through annual depreciation charges.
- Capital costs for new assets, and any renewals costs that exceed depreciation charges, are funded through debt.
- Loans are repaid through depreciation funds.
- The long-term capital debt forecast is taken as the indicator of financial sustainability, as the cumulative balance of operational costs does not need to be considered.

In addition to supporting the strategy above, NRSBU has the following requirements for its treasury and budgeting approach:

- Financial reporting requirements of relevant legislation and standards are met.
- Actual income and expenditure for the current financial year can be managed easily.
- Predictable charging can be provided to contributors.
- Budget planning for the short to mid-term future (1-10 years) is supported.
- Financial sustainability of the activity (at least 30 years) can be assessed through long term forecasting.

The treasury and budgeting systems that NRSBU has in place to meet these requirements are outlined below.

14.4.1.1 Financial reporting and actuals

Accounting is carried out to generally Accepted Accounting Principles to comply with the Local Government Act 2002 and Public Benefit Entity International Public Sector Accounting Standards (PBE IPSAS).

NRSBU uses NCC's financial systems to manage actual income and expenses, undertake invoicing and to track financial performance against current year budgets. Utilising these existing services is more efficient than maintaining separate financial systems and allows for easy integration with NCC's financial auditing. NCC uses integrated computer software supplied by MagiQ. The General Ledger is linked to packages that run Debtors, Creditors, Banking, Rates, Fixed Assets, Invoicing, Water Billing, Job Costing and Payroll. Internal monthly financial reports are generated by Council significant activity and sub-activity categories although real time data is available at any time. External financial reports by significant activity are published in the annual report.

14.4.1.2 Predictable charging for contributors

NRSBU has a comprehensive charging model that relates the components of the contributors' flows and loads to the actual costs incurred by the business. This model is documented in the contract and provides transparency to the contributors.

Each contributor is advised of its capital charge for its committed quota and the operational unit charges estimated from their historic loads and the forecast budget. The actual annual operational charge will vary based on flows and loads observed. The primary cause of large variations between estimated and actual are changes to flows and loads by the contributors. Where large variations in flows and loads occur, the charging agreement provides for an annual washup based on actual loads and flows and the actual operational costs.

Forecasting of changes to client charges in light of the long-term budget is not carried out.

14.4.1.3 Short term budget planning

NRSBU annually updates a detailed rolling three-year budget as part of its business plan process. The plan is developed by NRSBU management and then approved by the Joint Committee. The two owning Councils then each adopt the plan.

The three-year budget sits inside a high level 10-year budget that is developed as part of the AMP preparation. The 10-year budget is updated every three years.

14.4.1.4 Financial sustainability

NRSBU primarily evaluates its long-term financial sustainability by modelling its future debt levels. Debt is used as the metric because operational costs are balanced annually and do not have a cumulative financial impact.

NRSBU is reliant on NCC to develop the long-term debt forecasts, which are updated every three years after the AMP budget is submitted to the NCC finance team. This forecast consolidates debt from improvement, growth and renewals capex into a single account.

NRSBU's overall debt position is split evenly between TDC and NCC, with each council incorporating that debt within its organisational debt caps. The limitation imposed from these debt caps is considered as part of NRSBU's planning, being understood qualitatively through the Councils' representatives on the Joint Committee and informal discussions between NRSBU and council staff.

One of the challenges with incorporating financial sustainability into the long-term budgeting is that the long-term debt forecasts are not available until some months after the AMP budget has been prepared and adopted. Due to this limitation, the AMP budgets are tested for sustainability based on staff experience to judge how the last forecast would be impacted by changes in the new budget.

NRSBU management discusses the debt forecasts with the Joint Committee when they come available.

14.4.2 Valuation

NRSBU requires that its asset valuation system provides the following:

- replacement costs to inform insurance amounts and planning for renewals project budgets;
- annual depreciation calculations to support allocation of intergenerational equity and appropriate funding for renewals projects; and
- depreciated asset values as an indication of asset value/life consumed.

Currently, the valuation process is undertaken independently of Infor and the results are not updated into the Infor asset register. The intention is to reintegrate the process and data.

NRSBU's current valuation approach is:

- NRSBU maintains a fixed asset register.
- An independent valuer uses the fixed asset register to update the valuation each year. As part of this exercise, different process units are selected each year for complete re-valuation from first principles, based on the as-builts plans and supplier quotes for high value assets.

Part of the existing valuation methodology includes consideration of recent contract costs and this will be considered again in the next valuation.

The risks from the gaps between our current and preferred system are:

- We may have under-forecast the cost of our renewals programme (only if the asset register is being used to forecast costs though), resulting in inadequate budgets for planned renewal projects.
- We may not have the timing of our renewals programme right, resulting in projects being required sooner than was budgeted or reduced system reliability from deferred renewals.

We plan to make the following improvements to our valuation process:

- Improve the integration between the valuation process, the financial asset register and Infor.

14.4.3 Insurance

NCC purchases insurance on behalf of NRSBU. NCC and NRSBU assets are managed as a larger package of South Island Territorial Authorities for catastrophe insurance and the Top of the South Collective for material damage and liability insurance.

Assets are insured under either 'Infrastructure/SICC' or 'Building/MDBI' policies. The 'Building/MDBI' basic excess is $100k per non-natural disaster event, $500k per flood event and 5% per site for other natural disasters, whilst the 'Infrastructure/SICC' basic excess is $1.8M.

NRSBU also has liability insurance level of fire cover for Moturoa/Rabbit Island forest that is specified by TDC because it is the forest owner. This currently sits at $5,000,000, and this level of cover is supplied through the biosolids application contract.

The insurance purchased to cover the loss or damage of assets provides for the following:

- Additional increased cost of working (e.g. additional staff to support emergency response);
- Consents for new alignments or other matters arising;
- Additional operational costs during recovery (e.g. to cover alternate disposal solutions if Rabbit/Bell Islands forests are lost to fire); and
- Post event cost surcharging.

With the current insurance cover there is a risk that there is a lack of reserves for covering the 'excess' and that that the implications of not being able to use the Moturoa/Rabbit Island forest for biosolids disposal is not adequately covered.

A review is needed of the amount and types of cover held, in relation to the third part liability (e.g. Moturoa/Rabbit Island forest), and the operational impacts (e.g. additional disposal costs if Moturoa/Rabbit Island is not available).

14.4.4 Procurement

NRSBU operates under NCC's procurement policy and uses its purchasing systems.

NRSBU directly procures significant capital projects and professional consulting. Plant consumables (chemicals) and specialist maintenance services (e.g. electricians), renewals, and minor capital works are generally procured through the operations contract.

The current operations and maintenance contract is a cost reimbursable contract, with target outturn costs. The contract operates with a pain/gain function to drive contractor performance.

The structure of the operations contract creates a number of benefits:

- Responsive contractor with dedicated staff, that focus on activities that are importance to NRSBU
- Removal of typical contractual frustrations, and encouragement of collaboration to improve outcomes
- Cost reimbursable model removes the inclusion of risk in contractor pricing
- Contract KPIs drive contractor performance
- Ease of engagement of specialist suppliers

There are some potential risks associated with this style of contract, including:

- Contract administration requirements are increased
  Cost reimbursable model reduces in-built efficiency drivers for the contractor

Appendices

Appendix A : History of NRSBU

A1 Inception of NRSBU

In the early 1970's poor water quality in the Waimea Inlet meant there was a need to move towards better treatment of the waste streams in the area. Several of the major industries, along with the Councils, discharged partially treated effluent direct to the Waimea Inlet.

After five years of investigation Bell Island was chosen as the best site for a regional treatment facility and the Nelson Regional Sewerage Authority was set up to administer the Joint committee. The NRSA sewerage system, comprising pump stations, rising mains, aeration basin and oxidation ponds, was commissioned in 1983. The treatment plant was upgraded in 1996, 2006 and 2009/10.

In the early 1990's the plant exhibited sludge treatment capacity constraints resulting in the construction of a secondary clarifier and ATADs to take the sludge loads off the facultative ponds.

In 1998 a review of the structure and operating principles was undertaken on the NRSA, and it was renamed NRSBU.

Following severe odour issues a new aeration basin was constructed in 2004.

In 2006 several components of the plant began to exhibit capacity constraints at peak flows and loads and a review of the treatment capacity in November 2006 highlighted the need to further upgrade the plant. The plant was upgraded in 2009/10 to increase the plant capacity by pre-treating the peak loads at the front end of the plant and installing flow bypass facilities, which allow the flows and loads going through the plant to be treated within the existing capacity of the downstream components.

The 2009/10 upgrade was designed to increase the capacity in terms of flow, Chemical Oxygen Demand (COD) and Total Suspended Solids (TSS), and included:

- Installation of a new inlet chamber system and screen.
- A primary clarifier for pre-treatment of the load prior to the existing facilities.
- Installation of a thickening system for primary sludge.

Since the completion of the upgrade in July 2010 it has been demonstrated that the treatment plant has significant capacity to cater for future growth.

Over time the rising mains from Beach Road to Bell Island have been renewed to PE material. The renewal and upgrade of the rising mains and pump stations completed in 2013 created capacity in the network for the next eight years. Additional security was built into the rising main network with the completion of a second pipeline crossing from Monaco to Bell Island in 2012.

Effluent quality has decreased over time and is associated with the build-up of sludge in the facultative and maturation ponds. Future initiatives are programmed to improve the management of sludge in the ponds, and to improve the quality of effluent through the modification of the ponds.

A2 Contributing councils

A2.1 Nelson City Council

Nelson City Council and its forebears have been responsible for sewage disposal in the city since the first piped disposal system was put in place in approximately 1907. The city has expanded by amalgamation of adjoining areas. Tahuna Town Board joined the city in 1953 and Stoke was transferred from Waimea County Council in 1960.

A2.2 Tasman District Council

Tasman District Council and its forebears have been responsible for sewage disposal in the area since the first piped disposal system was put in place in the late 1940's and early 1950's. Tasman District was formed by the amalgamation of adjoining Boroughs and Districts in 1989. Before amalgamation Richmond Borough and Waimea County, along with Nelson City Council, were the major stakeholders in the Regional Scheme.

A3 Previous AMPs

The first AMP was completed in June 1999 and further refined in 2003, 2007, 2012, 2014, 2017 and 2020 to meet minimum requirements. The Asset Management changes between 1999 and 2023 include:

- NRSBU established
- Significant Asset Management awareness at governance level
- Increased understanding and implementation of risk management
- Asset register implemented
- Upgrade of the treatment plant
- Rising main upgrade through the Waimea Estuary from Monaco to Bell Island
- Dedicated website for NRSBU
- Upgrade of Saxton and Beach Road pump stations
- Construction of Songer Street regional pump station
- Moturoa/Rabbit Island biosolids resource consent – and amendments to resource consent
- Centre pivot irrigation on Bell Island for the irrigation of pastoral land
- Installation of booster pump on outfall. This improves the capacity to achieve consented discharge flows and allows NRSBU to optimise the buffer capacity of the ponds to manage wet weather flows
- Development of a long-term strategy for pipeline routes
- Review sludge treatment at Bell Island
- Construction of an irrigation supply pipeline from Bell Island to Monaco with Nelson City Council. (Irrigation pipeline is owned by Nelson City Council)
- Installation of wind generated mixers on one of the facultative ponds
- Desludging facultative ponds
- Modifications to maturation ponds (baffle curtains)
- Improvements to inlet works
- Bunding/flood protection at Bell Island WWTP, Beach Rd PS and Songer PS
- Overflow screens at Airport, Beach Road, Songer and Wakatū pump stations
- Emergency generation at Airport, Beach Road, Saxton and Songer pump stations
- Commencement of physical works on regional pipeline upgrades
- Increase capacity of biosolids storage tanks at the Biosolids Application Facility.
- Construction of ultra filtration recycled water plant
- Upgrade to odour extraction & treatment capabilities for the inlet & ATAD structures

- Emergency power generation

A4 Bell Island Wastewater Treatment Plant

A4.1 History

1983: The Bell Island Wastewater Treatment Plant (WWTP) was commissioned in 1983. The original design population for the WWTP was 33,000 and the plant consisted of a fully mixed aeration basin, three facultative oxidation ponds (in parallel), two maturation ponds (in series) and a tidal discharge. The original concept allowed for expansion by the addition of one extra aeration basin (alongside the original aeration basin), and extra maturation ponds as required. (BOD design capacity of ponds = 4,257kg per day = 149kg per Ha per day and a minimum of 30 days retention.)

The WWTP operated successfully until overloading of the facultative oxidation ponds (FOPs) was noticed in the late 1980s. The overloading caused malodour. Investigations into the issues concluded that the cause of the overloading was a combination of stratification and organic load build-up in the ponds in excess of treatment capacities. Because of the high organic load the available oxygen in the ponds was quickly assimilated, causing anaerobic and putrefactive conditions and noticeable malodour production. Mechanical mixers and aerators were installed in the facultative ponds to address these issues.

1992: A review of the WWTP in 1992 confirmed that sludge build-up was a primary factor causing the overloading and it was recommended that desludging of the oxidation ponds should be commenced and also recommended the installation of a clarifier and sludge processing plant (Autothermal Thermophilic Aerobic Digestion - ATAD) to improve the management of loads to the oxidation ponds.

These upgrades were completed in 1996. Over time further issues were observed and investigated:

- Overloading of the aeration basin caused malodours
- A fungal parasite infected the ponds, reducing the algal population for short periods with consequential generation of malodours
- Improved solids capture through recycling of sludge was desirable in the clarifiers to reduce load on the FOPs
- High nitrogen levels in the biosolids processed by the ATAD plant led to a requirement for additional land to maintain biosolids application rates within consent limits for nitrogen
- The operation of the ATAD and sludge processing plant needed improvements to the aeration and mixing equipment
- There were reported high hydrogen sulphide levels around the inlet basin which needed to be addressed.

2003: In 2003 NRSBU tendered the design, construction and operation of a retrofit at the WWTP that included the installation of a Dissolved Air Flotation System (DAF). This upgrade was implemented during 2004 and 2005.

After the acceptance of the tender, but prior to the construction, it became apparent that the influent parameters to the Bell Island facility could, at times, exceed the design parameters used for the upgrade. However, NRSBU decided to continue with the tender and to review the situation after the installation of the 2004-2005 upgrade.

2006: In 2006 several components of the plant began to exhibit capacity constraints at peak flows and loads, and a review of the treatment capacity in November 2006 highlighted the need to further upgrade the plant. It was agreed that the upgrade would increase the plant capacity by pre-treating the peak loads at the front of the plant and installing flow bypass facilities, which would then allow the flows and loads going through the plant to be treated within the existing capacity of the downstream components.

This strategy optimised the use of the existing assets and allowed the components to be better matched than previously in terms of treatment capacity. The main issues to be addressed in the upgrade were:

- The existing inlet screen which was undersized for future loads
- Screening was not sufficient to protect downstream equipment
- The existing treatment systems did not have the capacity to treat future loads
- Moturoa/Rabbit Island was running out of capacity to dispose of sludge with high levels of nitrogen.

2007 – 2010: The 2007-2010 upgrades were designed to increase the capacity in terms of flow, COD and TSS, and included:

- Installation of a new inlet chamber system and screen
- A new primary clarifier for pre-treatment of the load prior to the existing facilities
- Installation of a thickening system for primary sludge
- Installation of a pump at the outfall to maximise the discharge rate.

Although the design of the biosolids thickening/dewatering process was completed, the actual construction of the facility did not proceed because NRSBU had applied for, and was subsequently granted, a revised consent which allowed application of higher nitrogen levels at Moturoa/Rabbit Island. This removed the need for the capital investment. The physical works of the upgrade were completed in July 2010.

NRSBU agreed that it would be uneconomic to treat peak flows through the clarifier and aeration basin, and a series of flow splits were included in the design of the upgrade.

The bypass philosophy used for the upgrade provides for the efficient use of assets and reduced the capital costs of the upgrade, but at the same time it carries a slight increase in operational risk. This is because the performance of the overall plant could be affected during high rainfall periods due to the large amount of bypass flow that would pass to the facultative ponds.

During the development of the upgrade methodology, it was identified that the loading profile was not expected to change significantly over time due to the contractual agreements in place, and therefore while flows would increase as a result of proposed pumping increases, it was unlikely that the average daily flows would increase to above 300 l/s in the next 10 years. Therefore, the risks of the bypasses will be confined to heavy rainfall events. (Daily average 2016/17 = 198l/s)

In the worst-case scenario, there may be periods where plant performance might deteriorate due to long-term high flow periods.

2011: The 2011 sludge management review included a tour of facilities in the North Island where sludge was treated anaerobically. It was found that all the treatment plants visited struggled to use the methane to generate electricity. NRSBU's study concluded that maximising the useful life and optimising the ATAD processes currently used at Bell Island to treat sewage sludge provides the best economic outcomes for the Bell Island treatment plant.

2012-2020: An energy audit conducted in 2012 concluded that the treatment plant was operating highly efficiently with respect to power consumption. Overflows at pump stations from storm events and power failures continued to be an issue, leading to breaches of resource consents. Improved flexibility was built into the network through the duplication of pumps at the stations and commissioning of components upgraded under the Regional Pipeline Upgrade Project and in 2013 a second pipeline was installed below the estuary thus increasing flows through the treatment plant. In June 2013, the Operations and Maintenance Contract with Downer expired and was extended through to September to allow for the contract to be retendered, which included a complete review of management practices at the plant as well as improved management reporting and benchmarking. In October 2013, Nelmac was awarded the contract. A review of sludge treatment processes during 2012/13 concluded it was feasible to refurbish the facilities enabling implementation of increased sludge treatment to be deferred by up to 10 years. Desludging of the ponds was also deferred. However, a sludge survey conducted during 2013/14 confirmed further sludge build-up in the facultative ponds so desludging was programmed for 2015-17.

In 2015/16, savings in electricity usage continued to be made from improved utilisation of the capacity of the ponds by Nelmac. Investigations into the installation of mixers in the ponds to increase their hydraulic capacity by decreasing sludge levels were underway and the first online spectrolyser (S::can) was installed at the inlet to the treatment plant, providing real-time information about influent characteristics, which would allow NRSBU/Nelmac to optimise treatment plant performance. In 2016/17 lower energy costs were achieved by the installation of wind generated mixers in one of the three facultative ponds.

In 2017/18 failure to manage the odour management infrastructure resulted in a spate of complaints from neighbours. This led to remedial works, which mitigated the situation and resulted in a cessation of complaints. Further upgrades to odour management were programmed. In 2018/19 odour management improved following a variety of maintenance and remedial works. In March 2020, an issue with the ponds resulted in a number of odour complaints and chemical dosing of the ponds was frequently implemented to mitigate the issue. High loads were experienced through the plant as a result of Covid-19. Similarly, this was experienced in other facilities throughout New Zealand. Odour control upgrades at the inlet area, including construction of a biofilter commenced in the last quarter of financial year 2019/20. Odour patrols by an independent contractor were implemented during this period. Desludging of Facultative Ponds is underway in 2020/21, 2021/2022, and 2022/2023 with ponds F1 and F2 completed in 2023. Pond F3 is programmed for desludging during 2023/24. Land at Best Island was purchased in June 2020, with a view to utilising for irrigation of treated effluent at some time in the future. Fulton Hogan have been extracting sand and gravel for a number of years within the area purchased and an agreement with NRSBU has been entered into to allow operations to continue. This realises an annual return for NRSBU of $45,000.

In early 2022 work to install a pilot Ultra Filtration (UF) plant at the process outlet point on Bell Island was completed. This system utilised old UF membranes from the NCC Tangtragee water treatment plant to remove algae, TSS, and other contaminants from the treated effluent. This treatment enabled the water to be utilised in high pressure wash systems in the inlet milliscreens, along with other areas around the WWTP. It also produced sufficient capacity to allow excess water to be conveyed to the Greenacres Golfcourse to be irrigated in summer.

In 2022 work commenced on a significant upgrade to treatment of the odourous air extracted from the ATADs and biosolids tank. This project incorporated improved extraction capabilities and control, ammonia scrubbing, condensate removal and an additional bark biofilter. Further work around the treatment plant included surfacing & ablution upgrades.

During 2022/23 emergency generation was installed on Bell Island. This allowed the inlet works to operate without the need for staff intervention during a power outage. Further generation was installed to power the aeration basin & ATADs, however this requires staff to manually change the connection points, until an upgrade of the existing power infrastructure can be completed during 2024.

Appendix B: Industrial Contributors' Background

B1 Nelson Pine Industries (NPI)

The Nelson Pine Industries medium density fibre board (MDF) factory, near Richmond, opened in October 1986, for manufacturing products comprising of specially engineered wood fibre bonded with synthetic resin adhesive under heat and pressure. The plant has capacity to process 1,000,000 cubic metres annually, making it one of the largest single site MDF producers in the world.

Nelson Pine Industries is a wholly owned subsidiary of the Sumitomo Forestry Company Ltd of Tokyo, Japan.

NPI uses water for washing chips and other processes. Wash water is treated to remove solids before it leaves the site. A flotation clarifier uses tiny dispersed air bubbles to float coagulated solids to the surface of the clarifier where they are skimmed off. The solids are then thickened up in a big screw press. These solids are then burned with other wood waste in the furnaces at NPI. This minimises requirements for landfill disposal. The treated water is then pumped to the Bell Island WWTP for further biological treatment prior to discharge.

Nelson Pine demands on the WWTP can be affected by:

- Importing additional logs into the district (to make up shortfall or increase production);
- Harvesting peaks due to planting sequences (fluctuating production);
- No further land available for planting (cannot increase production);
- Competing land uses (reduction in land for forestry unless owned by NPI);
- Securing logs for processing into MDF (unable to buy logs for processing);
- World prices (influence demand);
- NPI Plant capacity and room for further expansion (influence demand);
- Undertake their own on-site treatment.

The above factors will be considered to validate the future requirements requested or not requested by NPI as part of the continued discussions with all contributors about their future requirements.

NPI has continued to make improvements to their on-site treatment facility. With little growth in production projected, the improvements to the on-site treatment facility are likely to release capacity for the use of other contributors in future.

NPI & NRSBU signed a MoU in 2022 regarding investigation and of a supply line to enable recycled effluent to be re-used in the processing treatment at NPI's Lower Queen St factory. Work on feasibility studies is ongoing, however funds of $6.8M have been allocated in 2028/2029- 2030/31 to facilitate this re-use option.

B2 Alliance

The Alliance Group Ltd replaced the 1909 plant with a new plant in 2000. It is a comparatively small and efficient, single chain sheep and lamb operation, which also processes bobby calves in the spring.

The plant operates on a shift basis, employing a staff of about 160 over two shifts, one starting in August operating almost all year round with the second shift commencing early November going through to May. The plant is able to add value to a lamb carcass.

Alliance does not present a major risk for Bell Island given the total flow contribution.

B3 Septage Disposers

The additional loading requirements from septage disposal (from non-reticulated rural areas septic tanks) have been resolved by the installation of a separate septic disposal facility adjacent to the Richmond pump station.

Current trade waste agreements for septage users are dated. New agreements are being developed which set out a single charge per m^3, representative of an 'average load'. Where disposers propose to discharge a load which significantly differs from average they must apply prior to discharge, with test results to verify discharge loading.

The main uses of the septage facility are to receive:

- Fish/Mussel Waste
- Chicken Waste
- Trade Waste
- Stock Effluent
- Septage

Appendix C: Risk Management Plan

C1 Background

Risk assessment is used as a strategic decision-making tool assisting with developing and prioritising strategies and work programmes. Risk management is the systematic application of management policies, procedures, and practices to the tasks of:

- Identifying
- Analysing
- Evaluating
- Treating
- Monitoring

It is important to note that risk management is not simply about the downside of events such as financial loss or legal proceedings. It also refers to the upside and opportunities that exist for NRSBU to do things more innovatively, sustainably, and effectively.

Analysis of risks

NCC's risk criteria (February 2022) framework has been used to assess the risks.

	CONSEQUENCES				
Descriptor	Insignificant(1)	Minor (2)	Moderate (3)	Major (4)	Extreme (5)
Almost certain (5)	Medium (5)	Medium (10)	High (15)	Very High (20)	Very High (25)
Likely (4)	Medium (4)	Medium (8)	High (12)	High (16)	Very High (20)
Possible (3)	Low (3)	Medium (6)	Medium (9)	High (12)	High (15)
Unlikely (2)	Very Low (2)	Low (4)	Medium (6)	Medium (8)	High (10)
Rare (1)	Very Low (1)	Very Low (2)	Low (3)	Medium (4)	Medium (5)

C2 Asset Risk Register

Potential Risk	Description	Inherent Risk	Treatment Description	Residual Risk
Unreliable data results in asset failure	Unreliable asset attribute information in Infor / Poor asset information in GIS leads to poor renewal decisions which in turn results in significant break/leak in network. Significant inefficiencies for operations and maintenance staff finding information	Medium (6)	• Operations manual hardcopy with information, staff/contractors experience • Flow meters at pump station, mass balance (5%) • A programme developed for risk-based condition assessments of the pipeline, especially the old line from Monaco to Bell Island • Asset support staff engaged within the Operations Contractor to support condition assessments. • Improve the GIS system. GIS data display for Regional Services assets in construction and Asset Data being reviewed and updated • Additional duplication of pipelines proposed to allow improved ability operate system while inspecting and maintaining assets • New duplicate rising main installed across estuary to Bell Island. • As-built plans of high quality and all asset locations known. • Use of Infor and other asset management tools, to streamline the use of asset data	Medium (6)

Potential Risk	Description	Inherent Risk	Treatment Description	Residual Risk
Lifeline service (NRSBU waste water) failure from natural hazards and similar events	Extreme weather results in overflows and damage to infrastructure. Overflow consequences include risk to the public and environment.	Medium (9)	• Rising main capacity upgrade • Redundant storm pumps for all pump stations (work in progress). • Allow overflows upstream in the contributors network • Bunds at Beach Rd to seal openings at building and around wet well • Standby generators for pump stations • insurance funding to assist recovery • Increased bunding at Bell Island. • Works at Songer Street to protect from flooding, storm surge and coastal inundation. • Improvements to trunk main and pump capacity. • Improved communications between NRSBU and contributors.	Medium (8)
Decrease in revenue due to drought	Decreased revenue due to drought (due to volumetric charges)	Medium (9)	• Increasing fixed charge component • Increased resilience from dams (Maitai, Waimea, etc)	Medium (9)
Unable to treat wastewater due to extended power supply failure	11kV submarine cable (owned by Network Tasman) is ageing and under capacity (max capacity 2.0MW). Lack of n+1 resilient power supply to Bell Island. Fault would result in an outage of 2-7 days or if fault occurs under the estuary, 14+ days.	Medium (8)	• Generator at WWTP inlet (3 x emergency generators for resource consent) • Ground penetrating radar as standard for any of our excavations / insist that the contractors get the locators to do a cable avoidance tool sweep of our excavation • Install larger generators that could power the plant. • Look at alternative power supply options, including alternative alignment to the current estuary location.	Medium (8)
Unable to dispose of biosolids because Moturoa / Rabbit island closed or restricted discharge due to fire risk.	Results in significantly reduced areas for biosolids disposal.	Medium (8)	• Two application vehicles - kept at either end of Moturoa/Rabbit Island in case one cannot be accessed due to fire risk • Extensive fire breaks exist (roads) • Easy access to site for firefighting equipment. • Other areas outside the Moturoa/Rabbit Island area are available for biosolids disposal. • Use the aeration ponds for emergency storage of biosolids, noting odour issues and removal costs.	Medium (6)

Potential Risk	Description	Inherent Risk	Treatment Description	Residual Risk
Avoidable non-compliance through staff inaction or inappropriate action.	Causes include Insufficient staff continuity, training, and retention. Primarily relates to WWTP operator error resulting in failure to achieve consent conditions. Noting ability to attract skilled staff weakened by uncertainty related to water reform.	Medium (9)	• Additional resources provided through secondment and/or external contractors • Engagement of NRSBU direct staff. • Revising the operations and maintenance contract to include specific requirements around staffing and to increase collaborative management of the system.	Medium (6)
Disruption to treatment processes in the ponds	Concurrent excess load from industries	Medium (9)	• Contributor contracts with penalty clauses • Online monitoring and regular contributor sampling	Medium (6)
Significant change in governing framework for Healthy Waters	Significant change in governing framework for Healthy Waters	Very High (20)	• Respond to Three Waters Reform legislation (Water Services Act 2021, Taumata Arowai Act, etc)	Very High (20)
Inefficient spending	Decisions about asset maintenance/ development/ replacement made ignoring advice in AMPs	High (12)	• Ensure alignment between AMP and Business Plan • Ensure the Joint Committee is well informed with regard to necessity and scope of projects and the content of AMPs.	High (12)
Non-compliance	One or more operated assets do not comply with resource consents	High (12)	• Processes for RMA compliance and reporting. • Independent contractor monitoring and reporting • Alarm systems, level indicators.	High (12)
Mis-information	Public misinformation about performance of systems	High (12)	• Keep website up to date	High (12)
Contractor H&S breach	Contractors do not meet required health and safety standard	High (12)	• Contractor reports to Council • Council reviews H&S systems • Audits of H&S systems	High (12)
Inexperience	Lack of staff and operator experience/resilience	High (12)	• Employ experienced people where possible. • Employ appropriately qualified and skilled staff. • Competitive pay and conditions.	High (12)
Climate Change /Sea Level Rise	Failure of part or component parts of the network.	High (12)	• Emergency procedures manual and exercises. • Programmes related to resilience/adaptation underway	High (12)

Potential Risk	Description	Inherent Risk	Treatment Description	Residual Risk
Harm to operators from exposure to sewage	Operators becomes ill from exposure to sewage.	High (12)	• Ongoing Health and Safety training. • Preventative inoculation of staff. • Use of barrier protection where possible. • Identify hazardous areas at facilities and employ processes to minimise risk	High (12)
Failure to achieve consent conditions at WWTP	Failure to comply with resource consents. Customer complaints.	High (12)	• Pond management team recently set up to routinely monitor pond performance in order to minimise the risk to the ponds "crashing" and causing odour issues. • Pre-treatment processes minimise loading fluctuations.	High (12)
Pump station equipment/ component failure	Wastewater discharges to the environment having a negative impact on environmental, cultural and health issues. Customer complaints. Wastewater not able to be pumped to WWTP.	High (12)	• Processes within pump stations have contingencies for failure (duplication of pumps) or alarm systems (Supervisory control and data acquisition) installed. • PS have additional storage capacity • PS have screened, monitored overflows	High (12)
Insufficient Storage Capacity at Pump stations	Insufficient storage or capacity resulting in wastewater discharges to the environment. Environmental and cultural issues and increase in public health risk	High (12)	• All pump stations have high level and overflow alarms for advance warning of an overflow event and high capacity pumps for peak flow conditions. • Work to increase capacity	High (12)
Projects exceed budget and /or time	Several projects in the financial year exceed budget and /or time as result of one or more of; scope changes, poor/ incorrect information, inadequate designs, or procurement delays	High (15)	• Contractor payment process • Procurement policy & planning • Project risk logs • Variation process including time extensions • Add time/$ for scope creep and contingency	Medium (9)
Insufficient Budget allocated	Budget allocated does not meet needs for operating to achieve standards set	Medium (9)	• Planning processes. • Finance information and reporting. • Asset Management plans • Annual reporting	Medium (9)
Insufficient capacity	Operated facilities are insufficient or cannot be operated to meet demand from community growth	Medium (6)	• Some contributors' requirements are known. • Encourage NCC to prioritise provision of future flows	Medium (6)

Appendix D: Financial Forecasts

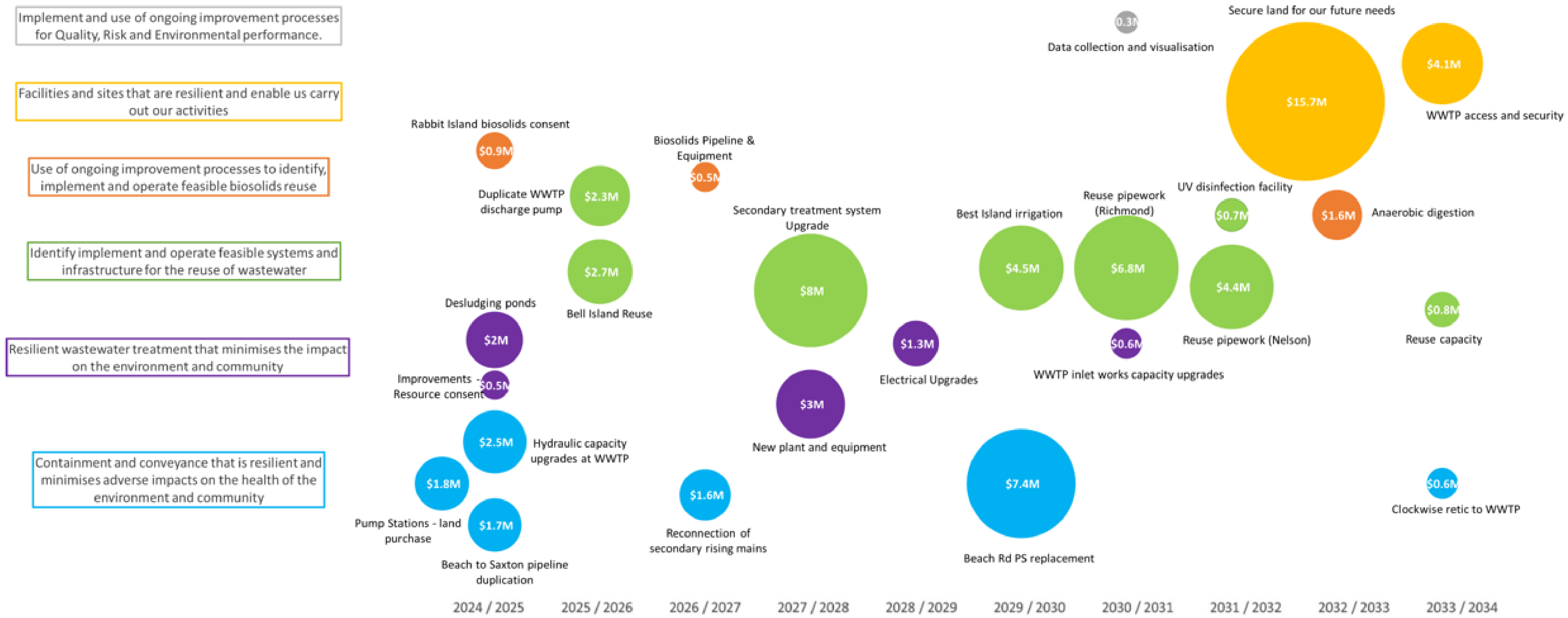


Figure D-2: Visual display of alignment of projects in 10-year budget to NRSBU's objectives

Table D-1: Total capex budgets 2024-2034 ($ thousands)

Form of capex	Total years 1-10	24/25	25/26	26/27	27/28	28/29	29/30	30/31	31/32	32/33	33/34
LoS		6,194	4,461	2,640	3,631	6,916	6,281	8,259	3,639	3,852	4,406

Form of capex	Total years 1-10	24/25	25/26	26/27	27/28	28/29	29/30	30/31	31/32	32/33	33/34
Growth	8,606	$500	1,500	3,000	3,000						606
Land		1,817					1,120		1,222	1,222	12,110
Renewals		2,086	2,148	2,668	2,000	2,000	2,000	2,000	2,000	2,000	2,000
Total capex		10,596	8,110	8,308	8,631	8,916	9,401	10,259	6,861	7,074	19,121

Table D-2: Planned capital projects excluding renewals ($ thousands)

Project	Capex	24/25	25/26	26/27	27/28	28/29	29/30	30/31	31/32	32/33	33/34
Anaerobic digestion	LoS						61	61	242	606	606
Beach Rd PS replacement	LoS				400	3500	3500				
Beach to Saxton pipeline duplication	LoS	1730									
Bell Island reuse	LoS		650	250	250	250	250	250	250	250	250
Best Island irrigation	LoS		305		611	500	1833	1222			
Data collection and visualisation	LoS							100	75	100	50
Design and consenting of clockwise retic to WWTP	Growth										606
Desludging ponds	LoS	756	750	500							
Duplicate WWTP discharge pump	LoS	272	2000								
Electrical Upgrades	LoS				300	1000					
Hydraulic capacity upgrades at WWTP	LoS	1833							61	611	
Biosolids Pipeline and Equipment	LoS		61	484							
Effluent discharge improvements required by R/C	LoS	523									
New plant and equipment	LoS	20	20	20	2020	845	20	20			
New technology assessments to meet Consent	LoS	61						61			
Pump Stations - land purchase for storage/adaption	Land	1817									
Rabbit Island biosolids consent	LoS	450	400								
Reconnection of secondary rising mains	LoS		244	1385							
Investigate and increase reuse capacity	LoS	250	31								500

Project	Capex	24/25	25/26	26/27	27/28	28/29	29/30	30/31	31/32	32/33	33/34
Reuse pipework (Nelson)	LoS								2950	1475	
Reuse pipework (Richmond)	LoS					321	482	6000			
Secondary treatment system upgrade	Growth	500	1500	3000	3000						
Secure land for our future needs	Land						1120		1222	1222	12110
UV disinfection facility	LoS								61	611	
WWTP access	LoS				500	500	75			200	3000
WWTP inlet works capacity upgrades	LoS						61	546			

Table D-3: Operational Costs (2024-2034 ($ thousands)

umb	Total years 1-10	24/25	25/26	26/27	27/28	28/29	29/30	30/31	31/32	32/33	33/34
Management	**6950**	695	695	695	695	695	695	695	695	695	695
Power costs	**11950**	1141	1146	960	965	1050	1181	1259	1407	1417	1424
Allowance for new processes	**7030**	55	55	80	80	305	675	875	1295	1555	2055
Maintenance	**35290**	3529	3529	3529	3529	3529	3529	3529	3529	3529	3529
Monitoring charges	**3395**	288	512	288	288	358	288	377	423	288	288
General	**11140**	1160	1086	994	1060	1110	1094	1161	1136	1174	1165
Subtotal O&M	**75754**	**6868**	**7023**	**6546**	**6616**	**7047**	**7462**	**7896**	**8485**	**8658**	**9155**
Financial Costs	**42112**	2553	2531	2730	2958	3710	4618	5058	5662	5980	6312
Depreciation	**40508**	3288	3422	3475	3777	3862	4209	4405	4503	4779	4789
Total Expenses	**158375**	**12708**	**12976**	**12751**	**13351**	**14619**	**16289**	**17358**	**18650**	**19417**	**20257**

Appendix E: Valuation June 2023

The valuation as of June 2023, which has been independently audited, is summarised in Table E-4 below:

Table E-4: June 2023 valuation

Assets	ORC	ODRC	AD
Pumps, Pipes, Biofilters	$48,873,246	$32,844,685	$800,215
Septage	$154,486	$77,243	$5,264
Inlet Works	$7,456,846	$5,011,812	$237,364
Primary Clarifier	$5,738,131	$4,104,431	$130,737
Aeration	$2,422,554	$769,809	$126,295
Secondary Clarifier	$4,026,624	$1,959,252	$94,055
Ponds, Outfalls	$40,186,355	$20,582,026	$660,839
Biosolids	$19,152,631	$11,091,170	$569,510
General	$14,976,469	$8,811,085	$428,206
TOTAL	**$142,987,343**	**$85,251,512**	**$3,052,486**

The typical useful lives adopted in the valuation of NRSBU's assets are derived from industry knowledge and local performance data. These typical useful lives are shown in Table E-5 to Table E-7 below.

Table E-5: Typical useful lives used in pump station valuation

Component	Life
Structure	50
Steelwork	30
Pump	15
Electrical	15/25
Valves	30
Telemetry	10
Flow Meters	15
Biofilters	20
Biofilter media	5

Table E-6: Typical useful lives used in rising main valuation

Material	Life
Pipelines- plastic/polyethylene	100
Pipelines- steel	50
Pipelines- concrete	80
Pipelines- asbestos cement	50
Valves	25
Flowmeters	15
Manholes/chambers	100

Table E-7: Typical useful lives used in wastewater treatment plant valuation

Asset	Life
Building/Structure	50
Biosolids Tanks	10
Mechanical	25
Aerators	25
Mixers	10
Flowmeters	15
Electrical	15/25
Electronic	10
Instrumentation	10
Office Equipment	10
Pipework- above ground	20/50
Pipework- below ground	80
Valves	25
Manholes/chambers	60