Te Kaunihera-ā-Rohe o Ngāmotu
New Plymouth District Council

2021-2031 Wastewater Asset Management Plan

2021-2031: He Rautaki Whakahaere Rawa mō Te Wai Paranga

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General Volume

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1. Executive Summary

This Wastewater Asset Management Plan (AMP) outlines how New Plymouth District Council (NPDC or the Council) manages the assets associated with the Council's wastewater asset portfolio, and will contribute to the community outcomes and priorities identified in the 2021-2031 Long Term Plan (LTP). This AMP covers the period from 1 July 2021 to 30 June 2031.

While much of this Wastewater AMP focuses upon the next 10 years in alignment with the LTP, asset management planning tends to consider much longer timeframes. The majority of the Council's assets have lifecycles far greater than 10 years.

Wastewater assets contribute to wastewater services in New Plymouth, Oakura, Inglewood, Bell Block, and Waitara. The assets include the New Plymouth Wastewater Treatment Plant (NPWWTP), 34 pump stations, and the reticulation network in the district.

The reticulation network and pump stations collect wastewater and feed it to the NPWWTP where it is treated and discharged via an outfall to the sea. A Thermal Drying Facility (TDF) processes treats sludge to produce Bioboost® fertiliser, which is sold through a private distributer - Bioboost Ltd.

The key objectives for the Three Waters Service in regard to wastewater assets are detailed below:

A. To provide a safe, healthy and efficient service at an affordable cost.

B. To minimise the impact of high density human populations on the environment.

C. To ensure infrastructure can meet both current and future demand within defined Levels of Service.

D. To protect public health and the environment.

E. To provide an acceptable level of resilience in emergency situations.

Key issues for the Three Waters Service in regard to wastewater assets have been identified through undertaking a problem statement gap analysis. The key issues are detailed below:

1. Incomplete inspection/condition rating data and programme.

2. Lack of asset inventory data and standards and guidelines.

3. Lack of a sewer containment standards.

4. System design does not meet current and future demand.

5. Lack of a robust renewal programme for telemetry and communications technology.

6. Lack of engagement with iwi on infrastructure design, build and operation.

7. Not understanding the threats of natural hazards to infrastructure and not building in resilience.

8. Lack of maintenance scheduling.

9. Lack of understanding of the system capacity and performance.

10. Historical lack of renewals.

11. Lack of sustainable processes and poor community education around people's impact on wastewater systems.

The following Levels of Service that identify key measures and targets for wastewater services have been defined:

- *Provide an effective wastewater treatment and disposal system* – in 2019/20 the target for the number of dry weather sewerage overflows per 1,000 connections to the wastewater system was one or less. During this period there were 0.76 dry weather sewerage overflows per 1,000 connections to the wastewater system, thereby achieving this target.

- *Comply with all resource consents for wastewater discharge from our system* – in 2019/20 the target for the number of abatement notices, infringement notices, enforcement orders, and convictions received was zero. This target was achieved, other than for abatement notices where one was received.

- *Respond to customer and maintenance requests in a timely manner* –
  - *The median response time to sewerage overflow callouts (from the time the Council receives notification to the time that service personnel reach the site)* – in 2019/20 the target for a response was one hour or less. This target was achieved as the response time was 0.64 hours.
  - *The median resolution time for sewerage overflow callouts (from the time the Council receives notification to the time that service personnel confirm resolution of the fault or interruption)* –in 2019/20 the target was four hours or less for sewers greater than 250 diameter and eight hours or less for sewers less than or equal to 250 diameter. These targets were achieved as the resolution time for sewers greater than 250 diameter was 2.33 hours and there were no callouts for sewers less than or equal to 250 diameter.

- *Ensure customers are satisfied with the wastewater treatment and disposal service* – in 2019/20 the target for the total number of complaints received about sewerage odour, system faults or blockages, or the Council's response to issues with the sewerage system (per 1,000 connected properties) was 13 or less. This target was met as the total number of complaints was 5.55.

Managing and maintaining the Three Waters Service and wastewater assets is resource intensive. To sustain current Levels of Service, the existing built asset base will require baseline Operational expenditure (Opex) of approximately $112 million and approximately $260 million Capital expenditure (Capex) for renewals and Level of Service projects over the next 10 years.

The biggest driver of increased demand for all Council services and use of Council assets is population growth. To complement and service the planned growth areas in the district wastewater network modelling needs to be undertaken (**Projects: WW2003 and WW2010**) and services are required for subdivisions (**Projects: WW2006, WW2009, WW2019, and WW2022**). The Growth Projects require Capex of approximately $27 million over the next 10 years.

As at 30 June 2019, the certified fair value of wastewater assets was approximately $351 million (excluding inflation).
A number of issues associated with asset management have been identified throughout this AMP. The improvement actions required over the 10 year period (2021-2031) have been collated in this AMP. A number of improvement actions relate to all the AMPs and are therefore included in the **Asset Management Strategy**.

2. Introduction

This Wastewater AMP outlines how NPDC manages the assets associated with wastewater, including the NPWWTP, pump stations, and the reticulation network. It also demonstrates how the Three Waters Service will contribute to the community outcomes and priorities identified in the 2021-2031 LTP.

Collecting, treating, and disposing of wastewater is essential to:

- Protect public health and minimise the impact of large concentrated populations and their industrial processes on the environment
- Ensure that human and industrial waste does not threaten the sustainability of the current environment, development, and business practices
- Protect river and ocean environments from pollution

In order to deliver this essential service in perpetuity, the Three Waters Team maintain and replace assets as required.

A range of Council staff are involved in preparing and delivering the Wastewater AMP and providing support services for asset management. How these responsibilities are allocated, managed and delivered is shown in **Figure 1** in the **Asset Management Strategy**. The framework and key elements of the overall AMP are shown in **Table 1** in the **Asset Management Strategy**.

2.1 Asset Descriptions

Wastewater assets contribute to wastewater services in New Plymouth, Oakura, Inglewood, Bell Block, and Waitara. The reticulation network and pump stations collect wastewater and feed it to the NPWWTP where it is treated and discharged via an outfall to the sea. A TDF processes treats sludge to produce Bioboost® fertiliser (see **Wastewater AMP: Volume 1 – Treatment Plant**).

Table 1 contains a summary of the wastewater assets. More details about each of these asset categories can be found in the **Wastewater AMP: Volume 1-3**.

Table 1: Asset Summary

Asset Category	Description	Quantity	AMP Volume
Treatment Plant	Outfalls	2	1
	NPWWTP	1	
Pump Stations		34	2
Reticulation Network	Valves	199	3
	Manholes	7,214	
	Reticulation	454km	
	Trunk main (Trunk)	38km	
	Laterals (Service)	245km	

2.2. Asset Information and Data

The Three Waters Service store and manage information and data for wastewater assets in various systems, including the following:

- Enterprise Asset Management (EAM) system (part of TechnologyOne) for document management, financial management, customer information and requests, asset inventory, asset history, work order management and maintenance scheduling
- ARCGIS for spatial records with general Geographic Information System (GIS) viewer MILES
- RedEye for all drawings, including working drawings
- SharePoint for the Drawing Management System (RedEye), asset data and Improvement Plan items
- CS-VUE - The Council's consent compliance management system is a web-based software solution specifically for compliance with RMA requirements. Resource consents are stored in CS-VUE and the system identifies and retrieves consent conditions and provides quality assurance.
- Water Outlook for gathering and managing the Supervisory Control and Data Acquisition (SCADA) system and processing data
- Water Online for reporting compliance data to the Ministry of Health
- Infoworks for pipe network modelling

Table 5 in **Section 5: Asset Management System** of the **Asset Management Strategy** outlines the asset data accuracy/confidence grades. In previous AMPs, asset data accuracy/confidence for asset descriptions was determined by the Three Waters Team's knowledge and experience. Asset data accuracy/confidence grades have not been provided in this AMP as a more robust data quality system is needed to determine the grades more accurately. There is an improvement action for data accuracy/confidence grades in **Section 10: Asset Management Improvement Programme** of the **Asset Management Strategy**.

3. Strategic Framework

NPDC's strategic framework for the district is detailed in **Section 4: Strategic Framework** of the **Asset Management Strategy**. This section of the AMP outlines the alignment of the Council's Asset Management Drivers and Objectives with Wastewater Objectives, key issues for wastewater, and the relevant statutory and regulatory requirements.

3.1 Strategic Alignment

AMPs are a key component of the strategic planning and management of the Council. The following four Asset Management Drivers have been identified to guide the Asset Management and Network Planning Team and to prioritise investment in asset infrastructure over the 10 year period of the AMP:

1. **Taking care of what we have –** We need to ensure that we invest in maintaining, renewing or replacing our existing asset infrastructure to preserve and extend their useful life.
2. **Resilience and responding to climate change** – As we build new assets and renew our existing infrastructure we must ensure that we build in resilience to issues from natural hazards including, volcanic and seismic activity, sea level rise, coastal erosion, flooding events and droughts along with the consideration of the predictions of climate change.
3. **Planning for growth** – Our district will continue to grow and it is important that we manage that growth and provide the infrastructure in the appropriate areas to support new housing and employment areas
4. **Meeting the needs of our community and reducing our impact on the environment –** As our community grows and changes we need to ensure that our infrastructure responds to those changing needs and that we also respond to increasing standards to support public health and environmental protection.

These four drivers of decision making have been translated into specific Asset Management Objectives as detailed in **Table 2**.

Table 2: Asset Management Drivers and Objectives

Taking care of what we have

Taking care of infrastructure assets means:

- We understand that asset data and evidence based decision making are critical to optimising costs and maximising the value our services bring to our customers
- We protect and enhance public health by providing quality services
- We own and operate infrastructure that is safe for our staff, suppliers and customers

Resilience and responding to climate change

Resilience of assets means:

- Our infrastructure protects and enhances our built environment and creates amenity value
- We provide reliable services and infrastructure that is resilient to natural hazards and adapts to climate change
- We provide system redundancy and emergency back up systems to our critical infrastructure

Planning for growth

Planning and providing for growth means:

- We work in partnership with Tangata Whenua when we plan for our infrastructure
- Our infrastructure is an enabler for economic activity and future growth
- We educate our community so they can make informed choices about how they use our services and manage demand on our infrastructure and services

Meeting the needs of our community and reducing our impact on the environment

Meeting the needs of our community and reducing our impact on the environment means:

- We manage the consumption of energy and associated greenhouse gas emissions to mitigate our impact on climate change.
- We protect and restore the health of our natural environment.
- We manage the use of resources in a sustainable way, minimising waste and seek out opportunities to use wastes as a resource to be reused or recycled

Details for the key Wastewater Objectives and the alignment of these to the Asset Management Drivers and Objectives are provided in **Table 3**.

Table 3: Alignment of Asset Management Drivers and Objectives, and Wastewater Objectives

Wastewater Objectives	Asset Management Drivers			
	1. Taking care of what we have	2. Resilience and responding to climate change	3. Planning for growth	4. Meeting the needs of our community and reducing our impact on the environment
A. Provide a safe, healthy and efficient service at a relatively low cost.				
B. To minimise the impact of high density human populations on the environment.				
C. To ensure infrastructure can meet both current and future demand within defined Levels of Service.				
D. To protect public health and the environment.				
E. To provide an acceptable level of resilience in emergency situations.				

3.2. Key Issues for Wastewater

A problem statement gap analysis has been undertaken for wastewater assets. **Table 4** outlines the problems, key issues, and the plan of actions associated with each problem.

Table 4: Problem statement gap analysis

Item No.	Title	Problem Statement	Key Issues	Planned Action	Residual Risks
1.	Incomplete inspection/ condition rating data and programme	Incomplete inspection/condition rating data and programme	• Incomplete plan and resourcing for the inspection and condition rating of: o Plant and equipment (P&E) o Pressurised mains o Gravity mains and general reticulation including manholes o Pipe bridges and river crossings o Above ground Asbestos Cement (AC) pipe o Unlined tunnels o Operational buildings	• Closed-Circuit Television (CCTV) inspection for some wastewater reticulation systems • Additional Opex for manhole inspections • Additional Opex for P&E inspectors • Condition assessment methodology research project • Opex for pipe bridge structural inspections • Opex for buildings inspections	• It will take a long time to complete a first pass inspection of all assets • Still not inspecting pressurised mains • Not inspecting small diameter pipes that CCTV cameras will not fit inside • Implementation of research recommendations
2.	Lack of asset inventory data and standards and guidelines	The Council has not understood the value of asset data and has not developed formal metadata standards to ensure the right data is recorded to support asset management decision making which has resulted in incomplete and inaccurate assets inventories which has in turn caused operational challenges including maintaining an inadequate spares inventory, increased risk of asset failure and an inability to accurately plan for future works	• No metadata standard – not planned for what data we need • No metadata standards – poor quality data in the inventory • Unrecorded assets are not maintained • Undervalued asset inventory which impacts on renewals planning • Undervalued asset valuation results in under insurance • Assets not in the inventory cannot have maintenance schedules created so they will not get maintained and serviced	• Write and adopt asset metadata standards • Introduce additional resource for asset inspections and use to complete as-built surveys and inventory validation • Asset data quality analysis scripting	• It will take a long time to complete a first pass inspection of all assets so data quality issues will persist for a long time

3.	Lack of a sewer containment standards	The Council has not developed and adopted a formal wastewater containment standard that clearly establishes a basis of design and performance expectations which has resulted in an inconsistent approach to infrastructure development, variable performance and peak capacity, increased risk of sewage overflow and challenges undertaking maintenance because of a lack of any shutdown strategies	• Insufficient emergency storage (does not comply with NZS 4404:2010) resulting in overflow • No shutdown strategy to allow repairs/maintenance • No standard to drive consistency regarding basis of design which guides investment decisions	• Wastewater network modelling • LiDAR project • Develop formal containment standard • Minor pump station improvement (including backup generator installation)	
4.	System design does not meet current and future demand	Poor system design, legacy performance issues and a lack of future development considerations, particularly for older facilities has resulted in poor asset performance, higher operational cost, increased health and safety risks, a lack of capacity to accommodate future development, lack of contingency plans, increased risk of environmental harm and non-compliance with the Council's own bylaw	• Shearer Reserve Pump Station issues: o Milliscreens constantly block o Screening room costs $12k to enter due to confined space o Detention tank rotork valves do not work so the wet well cannot be isolated o Wet well concrete under pumps is breaking apart and pumps are beginning to fall in o Pumps are obsolete and the Three Waters Service must fabricate their own replacement parts o Ineffective grit separation • Corbett Park Pump Station: o Pumps operate in series so have cavitation that causes vibration and high wear/failure rates o Transformer is undersized for a three pump train o Concrete corroded by Hydrogen sulphide (H_2S) has exposed re-bar • Te Henui Pump Station: o Is operating at capacity o Inlet valve runs off potable water pressure so is non-compliant with the by-law and is a backflow risk to the drinking water network o Has limited emergency storage and the screens require manual racking which is a major health and safety risk in a confined space o Suction isolation and wet well isolation is in the wet well o Bio-filter at end of life and needs replacing o Overhead gantry crane needs overhaul		

4.

- Mangati Pump Station has no emergency storage and is approaching peak capacity and will require flows from Inglewood to be diverted

- NPWWTP Issues:

o Cannot isolate clarifier No 2

o Bioreactor inlet valves and penstocks pneumatics and electrical is at end of life

o Bayleen filter is unreliable

o Screw press solids capture is rate is low

o Pressure fluctuations in water supply trip out the TDF

o The site stormwater system may be contaminating the adjacent stream

o Conveyor system has no redundancy

o Overflow system does not cover the inlet chamber making it unmaintainable

o Progressive cavity pumps are undersized so have no redundancy for wear on the rota so cannot get flow to screw presses

o Disposal of screening collections

o Bio-reactor mixers are inefficient and unreliable

o Need to de-sludge the large lagoon

o Small lagoon has not been dredged for 20 years

o Fuel tank on generator is non-compliant

- Waitara Transfer and Outfall Pump Station issues:

o Foul air extraction system hazardous to maintain

o Inadequate staff facilities

o No backup generator

o Insufficient working volume in wet well

o Screens use a lot of water

o Transfer pumps do not operate on the pump curve

o High Inflow and Infiltration (I&I)

o Inlet valves to all emergency storage quadrants leak

o Screens and screw presses at end of life

4.				o Pumps and control panels are obsolete and at their end of life o Gantry crane is non-compliant o Cannot maintain due to lack of isolation, seized valves etc. • Pump stations generally: o Most do not have backup power o Some do not have standby pumps • Inglewood oxidation pond and pump station issues: o Relies on storage to accommodate peak flows, pumps can only deliver x2 Average Dry Weather Flow (ADWF) and pumps downhill in high flow conditions (negative static/very high friction head) o Has ineffective grit separation o Has very high peaking factor (x16) that results in weeks long overflows o Screens are OOP and cannot get spare parts • WWTP admin, lab and welfare building configuration and associated hygiene issues • No asbestos management plans for buildings • Urenui Domain system breaching consent • Onaero Domain system breaching consent • Have no facilities for the receipt of septage • Large lagoon at WWTP is redundant and has never been properly decommissioned		
5.	Lack of a robust renewal programme for telemetry and communications technology	• Lack of software licenses • Out of date Piping and Instrumentation Diagrams (P&IDs) and functional descriptions • Communications single points of failure/lack of redundancy • Out of date radio equipment • Out of date pump station instrumentation including level monitors and alarms • Narrow bandwidth connections between SCADA sites • Lack of spares inventory		• Fibre link to Te Henui • Extra Opex to purchase more software licenses • PLC Replacement Programme • Create and update Functional Descriptions and P&IDs		

5.			• Lack of remote programming access to essential sites • Data inaccuracies in recorded data • Lack of essential power equipment • Inadequate firewalls • Reticulation instrumentation relies on cellular networks • Programmable Logic Control (PLC) codes do not comply with NPDC standards • No space at treatment plants for PLC room, Historian, remote access servers etc.		
6.	Lack of engagement with iwi on infrastructure design, build and operation	Much of the system was designed and built with little or no cultural consideration and pre-dates Te Mana O Te Wai and, as a result, parts of the system and the way it is designed to operate are considered culturally offensive	• Use of the Waitara Marine Outfall • Use of the New Plymouth Marine Outfall • Engineered overflows to rivers • E.coli contamination of Urenui stormwater system due to private septic tanks • Need to investigate if septic systems in non-reticulated towns are still fit for purpose	• He Puna Wai • Wastewater Treatment Plant Master Plan • Elimination of use of Waitara Marine Outfall (WW-2008) • Urenui/Onearo wastewater study • NPWWTP Land Disposal Trial • Wastewater in un-reticulated urban areas project • Containment standard	
7.	Not understanding the threats of natural hazards to infrastructure and not building in resilience	When infrastructure has developed, there has been a lack of consideration for natural hazards and poorly defined resilience performance expectations, which has resulted in vulnerable infrastructure being constructed in natural hazard zones and a vulnerable system that is linear in nature and has a high number of single-points-of-failure	• River crossings levels relative to flood levels • Unknown earthquake rating of buildings • Coastal erosion threatening the Urenui Domain sewer system • General effects of coastal erosion and sea level rise on coastal assets, in particular trunk mains • Administration building is earthquake prone • Inglewood fault lines • Impacts of volcanic ash fall • Above ground assets are at risk of land movement	• Opex survey of all river crossings • Pipe Bridge Resilience Upgrade Programme • LiDAR Project • Opex to do seismic assessments • Relocation of West Quay Pump Station • Golf Course sewer remediation project • Resilience Level of Service	

8.	Lack of maintenance scheduling	There has been insufficient investment of resources to develop a comprehensive programme of preventative maintenance schedules. This has resulted in many items of P&E receiving no routine servicing which has in turn increased the cost of reactive emergency repairs, voided equipment warranties, shortened the operating lives of assets, increased the cost of the renewals programme, reduced system performance and increased health, safety and environmental risks.	• Only about 50% of P&E assets have a maintenance schedule in the system • Material increase in funding required as current maintenance budget is insufficient • Lack of Operations and Maintenance manuals for some P&E • No maintenance on the marine outfall and its cathodic protection for 10 years	• Maintenance scheduling Opex project to create missing schedules and compile maintenance manuals • Additional fitter resource • Additional Opex for marine outfall maintenance • Create or update operating manuals	• No actions taken for wastewater pump stations and wastewater reticulation • Cannot get consents to spray moss on pipe bridges and clean them
9.	Lack of understanding of the system capacity and performance	The district's population is growing; however, there is insufficient evidence based understanding of the system's capacity and performance and an overreliance on the observational knowledge of field staff to inform future development decisions which has resulted in poor system performance, increased environmental risks, poorly informed investment decisions and barriers to land development	• Population growth assumptions are not sufficient to undertake growth modelling • LiDAR of the district is incomplete and will become out of date in 2025 leading to poor outcomes when creating hydraulic models • No calibrated network model • Pipe and manholes reaching capacity, surcharging and ultimately overflowing • Bell Block trunk main is surcharging and close to overflowing • No understanding of inflow and infiltration so cannot progress solutions • Lack of flow meters on the network to understand performance • WWTP is operating at peak hydraulic capacity • Growth is occurring and needs to be accommodated • The Hospital is being redeveloped and will require additional capacity	• Wastewater Network Modelling and I&I investigations • Creation of growth assumptions • LiDAR project • Te Henui Pump Station upgrade • Duplication/replacement of Bell Block trunk main • Eastern sewer realignment project • WWTP Master Plan • Junction Growth Area Sewer Upgrade • Upgrading of Huatoki Valley Sewer Main • Lorna Street Sewer Upgrade • Carey Street Sewer upgrades • Subdivision services upgrades budget • Wairau Road Sewer Extension • Pump station flow meters	

10.	Historical lack of renewals	Due to fiscal constraints the level of investment to replace assets was significantly reduced which has resulted in an overall deterioration in the condition of the network, increased risk of asset/system failure, increased reactive maintenance costs and increased risk of environmental damage	• Already carrying a large backlog of deferred reticulation renewals • Renewals funding is insufficient for both reticulation and P&E so backlog will continue to accrue • TDF Replacement • H2S corrosion of reticulation, P&E	• Wastewater Treatment P&E and instrumentation and electrical (I&E) renewal • Minor lab equipment renewals • Resource consent renewals • TDF replacement • Bioreactor Aeration System renewal • Reticulation renewals • WWTP and buildings renewals	
11.	Lack of sustainable processes and poor community education around people's impact on wastewater systems	The wastewater system disconnects the community and industry from the impact of their wastewater production and it operates in a way that is energy intensive, consumes a lot of chemicals and produces large volumes of waste which results in the consumption of natural resources and discharges to land, air and sea	• The wastewater system and treatment plant consumes large amounts of potable water, energy and chemicals • Illegal discharges and trade wastes impacting on the • Fat and wet-wipe sewer blockages • NPWWTP produces a significant proportion of NPDC's Green House Gas (GHG) emissions	• Operational efficiency reviews • Trade waste bylaws and associated enforcement • Wai Warrior education campaign • Water Conservation Plan • Resource Efficiency and GHG Emission Policy • Energy Management Program - Emergency Management site on the intranet • TDF Replacement	

3.3 Statutory and Regulatory Requirements documents

The statutory and regulatory documents that are relevant for wastewater assets are detailed in **Table 5**.

Table 5: Relevant legislation and other documents

Document	Relevance to the Wastewater AMP
Legislation	
LGA 2002 and Amendments	This Act sets the statutory requirements for local governments and includes the mandatory preparation and adoption of a 30 year Infrastructure Strategy that underpins each LTP.
Health (Drinking Water) Amendment Act 2007	This aims to protect public health by improving the quality of drinking-water provided to communities
Resource Management Act 1991 and Amendments (RMA)	This is the primary legislation dealing with the management of natural and physical resources. It provides a national framework to manage land, air, water and soil resources, the coast, subdivision and the control of pollution, contaminants and hazardous substances.
Fire and Emergency New Zealand Act 2017 and Amendments	This Act provides the framework under which Fire and Emergency New Zealand operate.
Civil Defence Emergency Management Act 2002 and Amendments	The Act requires that an emergency management plan is maintained and reviewed annually and that it is accepted as suitable by independent review.
Health and Safety at Work Act 2015 and Amendments	The objective of this Act is to promote the prevention of harm to all people at work, and others in, or in the vicinity of, places of work

Document	Relevance to the Wastewater AMP
Legislation	
Building Act 2004 and Amendments	In New Zealand, the building of houses and other buildings is controlled by this Act. It applies to the construction of new buildings as well as the alteration and demolition of existing buildings.
The Hazardous Substances and New Organisms Act 1996 (HSNO) and Amendments	The use of hazardous substances at any wastewater sites needs to comply with this Act.
Climate Change Response Act 2002 and Amendments	This Act created a legal framework for New Zealand to ratify the Kyoto Protocol and to meet obligations under the United Nations Framework Convention on Climate Change.
Public Works Act 1981 and Amendments	This Act acknowledges that works often cannot be carried out without affecting private landowners. It provides the Crown with legislative powers to compulsorily acquire land for public works so that public works proposals are not unreasonably delayed.
Other Documents	
Health and Safety at Work (Hazardous Substances) Regulations 2017	The regulation of hazardous substances that affect human health and safety in the workplace sits under the Health and Safety at Work Act 2015. Of relevance is the handling of hazardous substances in regard to wastewater.
Wastewater Services Management System and Contracts	The service levels, strategies, and information requirements described in the AMP are incorporated within contract specifications, Key Performance Indicators and reporting documentation.
Drinking-water Standards for New Zealand 2005 (Revised 2018) (DWSNZ)	The availability of safe drinking-water for all New Zealanders, irrespective of where they live, is a fundamental requirement for public health. The DWSNZ provide requirements for drinking-water safety.
NZ Standard NZS 4404:2010 – Land development and subdivision infrastructure	This Standard provides criteria for design and construction of land development and subdivision infrastructure.

Document	Relevance to the Stormwater and Flood Protection AMP
Other Documents	
Land development and subdivision infrastructure standard (local amendment Version 3)	This Standard was jointly prepared by NPDC, South Taranaki District Council (STDC), and Stratford District Council (SDC) and is based on NZS 4404:2010.
Water and Sanitary Assessment (2009)	This document provides an assessment of water services as required by the 2002 LGA.
New Zealand Infrastructure Asset Grading Guidelines (1999)	This is a guide used when carrying out condition assessments to determine the grading of assets life and condition.
Water, Wastewater and Stormwater Services Bylaw (2008, amended and readopted in 2014)	Part 10 of this Bylaw addresses the requirements for wastewater additional to the general requirements in the Bylaw.
NPDC Trade Waste Bylaw – Part 11 (2008, amended and readopted in 2013)	This Bylaw sets limits on the amount of instantaneous and daily mass Biological Oxygen Demand (BOD) that can be discharged.
Operative New Plymouth District Plan (2005) and Proposed District Plan (2019)	The District Plan includes objectives, policies and rules that manage the adverse effects of activities on the environment with a focus on land use and subdivision activities.
National Policy Statement for Freshwater Management (NPS-FW) (2020)	The NPS-FW provides local authorities with direction on how to manage freshwater under the RMA.
Resource Management (National Environmental Standards for Freshwater) Regulations 2020 (Freshwater NES)	The Freshwater NES regulates activities that pose risks to the health of freshwater and freshwater ecosystems.
Regional Fresh Water Plan (2001)	The Regional Fresh Water Plan promotes sustainable management of the region's freshwater resources by applying rules and conditions to various activities. The Plan is currently under review.
Guidelines for Earthworks (2006)	The aim of these guidelines is to provide guidance to consulting engineers and contractors working within the Taranaki region (the region), on practical measures to help them meet the conditions of the earthwork activities rules contained in the Regional Fresh Water Plan.

Document	Relevance to the Stormwater and Flood Protection AMP
Other Documents	
Guidelines for the Safe Application of Biosolids to Land in New Zealand (2003)	The Guidelines encourage producers, end users and regulators of biosolids, as well as local communities, iwi and interest groups to adopt current best practice for the application of biosolids to land.
Water Master Plan (ECM#: 7136169)	The Master Plan is intended to identify the key issues and deliverables required to ensure a future proofed sustainable, resilient and cost-effective water supply system for the community.
Three Waters and Resource Recovery Pandemic Plan (ECM#: 983033)	This Pandemic Plan specifies the actions to be taken by NPDC Three Waters Team and Resource Recovery Team in response to the threat of or in the event of an actual pandemic or epidemic. This Pandemic Plan should be read in conjunction with the Three Waters and Resource Recovery Business Continuity Plan and the Three Waters and Resource Recovery Incident Response Plan.

4. Levels of Service

The Levels of Service for wastewater are driven by the Council's overall service objectives in the LTP, customer expectations, and legislative and technical requirements. The Capex and Opex investment programmes included in this AMP are based on effective asset management that delivers on these objectives, expectations, and requirements.

4.1 Customer Levels of Service

The Customer Levels of Service included in the LTP, together with target levels and a snapshot of past performance are shown in **Table 6**.

Table 6: Customer Levels of Service

Asset Management Driver	Wastewater Objective	What you can expect	How we measure performance	Actual 2019/20	Target 2021/22	Target 2022/23	Target 2023/24	Target 2030/31
1 & 4		Provide an effective wastewater treatment and disposal system.	The number of dry weather sewerage overflows per 1,000 connections to the wastewater system.	1.07	1.5	1.5	1.5	1.5
1, 3, & 4	B, C & E	Comply with all resource consents for wastewater discharge from our system.	The number of abatement notices received.	3	0	0	0	0
1, 3, & 4	B, C & E		The number of infringement notices received.	0	0	0	0	0
1, 3, & 4	B, C & E		The number of enforcement orders received.	0	0	0	0	0
1, 3, & 4	B, C & E		The number of convictions received.	0	0	0	0	0
1, 2 & 3	C & E	Respond to customer and maintenance requests in a timely manner.	The median response time to sewerage overflow callouts (from the time the Council receives notification to the time that service personnel reach the site).	0.64	1 hour or less	1 hour or less	1 hour or less	1 hour or less
1, 2 & 3	C & E		The median resolution time for sewerage overflow callouts (from the time the Council receives notification to the time that service personnel confirm resolution of the fault or interruption).	2.33 No callouts	4 hours or less for sewers <250 dia 8 hours or less for sewers ≥250 dia	4 hours or less for sewers <250 dia 8 hours or less for sewers ≥250 dia	4 hours or less for sewers <250 dia 8 hours or less for sewers ≥250 dia	4 hours or less for sewers <250 dia 8 hours or less for sewers ≥250 dia
1 & 4	A & B	Ensure customers are satisfied with the wastewater treatment and disposal service	The total number of complaints received about sewerage odour, system faults or blockages, or the Council's response to issues with the sewerage system (per 1,000 connected properties).	6.52	13 or less	13 or less	13 or less	13 or less

4.2 Technical Levels of Service

To meet legislative requirements, the following Technical Levels of Service are applied:

- **NPDC Water, Wastewater and Stormwater Services Bylaw –** As noted in **Table 5**, this Bylaw covers specific requirements for wastewater as well as general requirements for the Three Waters
- Requirements and conditions of resource consents from Taranaki Regional Council (TRC) and NPDC

4.3 Level of Service Projects

To ensure the Three Waters Service meets community expectations, a number of projects have been identified to improve and maintain Levels of Service over the 10 year period of the AMP. The Three Waters Service also has a number of general initiatives, plans, and projects planned over the period of the AMP.

The Level of Service Projects are listed in **Table 7**. The alignment of each project to the Asset Management Drivers and key issues for wastewater (see **Section 3: Strategic Framework**) is also identified.

Table 7: Level of Service Projects

Project Budget Code	Project Description	Asset Management Driver	Key Issues
WW1091	Pump Station Fall Protection	1 & 4	4
WW2001	Urenui & Onaero Sewer System	1 & 4	6
WW2002	Wastewater Pumpstation Overflow Prevention	1, 2 & 4	6
WW2300	Inglewood Dump Station	1 & 4	4
WW2301	TDF Crown Infrastructure funded	1, 2 & 4	4, 10 & 11
WW2302	NPWWTP Screenings Handling Equipment Upgrade	1 & 4	4 & 6
WW3007	Golf Course Sewer Trunk Main Remediation	2 & 4	7
WW3009	Bell Block Trunk Sewer - Capacity Upgrade	1 & 4	4 & 9
WW3010	Mangati SPS Emergency Storage	1 & 4	4
WW3015	Screens for Maintenance Bypass of NPWWTP Inlet Works	1 & 4	4 & 6
WW3016	Corbett Park Pump Station Upgrade Project	1 & 4	4
WW3017	Inglewood Oxidation Ponds and Pump Station Upgrade Project	1 & 4	4
WW3018	Shearer Reserve Pump Station Upgrade Project	1 & 4	4
WW3019	Te Henui Pump Station Upgrade Project	1 & 4	4, 5 & 9
WW3020	Wastewater pipe bridge Upgrade Programme	1 & 4	7 & 8
WW3021	Waitara Wastewater Pumping System Upgrade	1 & 4	4
WW3025	Wastewater Pump Station Flow Meters	1 & 4	4 & 9

Key: Strategic Projects (see **Section 4: Strategic Framework of the Strategic Asset Management Plan**)

Details for key Level of Service Projects are provided below:

WW2001: Urenui and Onaero Wastewater
The Urenui and Onaero campground sewage schemes are currently in breach of consent due to the high flows experienced during peak season (Urenui and Onaero) and when it rains (Urenui). NPDC are currently looking to adjust the consent to make the current activity comply; however, this is only likely to be permitted on a temporary basis. As such a longer term solution needs to be found. The leach fields for these schemes are also at risk of failure due to coastal erosion (immediate for Onaero, and 20-80 years for Urenui).

In addition, the NPDC stormwater system at Urenui township is contaminated with faecal matter from poorly functioning septic tank systems. This places human health at risk as well as having a negative environmental impact, and places NPDC at risk of prosecution. Initial investigations have indicated this is due to a combination of poorly maintained septic tanks combined with an inappropriate combination of geology, section size, and groundwater level. This means that this is not a problem that can be solved just through enforcement action with the septic tank owners.

This project will aim to address the above issues through a combination of short and long term actions. The short term actions are: investigating possible enforcement actions (with the Building Consents Team) and creation of a communications plan for Urenui township and undertaking I&I investigations for Urenui campground. The long term action is to undertake concept design for options to resolve the consent compliance and coastal erosion issues at Urenui and Onaero campgrounds and the stormwater contamination issues at Urenui township.

WW2301: Thermal Drying Facility Replacement
The TDF project will replace an end-of-life thermal sludge dryer at the NPWWTP with a new thermal sludge dryer. The new dryer will use natural gas to supply the heat required but will also be able to make use of low-emission hydrogen (so as to reduce GHG emissions).

The earthquake-prone buildings associated with sludge drying (including administration and laboratories for quality assurance) are also to be replaced with a building appropriate to meeting the needs of Importance Level 4 (IL4) activities (wastewater treatment).

The current project programme including terminal float runs to 30 June 2024. The project will result in the following new assets:

- Thermal sludge dryer capable of producing dried biosolids of a standard to allow beneficial use
- Equipment associated with enabling the new thermal sludge dryer to utilise hydrogen to supply some of its required heat
- New building to house the thermal sludge dryer and associated civil works (e.g. bio filter) and road infrastructure changes
- New building to house administration, control and laboratory facilities along with associated road changes and parking infrastructure

WW3009: Bell Block Trunk Sewer – Capacity Upgrade
The Bell Block trunk sewer has exceeded its design capacity and is surcharging. Analysis indicates that by using the Area Q Pump Station to detain peak flows there is around 10 years before the pipe is expected to begin overflowing; therefore, the pipeline needs to be upgraded or duplicated well before 2030 (refer: ECM#: 8275791).

WW3019: Te Henui Pump Station Upgrade Project
There is some evidence that wastewater is being stored in the reticulation at times of peak flow indicating that this pump station is operating at capacity and has no room for growth. The wastewater network modelling will confirm if this correct and the scale of the issue.

The Capex forecast for the Level of Service Projects over the 10 year period of the AMP is shown in **Table 15** in **Section 8: Financial Summary**.

5. Future Demand

Average wastewater flows to the NPWWTP have increased by approximately 12.3% over the past 17 years, from around 23,000m^3/day in 2000 to around 25,829m^3/day in 2017. Peak flows have also increased over this period, from around 36,928m^3/day in 2000 to around 38,774m^3/day in 2017 – a 5% increase.

An estimated 70% to 80% of potable water is returned to the wastewater system, directly impacting volumes of dry weather wastewater discharges. It is known that the vast majority of the flow to the NPWWTP is from domestic sources (around 92%) with the remaining being contributed by trade waste customers.

The average BOD to the NPWWTP has gradually increased, from around 3,500kg/day in 2000 to approximately 5,900kg/day in 2015. Peak BOD to the NPWWTP has also gradually increased, from around 5,000kg/day in 2000 to about 16,600kg/day in 2015.

Around 70% of the BOD load to the NPWWTP is from domestic sources with the greater portion of the remaining load stemming from the largest trade waste customer (nearly 30%). The BOD load from other trade waste customers is very minimal (less than 5%). This means that while the largest trade waste customer contributes only about 9% of the total flow to the NPWWTP, the BOD load arising from this customer is significantly high (30% of the total BOD to the NPWWTP). In recent years, the NPDC Trade Waste Bylaw and recent trade waste consent conditions have set limits on the amount of instantaneous and daily mass

BOD that can be discharged. As a result, the largest trade customer constructed a pre-treatment Dissolved Air Flotation (DAF) plant (which was commissioned in February 2015).

The average Chemical Oxygen Demand (COD) to the NPWWTP has moderately increased from around 6,850kg/day in 2000 to about 12,600kg/day in 2015. The peak COD has gradually increased from approximately 10,230kg/day in 2000 to about 16,600kg/day in 2015. These increases, coupled with the residential growth predictions for New Plymouth, were the predominant drivers of the aeration upgrade to the NPWWTP.

The rate of inflow and infiltration of rainwater into the wastewater network is a key contributor to wastewater treatment plant influent flows. There are projects underway aimed at reducing wastewater inflow and infiltration issues in the worst wastewater catchments to a manageable level within the next 20 years. Although it is aimed to largely resolve issues with excessive infiltration, as the system ages infiltration will continue to contribute to wastewater volumes. Further, the rate of inflow/infiltration will be aggravated by climate change, which is expected to produce more intensive and frequent rainfall.

Wastewater Flow Projections
For the purpose of estimating future wastewater flows it is currently assumed that:

- The average flow trends for the domestic flows at the NPWWTP will be consistent
- The average flow trend for the largest trade waste customer will be consistent
- Peak daily flows will be calculated by applying a peaking factor of 1.6 to the municipal flows. A peaking factor will not be applied to industrial flows as it is assumed that these will be unaffected by storm flows.
- Volumes of trade waste will grow at the same rate as domestic flows, except for the main trade waste customer, which will be considered separately
- The impact of reduced water consumption on future wastewater volumes will be offset by the inflow/infiltration allowance
- Residential Area Q will ultimately generate an additional average dry weather flow of 1,477m³/day, with a peak wet weather flow allowance of 7,387m³/day
- Industrial Area N will generate an additional average dry weather flow of 588m³/day, with a peak wet weather flow allowance of 2,938m³/day
- Water treatment plant sludge may not be directed to the NPWWTP

These assumptions will be reviewed and updated as part of the network modelling project.

Wastewater Biological Load Projections
For the purpose of estimating future wastewater biological load it is assumed that:

- Trends in the average BOD for domestic flows to the NPWWTP will remain the same
- Trade waste BOD forecasts will assume that the daily mass BOD limit is enforced

- The total peak BOD load to the NPWWTP will increase at an average to peak flow ratio similar to the trend that has occurred in the last 17 years
- The BOD load from the main trade waste contributors will be considered separately. The BOD load of all other trade waste will grow at the same rate as domestic contributors.

The Three Waters Team under taking a strategic Water Master Planing to manage the expected growth of the district in relation to water supply. During the 2021-31 LTP period, it is planned to undertake Wastewater Master Planing to ensure that forecast population growth and climate change are catered for in a coordinated way. Step one will be the creation of the network model. Step two will be the creation of a improvement plan for the WWTP. This is an improvement action and is recorded in **Section 9: Improvement Plan**.

Wastewater Master Planning will provide a number of benefits, including:

- Clearly defined technical standards for wastewater system performance
- Strategic approach to growth and development so that upstream development is planned for
- More consistent and reliable delivery of defined Levels of Service

It is essential that the Three Waters Service build and introduce up-to-date, validated system models across the wastewater system to optimise works and projects associated with renewals, Levels of Service and growth. This is an improvement action and is recorded in **Section 9: Improvement Plan**.

A provision for building network models has been included for producing a Network Model Management Plan and for future maintenance and upkeep of models in the reticulation network (**Project: WW2003**).

5.1 Growth Projects

The Growth Projects related to wastewater assets are listed in **Table 8**. The alignment of each project to the Asset Management Drivers and key issues for wastewater (see **Section 3: Strategic Framework**) is also identified.

Table 8: Growth Projects

Project Budget Code	Project Description	Asset Management Driver	Key Issues
WW1018	Waimea Valley Sewer Extension	1 & 3	4
WW2003	Wastewater Network Modelling	3	3, 4 & 9
WW2006	Sewer Services For Subdivisions In Un-Service	3 & 4	4
WW2009	Upgrading of Huatoki Valley Sewer Main	3	4
WW2010	Wastewater Model Build and Update	1 & 3	4
WW2019	Eastern Sewer Network Realignment	3 & 4	4
WW2022	Junction Growth Area Sewer Upgrade Thames	3 & 4	4 & 9

Key: Strategic Projects (see **Section 4: Strategic Framework** of the **Asset Management Strategy**)

Information for key Growth Projects is provided below:

WW2003: Wastewater Network Modelling
The capacity and performance of the wastewater systems in the district is not fully understood. It is known that sections of the wastewater system have significant wet weather inflow and infiltration problems generating flows that are well above design standards and system capacity. This results in uncontrolled sewage overflows to the environment.

Strategic planning for growth requires detailed knowledge of the wastewater systems performance. Currently new subdivision wastewater flows are being added into systems without a full understanding of the loading implications. This further increases the potential for uncontrolled sewage overflows to the environment.

WW2006: Sewer Services for Subdivisions in Un-Service
As urban areas are extended, opportunities for subdivisions and development are created. In some instances, there are no wastewater services in these areas and developers are expected to extend wastewater services across vast distances to dispose of sewage from proposed subdivisions. This can discourage them from proceeding. These funds to extend wastewater services and can be utilised on an as and when required basis to encourage development.

WW2009: Upgrading of Huatoki Valley Sewer Main
In the past five years new subdivisions have been developed adjacent to Fernbrook Drive. These subdivisions dispose of wastewater in the Huatoki Valley wastewater trunk main. Additional phases of the Fernbrook development which have been recently consented, will also be disposing wastewater to this trunk main. Other future subdivisions, i.e. Balance Street, Fernbrook Stage 7, subdivisions between Fernbrook Stage 7 and Atkinson Road, etc. will also dispose wastewater into the Huatoki Valley wastewater trunk main. Calculations show the Huatoki Valley wastewater trunk main will reach its maximum capacity once the existing and consented subdivisions are fully developed. In order to allow any more development in the Huatoki Valley, the wastewater network needs to be upgraded.

WW2010 - Wastewater Model Build and Update
Wastewater model updating is not currently budgeted but models are assets and essential tools to optimise the capital works programme, particularly service level and growth. This project will follow on from WW2003 to establish a new network model and manage/update it in accordance with a new Waste Water Network Modelling Management Plan.

WW2019 - Eastern Sewer Network Realignment
This project involves the construction of a trunk wastewater main, pump station and rising main to provide wastewater service to Area N. The main will also provide the ability to divert wastewater from Inglewood, Tegel, and McKechnie Aluminium Solutions relieving the load and potential overflows at Mangati Pump Station. This project also includes upgrading some existing pipework in Katere Road and communications with Glen Avon Pump Station to ensure Area N stops pumping if there is a fault.

WW2022 - Junction Growth Area Sewer Upgrade Thames
This project involves the upgrade of the existing wastewater reticulation network to service the anticipated growth area at Junction Street.

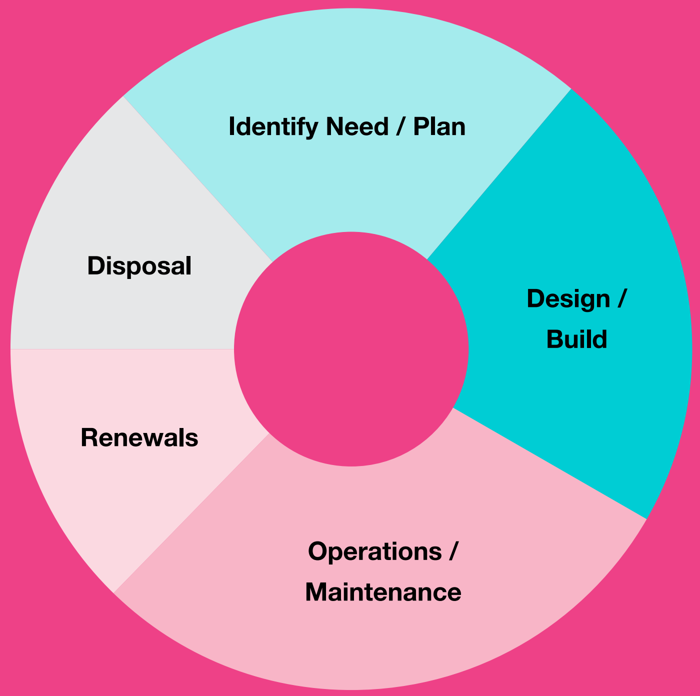
The Capex forecast for the Growth Projects over the 10 year period of the AMP is provided in **Table 16** in **Section 8: Financial Summary**.

6. Lifecycle

The lifecycle of an asset has five main stages as shown in **Figure 2** and detailed in **Section 7: Asset Lifecycle** of the **Asset Management Strategy**.

General information about the lifecycle management of wastewater assets is below. Detailed lifecycle management is covered in each of the **Wastewater AMP: Volumes 1-3**.

Figure 1: Asset lifecycle



6.1 Identify Need and Plan

The Three Waters Team determines the need for new wastewater assets by using the Council's Portfolio, Programme and Project Management (P3M) framework.

6.1.1 Asset Condition

Table 6 in **Section 7: Asset Lifecycle** of the **Asset Management Strategy** outlines the condition grades for assets. In previous AMPs, asset condition was determined by the Three Waters Team's knowledge and experience. Condition grades for assets have been provided in this AMP; however, a robust data quality system is needed to determine the grades more reliably. There is an improvement action for asset condition data in **Section 10: Asset Management Improvement Programme** of the **Asset Management Strategy**.

Table 9 outlines available condition assessment methods for wastewater pipes and examples of each technology.

Table 9: Current available technologies for wastewater pipelines

Condition Assessment Methods	Description	Examples
Pressure testing	Confirms the limits of pipelines in terms of maximum pressure, leaks, joint and fitting integrity	Isolate the pipe and raise the pressure to the required level and hold for a specific time
Visual inspection	Assesses the internal or external surface condition of the pipe by a visual inspection	Visual inspection by the trained field technician
Pitting depth measurement	Measures wall thickness loss of the pipeline	Pit depth gauge
Direct Current Voltage Gradient (DCVG) survey	Assesses coating condition of buried steel structure	DCVG Survey
Electromagnetic inspection	Inspects ferromagnetic pipes condition (external or internal) using electromagnetic technology	• Magnetic Flux Leakage (MFL) • Remote field eddy current • Broadband electromagnetic • Pulsed eddy current • Ground penetrating radar survey • Pipe Diver
Acoustic inspection	Utilises sound waves to determine the location and extent of defects in the pipe	• Acoustic emission leak detection • Smart Ball or Sahara • Leak finder-ST • SL Rat®
Ultrasonic Testing (UT)	Pipe external or internal screening tool for corrosion/erosion at discrete locations	• Ultrasonic wall thickness check • UT in-line inspection survey • Long-range UT

Condition Assessment Methods	Description	Examples
CCTV or video camera inspection including laser or sonar profiling	Uses laser technology to create a pipe interior wall profile	• Laser and sonar profiling system (3D scan) • CCTV inspection
Infrared pipeline testing	Detects and locates subsurface pipeline leaks	• Infrared thermographic
Operational results analysis	Analysis of operational interventions to predict the condition of the pipes e.g. leaks	• Operational data monitoring and analysis
Pipeline sampling	Take pipe samples for condition assessment	• Asbestos Cement (AC) pipe sample Computerised Tomography (CT) scan/analysis • Cross Sonic Logging (CSL) pipe sample analysis

Explanations for some of the examples detailed in **Table 9** are provided below:

- **MFL –** is a magnetic method of non-destructive testing that is used to detect corrosion and pitting in steel structures. The principle is that a powerful magnet is used to magnetise the steel. At areas with missing metal, the magnetic field leaks from the steel and MFL tool detects the leakage.
- **Remote field eddy current –** is a method of non-destructive testing using low-frequency alternating current to identify defects in steel pipes and tubes
- **Broadband electromagnetic –** works by inducing eddy currents to flow in close proximity to the transmitter in a ferrous pipe. The eddy currents migrate with time, allowing a complete profile of the ferrous pipe to be obtained.
- **Pulsed eddy current –** an electromagnetic method is used to determine the wall thickness of the metal component. A probe induces eddy currents in a component, and the probe measures wall thickness by tracking the amount of time it takes the eddy currents to decay. The thicker the wall, the longer it takes for the eddy currents to decay to zero.
- **Acoustic emission testing –** is a non-destructive testing method that is based on waves produced by a sudden redistribution of stress in a material
- **UT –** is a family of non-destructive testing techniques based on the propagation of ultrasonic waves in the object or material tested
- **Infrared thermographic –** is a form of non-destructive testing that measures temperature variances of a component as heat flow though

6.1.2 Remaining Useful Life

Asset condition is a key parameter in determining the Remaining Useful Life (RUL) of an asset and can be used to predict how long it will be before an asset needs to repaired, renewed or replaced. Asset condition is also an indicator of how well an asset is able to perform its function.

The RUL of assets have been recorded in the **Wastewater AMP: Volumes 1-3**. Condition ratings for underground assets where inspection programmes are not currently in place are predominantly inferred from the assets age, and known failure profiles. A CCTV programme is in place for Wastewater assets, which attributes a condition rating inline with the methodology in the New Zealand Pipe Inspection Manual. Where visual inspection is possible professional judgement and experience is relied upon to determine the condition rating. There is an improvement action in **Section 10: Asset Management Improvement Programme** of the **Asset Management Strategy** to address this.

6.1.3 Critical Assets

There is currently no definition for critical assets; however, critical wastewater assets have been identified in the **Wastewater AMP: Volumes 1-3**, where possible. This information is based on the Three Waters Team's knowledge and experience.

The Three Waters Team recently commenced a programme to assess and record criticality ratings for P&E assets in the EAM asset inventory. This process is only partially complete and is recorded as an improvement action in **Section 9: Improvement Plan**.

Table 7 in **Section 7: Asset Lifecycle** of the **Asset Management Strategy** outlines the criticality ratings for assets. No criticality ratings have been provided for assets in this AMP as a more robust data quality system is needed to determine the ratings more accurately, and there is an improvement action for asset data in **Section 10: Asset Management Improvement Programme** of the **Asset Management Strategy**.

6.1.3.1 Critical Spares

Critical spares are the parts within critical equipment that, should they fail, will badly reduce or stop production, or harm the organisation, or a person, or the community.

Refer to **Section 2: Lifecycle** in the **Wastewater AMP: Volumes 1-3** for information about critical spares for wastewater assets.

6.2 Design and Build

The design and build of wastewater assets is managed by the Council's Projects Team. The Projects Team typically works closely with designers, the Council's engineers and consultant engineers, to lead the project through the necessary stages, depending upon the risk to the Council, complexity of the project, financial implications and integration in the wider network.

Development works are planned in response to identified service gaps, growth and demand issues, risk issues and economic considerations.

6.3 Operating and Maintenance

The operation and maintenance of wastewater assets is undertaken by several different teams within the Council. Further details are below:

- The Wastewater Treatment Plant Operations Team maintains the everyday running of the plant. They also schedule in routine maintenance on the various plant with specialist suppliers and contractors.
- The Network and Customer Team work with the maintenance contractor to operate the wastewater reticulation system. This team also works closely with the Mechanical Maintenance Team on wastewater valves, the Control Systems Team on the operation of pump stations and the Asset Data Team to ensure that any changes to the network are recorded.

There are a number of issues in regard to the operation and maintenance of wastewater assets. These are listed below:

- There is currently no Maintenance Management Plan detailing how the Three Waters Team identify, record, measure, analyse, and optimise/improve maintenance activity and performance. This has resulted in high levels of reactive maintenance and its associated higher levels of risk and cost.
- There are large discrepancies between the asset inventory of P&E assets and the physical assets that exist on site. This has resulted in undervaluation of P&E assets and in unrecorded assets having no defined scheduled maintenance.
- Many of the mechanical P&E equipment assets do not have any scheduled maintenance activities assigned to them. This has resulted in high levels of reactive maintenance and the associated higher levels of risk and cost. It has also resulted in poor reliability.
- The Three Waters Team record and schedule most maintenance tasks using EAM. However, I&E maintenance is not scheduled in EAM, which makes it difficult to monitor and measure performance.
- A significant number of P&E assets are not tagged with P&ID reference numbers. This is not consistent with good engineering practice and makes it difficult to identify equipment on-site.
- Many P&IDs and layout drawings for P&E are inaccurate, incomplete, or out of date. This causes delays and additional costs during project planning, and creates potential safety issues when operating equipment.

Improvement actions have been identified for these issues in **Section 9: Improvement Plan**.

6.3.1 Opex Projects

Opex funding related to Capex projects and general operating expenditure is allocated for scheduled and routine maintenance of wastewater assets (see **Tables 19 and 20 in Section 8: Financial Summary**).

Table 10 shows the Opex Projects that are related to the Capex Projects, which are planned during the 10 year period of the AMP. These projects have seed funding allocated for the initial planning stage and/or when the project is completed.

The alignment of each project to the Asset Management Drivers and key issues for wastewater (see **Section 3: Strategic Framework**) is also identified.

Table 10: Opex Projects related to Capex Projects

Project Budget Code	Project Description	Asset Management Driver	Key Issues
WW1018	Waimea Valley Sewer Extension	1 & 3	4
WW1091	Pump Station Fall Protection	1	4
WW2001	Urenui & Onaero Sewer System	1 & 4	6
WW2002	Wastewater Pumpstation Overflow Prevention	1, 2 &4	6
WW2003	Wastewater Network Modelling	1 & 3	3, 4 & 9
WW2004	Effluent Buffer Lagoon	1, 3 & 4	4
WW2006	Sewer Services For Subdivisions In Un-Service	1, 3 & 4	4
WW2009	Upgrading of Huatoki Valley Sewer Main	1 & 3	4
WW2019	Eastern Sewer Network Realignment	1, 3 & 4	4
WW2022	Junction Growth Area Sewer Upgrade Thames	1, 3 & 4	4 & 9
WW2302	NPWWTP Screenings Handling Equipment Upgrade	1 & 4	4 & 6
WW3009	Bell Block Trunk Sewer - Capacity Upgrade	1 & 4	4 & 9
WW3010	Mangati SPS Emergency Storage	1	4
WW3013	Alternatives for Disposal of Dewatered Sludge at NPWWTP	1 & 2	6
WW3015	Screens for Maintenance Bypass of NPWWTP Inlet Works	1 & 4	4 & 6
WW3016	Corbett Park Pump Station Upgrade Project	1	4
WW3017	Inglewood Oxidation Ponds and Pump Station Upgrade Project	1 & 4	4
WW3018	Shearer Reserve Pump Station Upgrade Project	1	4
WW3019	Te Henui Pump Station Upgrade Project	1	4, 5 & 9
WW3020	Wastewater pipe bridge Upgrade Programme	1 & 4	7 & 8
WW3021	Waitara Wastewater Pumping System Upgrade	1	4
WW3025	Wastewater Pump Station Flow Meters	1	4 & 9
WW3026	Patterson Road Sewer Pump Station	1 & 3	4

Key: Strategic Projects (see **Section 4: Strategic Framework** of the **Asset Management Strategy**)

The expenditure forecast for Opex Projects which are related to Capex Projects over the 10 year period of the AMP is provided in **Table 18** in **Section 8: Financial Summary**.

There are a number of Opex Projects for wastewater assets that are not related to a specific Capex Project as detailed in **Table 11.**

Table 11: Opex Projects (not related to Capex Projects)

Project Description	Asset Management Driver	Key Issues
Wastewater network Containment Standard	1 & 3	3 & 9
Remediate Sludge Lagoon NPWWTP	1 & 3	10
As-Built Survey of all Pipe Bridges	1, 2 & 3	1 & 7
Asset Inspection Research Project	1 & 2	2
Resilience Framework & Level of Service	1	4 & 9
Wastewater Buildings Asbestos Surveys	1	2
Riparian Planting NPWWTP	1 & 4	7

The expenditure forecast for these Opex Projects over the 10 year period of the AMP is provided in **Table 19** in **Section 8: Financial Summary**.

6.4. Renewals

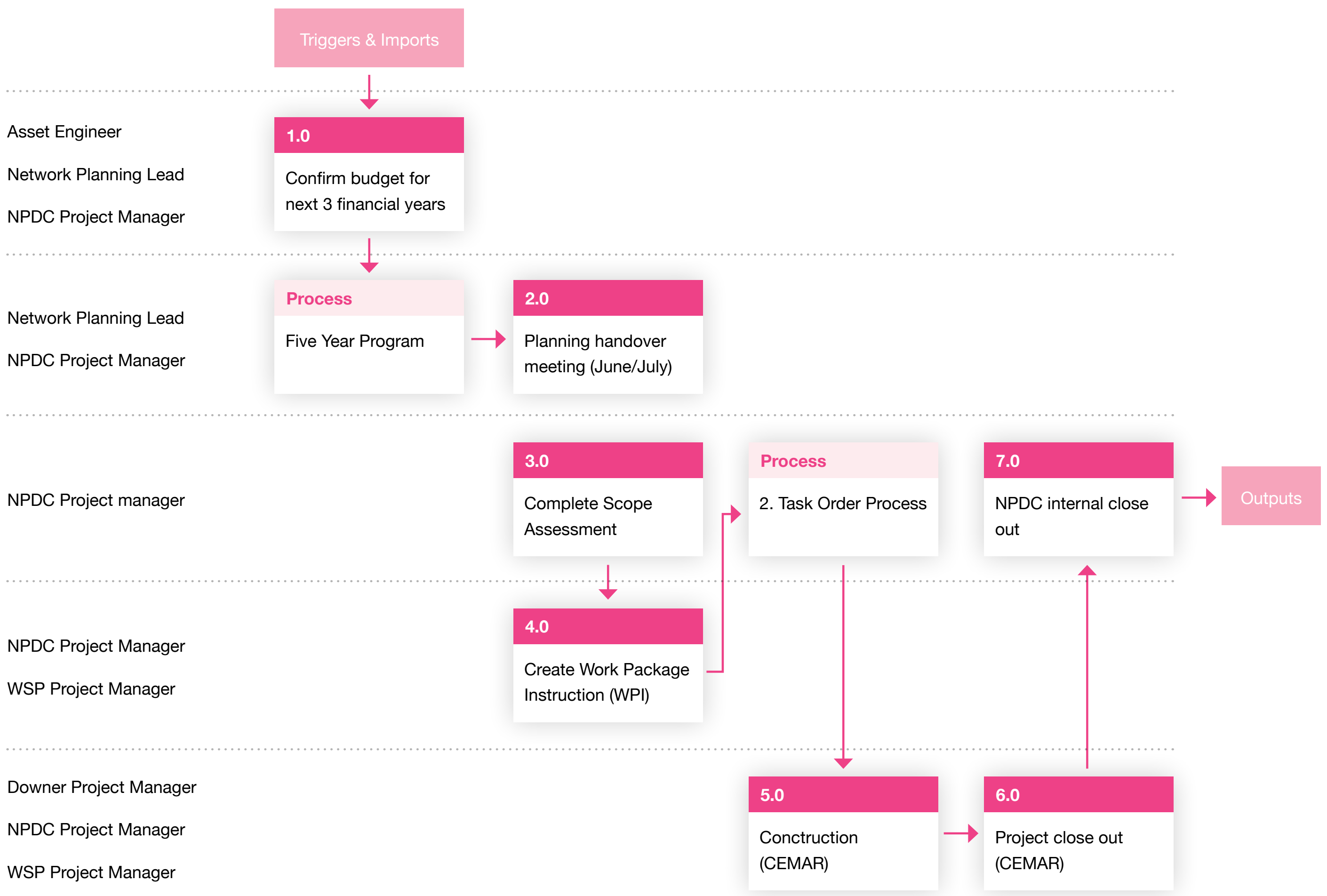
The Council's Asset Management and Network Planning Team determine a schedule of renewals on a three-yearly basis. The reticulation renewals projects are delivered by the Projects Team. With respect to P&E renewals the Projects Team delivers larger projects, while the renewal of small-scale mechanical equipment is undertaken by the Maintenance Team.

Asset renewals are determined using condition assessment inspections and the use of Monte Carlo

analysis for planning the improvements. The Monte Carlo analysis provides confidence intervals for funding decisions. This method has been used to determine spend on renewals for the water supply, wastewater and stormwater reticulation systems.

Figure 2 shows the process for the renewal of wastewater assets.

Figure 2: Renewals of wastewater assets



6.4.1 Renewals Projects

Details for Renewals Projects are provided in **Table 12**. The alignment of each project to the Asset Management Drivers and key issues for wastewater (see **Section 3: Strategic Framework**) is also identified.

Table 12: Renewal Projects

Project Budget Code	Project Description	Asset Management Driver	Key Issues
AA0026	West Quay Pump Station	1	7
WW1001	Laboratory Minor Equipment Renewals	1	4
WW1013	Lorna St Sewer Upgrade	1 & 3	4 & 9
WW1036	Emergency Wastewater Retic Network Renewals	1 & 2	4 & 7
WW1055	Waitara Outfall Pipeline Renewals	1	4
WW1056	Resource Consent Renewals Wastewater	1 & 4	10
WW2023	Wastewater Building Renewals	1 & 2	4
WW2026	Laboratory Major Equipment Renewals	1	4
WW2201	Sewer Lining & Rehab of Pipes	1	4
WW3002	Wastewater Reticulation Renewals Full Budget (Medium)	1	4
WW3003	Wastewater Plant, Equipment, I&E Renewals (Medium)	1	9 & 10
WW3006	New Plymouth Outfall Pipeline Renewals	1	4
WW3024	Waitara Pumping Station Purlin Replacement	1 & 2	4

Information for key Renewals Projects is provided:

AA0026: West Quay Pump Station
NPDC have identified the need to relocate the West Quay wastewater pump station out of the Waitara River floodplain due to the unacceptable risk of damage and loss of containment posed by flooding. The pump station also has no emergency storage so does not comply with current codes (NZS 4404). The project objective is to improve the resiliency and Level of Service of the wastewater system in Waitara. The new pump station will be protected from flooding, provide safer access for maintenance, and will future proof the existing system. Future proofing is being achieved by providing new pumps, pipework and valves. Also the operational requirements of the pump station will be improved by including six hours ADWF of emergency storage in the system.

WW1013: Lorna St Sewer Upgrade
The Base Hospital is being redeveloped and will require additional capacity in the Lorna Street sewer. NPDC will have to renew the sewer with the redevelopment project paying for the extra over cost of the additional capacity.

WW1056: Resource Consent Renewals Wastewater
This project is for the renewal of the following consents:

- To erect, place and maintain a marine outfall (known as the Waitara marine outfall) and to occupy the associated space in the coastal marine area:
  - o ECM#: 122248
  - o Expires 01/06/2021
  - o Cost $100,000
  - o Status - already started
- To authorise the application of Bioboost® onto land within the Waikato region as a fertiliser or soil conditioner:
  - o ECM#: 1398699
  - o Expires 01/03/2023
  - o Cost $10,000

WW3024: Waitara Pumping Station Purlin Replacement
NPDC requested an inspection of the corroded purlin sections at the Waitara Transfer Station and to supply recommendations in regard to maintenance requirements.

An external consultant completed an inspection on 20 August 2020. Observations were that the existing galvanised coating system is now failing over a significant portion of the inspected elements and in at least one location on the building (north east) the purlins are losing steel material and therefore structural integrity.

The external consultant advised that maintenance painting would not be suitable and replacement of any failed steel sections is recommended in the next 12 months to maintain integrity of the non-structural (cladding) elements of the building. Given the access and material handling constraints they also believe it is prudent to replace all other affected (corroded) purlin elements local to the site i.e. per building face, during this activity using like for like replacements as it is deemed appropriate and most cost effective.

The cross-bracing elements should also be inspected thoroughly at this time (using scaffold access) to determine if any section loss has occurred and at that time a decision would be made as to whether their condition warranted replacement or repair. For all other galvanised purlins the recommendation is to program for replacement to suit budgetary constraints over the next five years. The Capex forecast for Renewals Projects over the 10 year period of the AMP is provided in **Table 20** in **Section 8: Financial Summary**.

6.5 Disposals

The disposal of wastewater assets typically applies to reticulation assets. On large scale disposal projects, the planning is undertaken by the Asset Management and Network Planning Team and the Projects Team delivering the project for the Council. Smaller scale disposal projects are undertaken by the maintenance contractor.

7. Risk Management

7.1 Risk Assessment

Risk assessments are conducted, recorded, managed, escalated, and monitored in accordance with NPDC's Corporate Risk Management Framework: Policy and Process (ECM#: 1479536). A summary of how the policy and process operate and a list of the current key risks relevant to assets is included in **Section 8: Risk Management** of the **Asset Management Strategy**. The list includes risks that are applicable across all asset categories and those particular to the Three Waters Service.

Table 13 lists the wastewater projects and shows the level of risk and prioritisation for each project. Information for the risk levels is provided in **Section 8: Risk Management** of the **Asset Management Strategy**. Priority 1 projects are scheduled to take place within the first three years of this AMP and Priority 2 projects are scheduled to take place within the first six years of this AMP.

Table 13: Risk level and prioritisation for wastewater projects

Project Budget Code	Project Description	Priority	Risk Level
Level of Service Projects			
WW1091	Pump Station Fall Protection	1	Medium
WW2001	Urenui & Onaero Sewer System	2	Extreme
WW2002	Wastewater Pumpstation Overflow Prevention	2	Medium
WW2300	Inglewood Dump Station	3	Medium
WW2301	TDF Crown Infrastructure funded	1	High
WW2302	Screenings handling	1	Medium
WW3007	Golf Course Sewer Trunk Main Remediation	1	Medium
WW3009	Bell Block Trunk Sewer - Capacity Upgrade	2	High
WW3010	Mangati SPS Emergency Storage	2	High
WW3015	Screens for Maintenance Bypass of NPWWTP Inlet Works	1	Medium
WW3016	Corbett Park Pump Station Upgrade Project	2	High
WW3017	Inglewood Oxidation Ponds and Pump Station Upgrade Project	2	Medium

Key: Strategic Projects (see **Section 4: Strategic Framework of the Strategic Asset Management Plan**)

Project Budget Code	Project Description	Priority	Risk Level
Level of Service Projects			
WW3018	Shearer Reserve Pump Station Upgrade Project	2	High
WW3019	Te Henui Pump Station Upgrade Project	2	Medium
WW3020	Wastewater pipe bridge Upgrade Programme	2	Medium
WW3021	Waitara Wastewater Pumping System Upgrade	2	Extreme
WW3025	Wastewater Pump Station Flow Meters	1	High
Growth Projects			
WW1018	Waimea Valley Sewer Extension	2	Medium
WW2003	Wastewater Network Modelling	1	Medium
WW2006	Sewer Services For Subdivisions In Un-Service	1	Low
WW2009	Upgrading of Huatoki Valley Sewer Main	2	Low
WW2010	Wastewater Model Build and Update	Unknown	Unknown
WW2019	Eastern Sewer Network Realignment	2	High
WW2022	Junction Growth Area Sewer Upgrade Thames	2	Medium
Renewals Projects			
AA0026	West Quay Pump Station	1	High
WW1001	Laboratory Minor Equipment Renewals	Unknown	Unknown
WW1013	Lorna St Sewer Upgrade	1	High
WW1036	Emergency Wastewater Retic Network Renewals	?	Unknown
WW1055	Waitara Outfall Pipeline Renewals	?	Unknown
WW1056	Resource Consent Renewals Wastewater	1	High
WW2023	Wastewater Building Renewals	Unknown	Unknown
WW2026	Laboratory Major Equipment Renewals	Unknown	Unknown
WW2201	Sewer Lining & Rehab of Pipes	Unknown	Unknown
WW3002	Wastewater Reticulation Renewals Full Budget (Medium)	Unknown	Unknown
WW3003	Wastewater Plant, Equipment, I&E Renewals (Medium)	Unknown	Unknown
WW3006	New Plymouth Outfall Pipeline Renewals	Unknown	Unknown
WW3024	Waitara Pumping Station Purlin Replacement	1	High

Key: Strategic Projects (see **Section 4: Strategic Framework of the Strategic Asset Management Plan**)

7.2 Infrastructure Resilience Approach

Information regarding NPDC's infrastructure resilience approach is provided in **Section 8: Risk Management of the Asset Management Strategy**. Additional information for wastewater assets is provided below.

7.2.1 Natural Hazards and Climate Change

Following on from ex-cyclone Gita, which damaged a trunk main crossing a pipe-bridge in February 2018, and the Havelock North Water Inquiry; the importance of the Council's water network has been highlighted. This has resulted in the Council considering the resilience of water assets based on cost versus risk assessments. The Council now plans to invest more on the general resilience of the wastewater network to enhance security and integrity, and increase performance against the Levels of Service. The items that have identified for investment over the period of the AMP include the following:

- More inspections and preventative maintenance of critical assets
- More backup spare parts for critical equipment such as spare pipes, valves and pumps
- Enhancing scenario based planning and mitigation for weather events
- Investigation of options to improve the resilience of the NPWWTP
- Upgrading critical pipe bridges
- Upgrading pump stations to include back up power supplies, warning alarm systems and increased emergency storage
- There is currently no containment standard (or acceptable overflow frequency). This is effectively a resilience Level of Service. To resolve this, it is proposed to create an overflow standard as part of the network modelling project (as this will provide the baseline information to make it possible).
- A number of pump stations, trunk mains, and rising mains are at risk of coastal erosion, river erosion, and coastal inundation. Most notable is the Te Henui Pump Station and rising main. There is also a risk of increased

inflow due to higher groundwater tables as a result of sea level rise. The capacity of the NPWWTP outfall will also be affected by sea level rise.

- There are a number of vulnerable pipe bridges across streams that are below the 1:100 year flood level
- The NPWWTP main administration building is earthquake prone
- Seismic assessments on pump stations have not been completed
- An eruption could cause the network to fail in the following ways:
  - o Loss of power knocking out pump stations
  - o Generators being unable to run due to ash level in the air
  - o Ash getting into sewers from cross connections to the stormwater system blocking pipes, pumps and/or overwhelming the treatment plant
  - o Lahars taking out pipe bridges

7.2.2 Compliance with Legislation and Resource Consent Conditions

The relevant planning documents for wastewater assets are listed in **Table 5**. The Three Waters Service also holds a number of extant resource consents, with conditions that need to be actively monitored and complied with.

Consent conditions are currently being monitored through CS-VUE and resource consents are renewed when required, as detailed in this AMP. Further, new resource consent applications are also obtained for wastewater assets when required.

7.2.3 Pandemics

The Three Waters Team follow the Three Waters and Resource Recovery Pandemic Plan (ECM#: 983033, version 12). As noted in **Table 5**, the Pandemic Plan specifies the actions to be taken by NPDC Three Waters Team and Resource Recovery Team in response to the threat of, or in the event of, an actual pandemic or epidemic.

The key objectives of the action plans are to ensure the Council meets its legal and moral obligations to provide essential services to the community, to protect the health of the public and the Council's workforce, including managing exposure to risk. The Pandemic Plan comes into effect in the event of an Alert Level 1 issued by the New Zealand Government.

The Pandemic Plan should be read in conjunction with the Three Waters and Resource Recovery Business Continuity Plan and the Three Waters and Resource Recovery Incident Response Plan.

8. Financial Summary

This section provides a summary of the relevant financial information for the Wastewater AMP. All financial forecasts show inflation adjusted dollar values.

8.1 Funding Strategy

This service is funded through a Uniform Annual Charge paid by ratepayers connected to the wastewater system. NPDC also charge industrial and commercial users for trade waste discharges. Capital improvements are funded by loans, while the renewal and replacement of wastewater assets is funded from renewal reserves. The replacement value of wastewater assets is $351 million (including land and buildings).

8.2 Valuation Forecasts

The last three yearly statutory valuation of fixed assets was conducted in 2019. Details can be found in the NPDC 2019 Valuation of Plant and Equipment for Three Waters, Solid Waste and Treatment Plants report (ECM#: 8050452). The assets included are all the equipment for wastewater. The valuation also includes onsite pipelines as they are typically not constructed in a manner where NZS 4404 would be applicable.
The valuation of wastewater assets is based on the criticality of assets and is summarised in **Table 14**.

Table 14: Wastewater asset valuation

Asset Type	2019					
	Critical	Important	Moderate	Non-Critical	To Be Determined	Grand Total
Wastewater P&E	43,694,555	48,916,496	84,014,462	31,673,857	143,059,191	351,358,561

8.3 Expenditure Forecast Summary for Opex and Capex

A summary for the general Opex and Capex total expenditure during the LTP period (2021 to 2031) is provided in **Table 15**. The total forecast for wastewater assets is $371.9m. Of this, the total general Opex is $111.7m excluding depreciation and the total Capex is $260.2m.

Table 15: Wastewater expenditure forecast summary for Opex and Capex

Wastewater Expenditure Forecast ($)											
Activity	**21/22**	**22/23**	**23/24**	**24/25**	**25/26**	**26/27**	**27/28**	**28/29**	**29/30**	**30/31**	**LTP Total**
General Operating	2,036,044	2,139,647	2,186,178	2,264,977	2,346,942	2,426,121	2,507,951	2,593,097	2,681,353	2,772,790	**23,955,100**
Direct Cost	3,895,230	3,814,410	4,258,145	4,174,027	4,175,602	4,415,814	4,544,202	4,537,331	4,788,612	4,918,094	**43,521,467**
Internal Charges	3,982,173	4,038,221	4,170,153	4,317,557	4,517,730	4,416,092	4,526,349	4,674,204	4,822,782	4,758,794	**44,224,055**
Total Opex	**9,913,446**	**9,992,279**	**10,614,475**	**10,756,561**	**11,040,274**	**11,258,028**	**11,578,502**	**11,804,632**	**12,292,747**	**12,449,678**	**111,700,622**
Renewals	5,798,553	8,160,003	11,114,593	14,450,800	12,801,227	13,257,749	13,376,987	13,722,159	14,133,216	14,559,292	**121,374,580**
Service Level	10,891,258	10,692,160	17,378,912	13,880,097	12,673,967	15,273,333	9,892,863	4,380,398	4,166,459	4,279,487	**113,508,933**
Growth	3,621,801	2,754,766	2,555,448	1,727,535	133,644	136,980	3,862,995	3,917,259	5,069,671	5,226,053	**29,006,152**
Total Capex	**20,311,612**	**21,606,929**	**31,048,953**	**30,058,432**	**25,608,838**	**28,668,061**	**27,132,844**	**32,019,816**	**23,369,346**	**24,064,832**	**263,889,664**

8.4 Level of Service Projects Capex Forecast Summary

The Capex forecast for Level of Service Projects is shown in **Table 16**

Table 16: Level of Service Projects expenditure forecast

List of Service Forecast ($)														
Project	**21/ 22**	**22/ 23**	**23/ 24**	**24/ 25**	**25/ 26**	**26/ 27**	**27/ 28**	**28/ 29**	**29/ 30**	**30/ 31**	**LTP Total**	**% LOS**	**% GRW**	**% RNL**
WW1091 Pump Station Fall Protection	0	103,010	106,000	108,650	0	0	0	0	0	0	**317,660**	100	0	0
WW2001 Urenui & Onaero Sewer System	503,000	515,050	530,000	1,629,750	3,341,100	5,707,500	5,850,000	3,601,200	3,698,400	3,798,300	**29,174,300**	100	18	0
WW2003 Wastewater Network Modelling	515,877	391,438	54,272	0	0	0	0	0	0	0	**961,587**	20	80	0
WW2002 Wastewater Pumpstation Overflow Prevention	0	0	0	108,710	111,431	114,213	117,513	119,646	122,875	126,679	**821,065**	100	0	0
WW2009 Upgrading of Huatoki Valley Sewer Main	0	0	0	0	0	0	58,500	0	0	0	**58,500**	5	95	0
WW2010 Wastewater Model Build and Update	0	0	5,300	5,433	5,569	5,708	5,850	6,002	6,164	6,331	**46,355**	20	80	0
WW2022 Junction Growth Area Sewer Upgrade Thames	0	0	0	0	0	0	29,250	0	0	0	**29,250**	5	95	0
WW2201 Sewer Lining and Rehab of Pipes	75,450	77,258	79,500	81,488	83,528	85,613	87,750	90,030	92,460	94,958	**848,033**	15	0	85
WW2300 Inglewood Dump Station	0	77,258	0	0	0	0	0	0	0	0	**77,258**	100	0	0
WW2301 TDF Crown Infrastructure funded	8,954,406	6,422,674	13,582,840	9,811,095	0	0	0	0	0	0	**38,771,015**	86	14	0

List of Service Forecast ($)

Project	21/ 22	22/ 23	23/ 24	24/ 25	25/ 26	26/ 27	27/ 28	28/ 29	29/ 30	30/ 31	LTP Total	% LOS	% GRW	% RNL
WW2302 NPWWTP Screenings Handling Equipment Upgrade	301,800	0	0	0	0	0	0	0	0	0	**301,800**	100	0	0
WW3007 Golf Course Sewer Trunk Main Remediation	62,875	0	0	0	0	0	0	0	0	0	**62,875**	50	0	50
WW3009 Bell Block Trunk Sewer - Capacity Upgrade	0	0	0	0	0	3,424,500	3,510,000	0	0	0	**6,934,500**	100	0	0
WW3010 Mangati SPS Emergency Storage	0	2,575,250	2,650,000	0	0	0	0	0	0	0	**5,225,250**	100	0	0
WW3015 Screens for Maintenance Bypass of NPWWTP Inlet Works	201,200	0	0	0	0	0	0	0	0	0	**201,200**	100	0	0
WW3016 Corbett Park Pump Station Upgrade Project	0	0	0	0	5,568,500	0	0	0	0	0	**5,568,500**	100	0	0
WW3017 Inglewood Oxidation Ponds and Pump Station Upgrade Project	0	0	0	0	0	5,707,500	0	0	0	0	**5,707,500**	100	0	0
WW3018 Shearer Reserve Pump Station Upgrade Project	0	0	0	0	3,341,100	0	0	0	0	0	**3,341,100**	100	0	0
WW3019 Te Henui Pump Station Upgrade Project	0	0	0	0	0	0	0	10,323,440	0	0	**10,323,440**	86	14	0
WW3020 Wastewater pipe bridge Upgrade Programme	0	0	0	217,300	222,740	228,300	234,000	240,080	246,560	253,220	**1,642,200**	100	0	0
WW3021 Waitara Wastewater Pumping System Upgrade	276,650	281,732	371,000	1,917,673	0	0	0	0	0	0	**2,847,055**	50	0	50
WW3025 Wastewater Pump Station Flow Meters	0	248,491	0	0	0	0	0	0	0	0	**248,491**	86	14	0
Total	10,891,258	10,692,160	17,378,912	13,880,097	12,673,967	15,273,333	9,892,863	14,380,398	4,166,459	4,279,487	**113,508,933**			

Key: Strategic Projects (see **Section 4: Strategic Framework of the Strategic Asset Management Plan**)

8.5 Growth Projects Capex Forecast Summary

The Capex forecast for Growth Projects is shown in **Table 17**.

Table 17: Growth Projects expenditure forecast

Growth Forecast ($)														
Project	21/ 22	22/ 23	23/ 24	24/ 25	25/ 26	26/ 27	27/ 28	28/ 29	29/ 30	30/ 31	LTP Total	% LOS	% GRW	% RNL
WW1018 Waimea Valley Sewer Extension	0	0	0	0	0	0	2,055,345	2,092,651	0	0	**4,147,996**	0	100	0
WW2003 Wastewater Network Modelling	2,063,507	1,565,752	217,088	0	0	0	0	0	0	0	**3,846,347**	20	80	0
WW2006 Sewer Services For Subdivisions In Un-Service	100,600	103,010	106,000	108,650	111,370	114,150	117,000	120,040	123,280	126,610	**1,130,710**	0	100	0
WW2009 Upgrading of Huatoki Valley Sewer Main	0	0	0	0	0	0	1,111,500	0	0	0	**1,111,500**	5	95	0
WW2010 Wastewater Model Build and Update	0	0	21,200	21,730	22,274	22,830	23,400	24,008	24,656	25,322	**185,420**	20	80	0
WW2019 Eastern Sewer Network Realignment	0	0	0	0	0	0	0	0	4,921,735	5,074,121	**9,995,856**	0	100	0
WW2022 Junction Growth Area Sewer Upgrade Thames	0	0	0	0	0	0	555,750	0	0	0	**555,750**	5	95	0
WW2301 TDF Crown Infrastructure funded	1,457,694	1,045,552	2,211,160	1,597,155	0	0	0	0	0	0	**6,311,561**	86	14	0
WW3019 Te Henui Pump Station Upgrade Project	0	0	0	0	0	0	0	1,680,560	0	0	**1,680,560**	86	14	0
WW3025 Wastewater Pump Station Flow Meters	0	40,452	0	0	0	0	0	0	0	0	**40,452**	86	14	0
Total	**3,621,801**	**2,754,766**	**2,555,448**	**1,727,535**	**133,644**	**136,980**	**3,862,995**	**3,917,259**	**5,069,671**	**5,226,053**	**29,006,152**			

Key: Strategic Projects (see **Section 4: Strategic Framework of the Strategic Asset Management Plan**)

8.6 Opex Projects related to Capex Projects Expenditure Forecast Summary

The overall 10 year Opex expenditure forecast for Stormwater Projects that are related to Capex Projects is shown in **Table 18.**

Table 18: Opex Projects related to Capex Projects expenditure forecast

Opex related to Capex Forecast ($)												
Project	21/ 22	22/ 23	23/ 24	24/ 25	25/ 26	26/ 27	27/ 28	28/ 29	29/ 30	30/ 31	LTP Total	Driver
WW1018 Waimea Valley Sewer Extension	0	0	0	0	0	0	0	0	9,156	9,440	**18,596**	GRW
WW1091 Pump Station Fall Protection	0	0	31,520	32,431	33,242	34,074	35,060	35,696	36,659	37,794	**276,476**	LOS
WW2001 Urenui & Onaero Sewer System	150,000	153,600	158,055	162,000	166,050	170,205	174,465	178,995	183,825	188,790	**1,685,985**	STG
WW2002 Wastewater Pumpstation Overflow Prevention	0	0	0	54,030	55,380	56,766	58,410	59,469	61,074	62,964	**408,093**	LOS
WW2003 Wastewater Network Modelling	240,000	702,464	472,058	0	0	0	0	0	0	0	**1,414,522**	GRW
WW2006 Sewer Services For Subdivisions In Un-Service	0	0	0	162,000	0	0	0	0	0	0	**217,685**	GRW

Key: Strategic Projects (see **Section 4: Strategic Framework of the Strategic Asset Management Plan**)

Opex related to Capex Forecast ($)

Project	21/ 22	22/ 23	23/ 24	24/ 25	25/ 26	26/ 27	27/ 28	28/ 29	29/ 30	30/ 31	LTP Total	Driver
WW2009 Upgrading of Huatoki Valley Sewer Main	0	0	0	108,000	0	0	0	0	0	0	**108,000**	GRW
WW2019 Eastern Sewer Network Realignment	0	0	421,480	432,000	0	0	0	0	0	0	**853,480**	STG
WW2022 Junction Growth Area Sewer Upgrade Thames	0	0	0	0	0	56,735	0	0	0	0	**56,735**	LOS
WW2302 NPWWTP Screenings Handling Equipment Upgrade	0	10,248	10,505	10,808	11,078	11,356	11,685	11,896	12,217	12,596	**102,389**	LOS
WW3009 NPWWTP Screenings Handling Equipment Upgrade	0	0	0	54,000	55,350	0	0	0	0	0	**109,350**	STG
WW3010 Mangati SPS Emergency Storage	0	0	0	324,000	0	0	0	0	0	0	**324,000**	LOS
WW3013 Alternatives for Disposal of Dewatered Sludge at NPWWTP	0	0	0	0	0	0	0	0	0	251,720	**251,720**	GRW
WW3015 Screens for Maintenance Bypass of NPWWTP Inlet Works	0	20,480	21,074	21,600	22,140	22,694	23,262	23,866	24,510	25,172	**204,798**	GRW
WW3016 Corbett Park Pump Station Upgrade Project	0	0	0	270,000	0	0	0	0	0	0	**270,000**	GRW
WW3017 Inglewood Oxidation Ponds and Pump Station Upgrade Project	0	0	0	270,000	0	0	0	0	0	0	**270,000**	LOS
WW3018 Shearer Reserve Pump Station Upgrade Project	0	0	0	162,000	0	0	0	0	0	0	**162,000**	LOS

Key: Strategic Projects (see **Section 4: Strategic Framework of the Strategic Asset Management Plan**)

Opex related to Capex Forecast ($)												
Project	**21/ 22**	**22/ 23**	**23/ 24**	**24/ 25**	**25/ 26**	**26/ 27**	**27/ 28**	**28/ 29**	**29/ 30**	**30/ 31**	**LTP Total**	**Driver**
WW3019 Te Henui Pump Station Upgrade Project	0	0	0	270,000	276,750	0	0	0	0	0	**546,750**	LOS
WW3020 Wastewater pipe bridge Upgrade Programme	0	0	0	0	110,559	113,325	116,607	0	0	0	**340,491**	LOS
WW3021 Waitara Wastewater Pumping System Upgrade - Activity 1005	150,000	153,600	0	0	0	0	0	0	0	0	**303,600**	LOS
WW3025 Wastewater Pump Station Flow Meters	0	0	26,343	27,000	27,675	28,368	29,078	29,833	30,638	31,465	**230,398**	LOS
WW3026 Patterson Road Sewer Pump Station	0	0	0	0	0	226,940	0	0	0	0	**226,940**	LOS
Total	**540,000**	**1,040,392**	**1,141,034**	**2,359,869**	**813,909**	**720,462**	**448,566**	**339,755**	**358,079**	**619,941**	**8,382,007**	

Key: Strategic Projects (see **Section 4: Strategic Framework of the Strategic Asset Management Plan**)

8.7 Opex Projects Expenditure Forecast Summary

The overall 10 year Opex forecast for Opex Projects that are not related to any Capex Projects is shown in **Table 19**.

Table 19: Opex Projects not related to Capex Projects expenditure forecast

Capex Forecast ($)											
Project	**21/ 22**	**22/ 23**	**23/ 24**	**24/ 25**	**25/ 26**	**26/ 27**	**27/ 28**	**28/ 29**	**29/ 30**	**30/ 31**	**LTP Total**
Wastewater network Containment Standard	0	0	0	33,333	33,333	33,333	0	0	0	0	**99,999**
Remediate Sludge Lagoon NPWWTP	500,000	0	0	0	0	0	0	0	0	0	**500,000**
As-Built Survey of all Pipe Bridges	0	75,000	27,914	28,021	28,021	28,021	28,129	27,914	27,914	28,021	**298,955**
Asset Inspection Research Project	0	150,000	300,000	300,000	300,000	300,000	300,000	300,000	3,00,000	3,00,000	**2,550,000**
Resilience Framework & Level of Service	0	30,000	30,000	0	0	0	0	0	0	0	**60,000**
Wastewater Buildings Asbestos Surveys	0	10,000	90,000	0	0	0	0	0	0	0	**100,000**
Riparian Planting NPWWTP	0	0	0	0	50,000	0	0	0	0	0	**50,000**
Total	**500,000**	**265,000**	**447,914**	**361,354**	**411,354**	**361,354**	**328,129**	**327,914**	**327,914**	**328,021**	**3,658,954**

8.8 Renewals Projects Expenditure Forecast Summary

The Capex forecast for Renewals Projects is shown in **Table 20**.

Table 20: Renewals Projects expenditure forecast

Renewals Forecast (S)														
Project	21/ 22	22/ 23	23/ 24	24/ 25	25/ 26	26/ 27	27/ 28	28/ 29	29/ 30	30/ 31	LTP Total	% LOS	% GRW	% RNL
AA0026 West Quay Pump Station	1,414,139	0	0	0	0	0	0	0	0	0	**1,414,139**	0	0	100
WW1001 Laboratory Minor Equipment Renewals	7,296	7,471	7,658	7,880	8,077	8,279	8,486	8,706	8,941	9,183	**81,978**	0	0	100
WW1013 Lorna St Sewer Upgrade	0	257,525	0	0	0	0	0	0	0	0	**257,525**	0	0	100
WW1036 Emergency Wastewater Retic Network Renewals	100,600	103,010	106,000	108,650	111,370	114,150	117,000	120,040	123,280	126,610	**1,130,710**	0	0	100
WW1055 Waitara Outfall Pipeline Renewals	100,600	103,010	106,000	108,650	111,370	114,150	117,000	120,040	123,280	126,610	**1,130,710**	0	0	100
WW1056 Resource Consent Renewals Wastewater	0	5,151	0	10,865	38,980	17,123	0	0	0	0	**72,118**	0	0	100
WW2023 Wastewater Building Renewals	100,600	77,258	23,320	28,249	66,822	228,300	39,780	38,413	80,132	126,610	**809,483**	0	0	100
WW2026 Laboratory Major Equipment Renewals	30,091	30,812	31,585	32,499	33,312	34,144	34,996	35,906	36,875	37,871	**338,090**	0	0	100
WW2201 Sewer Lining & Rehab of Pipes	427,550	437,793	450,500	461,763	473,323	485,138	497,250	510,170	523,940	538,093	**4,805,518**	15	0	85
WW3002 Wastewater Reticulation Renewals Full Budget (Medium)	2,246,700	4,360,722	6,607,298	7,703,766	7,896,626	8,093,741	8,295,818	8,511,368	8,741,098	8,977,210	**71,434,346**	0	0	100

Growth Forecast ($)

Project	21/ 22	22/ 23	23/ 24	24/ 25	25/ 26	26/ 27	27/ 28	28/ 29	29/ 30	30/ 31	LTP Total	% LOS	% GRW	% RNL
WW3003 Wastewater Plant, Equipment, I&E Renewals (Medium)	895,642	2,459,467	3,374,132	3,924,128	4,022,367	4,122,773	4,225,707	4,335,503	4,452,522	4,572,793	**36,385,034**	0	0	100
WW3006 New Plymouth Outfall Pipeline Renewals	35,210	36,054	37,100	38,028	38,980	39,953	40,950	42,014	43,148	44,314	**395,749**	0	0	100
WW3007 Golf Course Sewer Trunk Main Remediation	62,875	0	0	0	0	0	0	0	0	0	**62,875**	50	0	50
WW 3021 Waitara Wastewater Pumping System Upgrade	276,650	281,732	371,000	1,917,673	0	0	0	0	0	0	**2,847,055**	50	0	50
WW3024 Waitara Pumping Station Purlin Replacement	100,600	0	0	108,650	0	0	0	0	0	0	**209,250**	0	0	100
Total	**5,798,553**	**8,160,003**	**11,114,593**	**14,450,800**	**12,801,227**	**13,257,749**	**13,376,987**	**13,722,159**	**14,133,216**	**14,559,292**	**121,374,580**			

Key: Strategic Projects (see **Section 4: Strategic Framework** of the **Strategic Asset Management Plan**)

9. Improvement Plan

This section provides information about wastewater asset maturity and an Improvement Plan for this service. The general Asset Management Maturity Improvement Plan undertaken using the International Infrastructure Management Manual 2015 (IIMM) maturity guidelines is included in **Section 10: Asset Management Improvement Programme** of the **Asset Management Strategy.**

9.1 Asset Management Maturity

An internal assessment of wastewater asset management maturity was conducted in December 2020 using the IIMM maturity guidelines. The assessment covers 16 key areas of the specification and each area attracted a score between 0 and 4.

The maturity scores in most areas were assessed as being in the 0 – 1 range indicating that some improvement is required. The medium term plan i.e. during 2020 and 2023 period is to increase maturity scores into the 2 – 3 range. The scores assessed for each of the 16 components and the aims to improve the scores to take the Wastewater asset management practices from current ratings to Basic, Core, Intermediate and Advanced levels is shown in **Table 21**.

Table 21: Asset management maturity ratings score

Element	Aware	Basic	Core	Intermediate	Advanced
	0	1	2	3	4
Asset Management Policy Development					
Levels of Service and Performance Management					
Demand Forecasting					

Element	Aware	Basic	Core	Intermediate	Advanced
	0	1	2	3	4
Asset Register Data					
Asset Condition					
Decision Making					
Risk Management					
Operational Planning					
Capital Works Planning					
Financial and Funding Strategies					
Asset Management Teams					
AMPs					
Management Systems					
Information Systems					
Service Delivery Mechanisms					
Improvement Planning					

Key: Maturity rating status at 2020

Proposed improvements to 2023

The AMPs produced to date have therefore been developed during a period of basic asset maturity competence. There is an expectation that the next AMP developed for the next 10 Year Plan (2024-2034 LTP) will be at a more advanced maturity level.

9.2 Improvement Plan

General improvements identified for wastewater assets and specific areas of improvement identified for different asset categories are listed in **Table 22**.

Table 22: Wastewater AMP improvements summary

No.	Title	Description	Status	BAU
General Improvements				
1	Master Planning	Produce Wastewater Master Planning	In progress	
2	Network model	Produce fully validated wastewater network models to facilitate improved planning and operations	In progress	
3	Maintenance Management Plan	Produce and implement Maintenance Management Plan	In progress	
4	Plant equipment survey	Survey all P&E and match inventory to on-site status	In progress	
5	Service notifications and check sheets	Produce full set of scheduled maintenance and check sheets for mechanical P&E and record/implement schedule in EAM.	In progress	
6	I&E maintenance records	Record and manage I&E scheduled maintenance tasks in EAM.	In progress	
7	Assets identification tags	Check and install tagging to all P&E	In progress	
8	RedEye	Following survey in item 4, update P&IDs and layout drawings	In progress	

No.	Title	Description	Status	Business as usual or Sharepoint
Treatment Plant				
9	Critical spares assessment	Assess critical spares and procure any required components	In progress	
10	Critical asset management plan	Produce a focused management plan for those assets identified as critical	In progress	
Pump Stations				
11	Critical spares assessment	Assess critical spares and procure any required components	In progress	
12	Critical asset management plan	Produce focused management plan for those assets identified as critical	In progress	
Reticulation Network				
13	Asset inventory	Include pipe bridges/values on asset inventory for the structures constructed to specifically support pipes and owned/maintained by the Three Waters Service	In progress	
14	Asset data quality plan	Conduct analysis of existing asset data to identify and correct any obvious errors or omissions. This will form part of the Asset Data Quality Plan to be developed with the Infrastructure Systems Team.	In progress	

Glossary

AC	Asbestos Cement
AC	Alternating Current
ADWF	Average Dry Weather Flow (sewage)
AM	Asset Management
AMP	Asset Management Plan
AMS	Asset Management System
ANZCO	ANZCO Foods Limited
AS/NZS	Australian/New Zealand Standards
BAC	Biologically Activated Carbon trial
BOD	Biochemical Oxygen Demand
Capex	Capital Expenditure
CDEM Act	Civil Defence and Emergency Management Act
CI	Cast Iron
City Care Ltd	Water and Wastewater reticulation maintenance contractor
CLDI	Concrete Ductile Iron
COD	Chemical Oxygen Demand
Communitrak	Annual Communitrak survey performed by National Research Bureau
CONC	Concrete
COP	Code of Practice
COPP	Copper
CV	Corporate Vision
DI	Ductile Iron
DISP	Decline in Service Potential
DWS	Drinking Water Standards (or the latest edition thereof)
EColi	Bacterium Escherichia coli that produces a toxin and can cause severe illness
FAC	Free Available Chlorine
GL	General Ledger
HUE	Household Unit Equivalent
I&E	Instrumentation and Electrical
I&I	Inflow and Infiltration

Infra/Enterprise	NPDC customer support services information system
IRP	Incident Response Plan
IWWF	Instantaneous Wet Weather Flow (sewage)
Kl	Kilo-litres
KPI	Key Performance Indicator
LGA	Local Government Act
LIM	Land Information Memoranda
LOS	Level of Service
LTP	Long-Term Plan
MANN	Mannesmann Steel
MAV	Maximum Allowable Value
MCC	Main Control Cabinet
MfE	Ministry for Environment
Ml	Mega–litres (1 ML = 1,000,000 litres)
MIS	Management Information System (water and wastewater)
MoH	Ministry of Health
NAMS	National Asset Management Strategy
NB	Nominal Bore
NPDC	New Plymouth District Council
NPV	Net Present Value
NPWTP	New Plymouth Water Treatment Plant
NPWWTP	New Plymouth Wastewater Treatment Plant
NRB	National Research Bureau
NTU	Turbidity units
NZTA	New Zealand Transport Agency
NZWWA	New Zealand Water and Wastes Association
ODM	Optimised Decision Making
OTH	Other
Opex	Operational Expenditure
PIM	Project Information Memorandum

PHRMP	Public Health Risk Management Plan
PLC	Programmable Logic Control
POLY-H	Polyethylene high density
POLY-L	Polyethylene low density
POLY-M	Polyethylene medium density
PRV	Pressure Reducing Valve
PWC	Price Waterhouse Coopers
PWWF	Peak Wet Weather Flow (sewage)
SCADA	Supervisory Control and Data Acquisition
SDC	Stratford District Council
ST	Steel
ST-CL	Cast Iron Steel Tube
ST-GTS	Galvanised Steel Tube
ST-SWS	Stain/Steel Spiral Welded Seam
STDC	South Taranaki District Council
SWAMP	Stormwater Asset Management Plan
TDF	Thermal Drying Facility
TDHB	Taranaki District Health Board
TLA's	Territorial Local Authorities
TNZ	Transit New Zealand
TRC	Taranaki Regional Council
UAC	Uniform Annual Charge
UFW	Unaccounted-For-Water (also known as Non-Revenue Water)
UNKN	Unknown
UPVC	Un-plasticised PVC
UV	Ultra Violet disinfection treatment
VFR	Visiting friends and relations
WAMP	Water Asset Management Plan
WAP	Water Augmentation Project
WBM	Water by Meter

WINZ	Water Industry New Zealand
WOMB	Waitara Outfall Management Board
WTP	Water Treatment Plant
WWAMP	Wastewater Asset Management Plan
WWTP	Wastewater Treatment Plant

2021-2031 Wastewater Asset Management Plan

2021-2031: He Rautaki Whakahaere Rawa mō Te Wai Āwhā me te Taupā Waipuke

Volume 1 - Treatment Plant

Pukapuka Tuatahi - Te Taupuni Whakatika

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1. Introduction

This volume provides a description of the NPWWTP, which is covered by the treatment plant asset category of the Wastewater AMP. It also contains details for the asset lifecycle management of this asset.

NPDC own and operate the NPWWTP, which treats raw wastewater prior to discharge of the treated liquid effluent to the sea. NPWWTP operators continually monitor effluent quality to protect public health and minimise adverse effects of wastewater on the environment. The Water, Wastewater and Stormwater Services Bylaw (2014 version) (Part 10) covers wastewater treatment. The discharge of industrial effluent into the public wastewater system is regulated by the Trade Wastes Bylaw (2013 version) (Part 11).

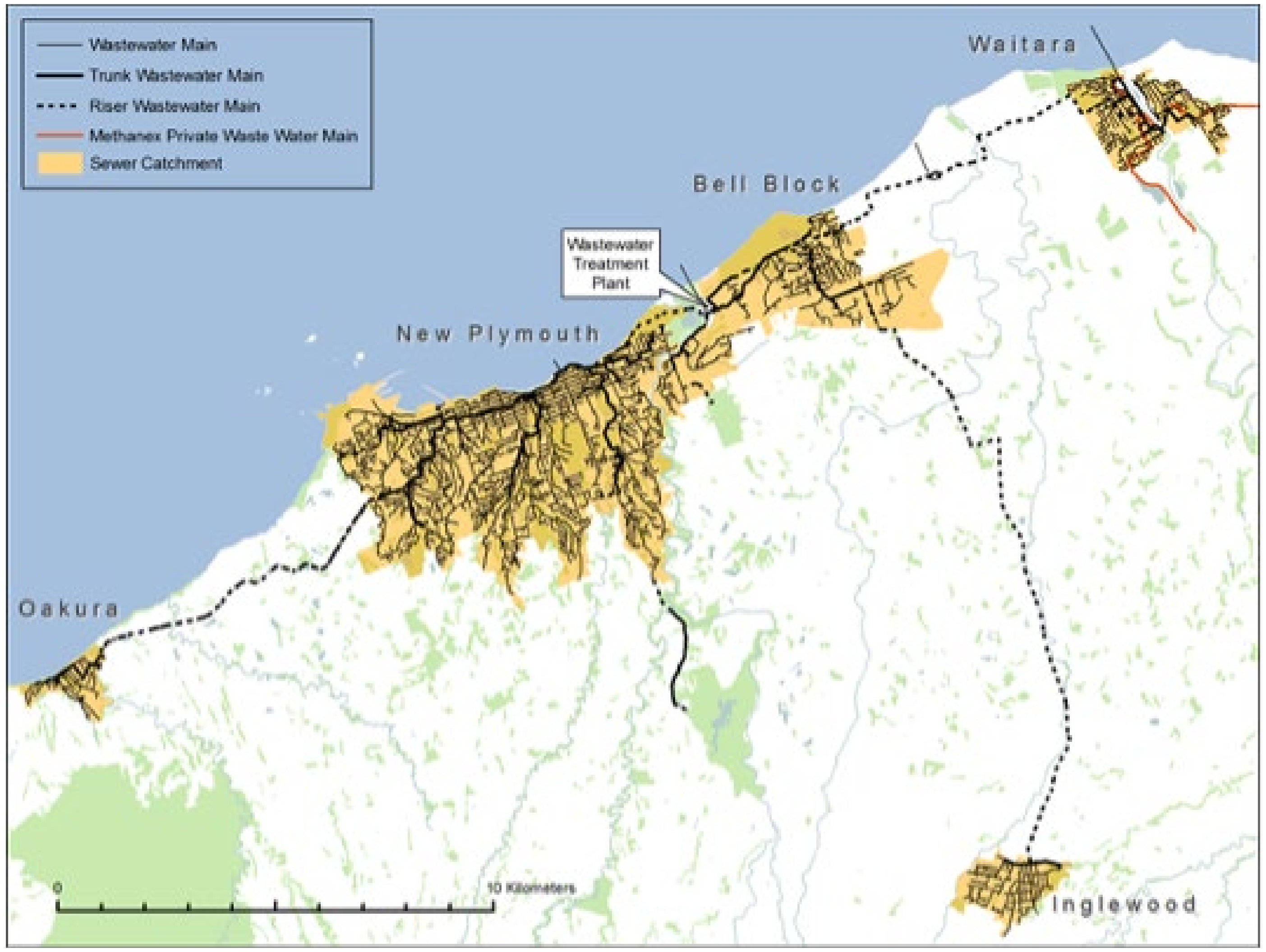
The NPWWTP system uses mechanical, biological, and chemical processes to remove harmful constituents from wastewater before discharging the treated liquid portion (effluent) to the sea via outfalls. Discharge of treated effluent to the sea is regulated by conditions in resource consents for this activity, ensuring water quality is at accepted environmental levels.

Wastewater solids from mechanical screening plant are disposed of to landfill. Activated sludge solids produced from the bioreactors are mechanically dewatered, thermally dried and sold as the fertiliser Bioboost® through a private distributer - Bioboost Ltd.

NPDC also own two outfall lines in New Plymouth and Waitara and oxidation ponds in Inglewood. The Waitara outfall was associated with the former Waitara Wastewater Treatment Plant, which was modified to a pump station and trunk main in 2013. Wastewater from Waitara is now pumped to the NPWWTP.

The location of the NPWWTP is shown in **Figure 1**.

Figure 1: Location of the New Plymouth Wastewater Treatment Plant



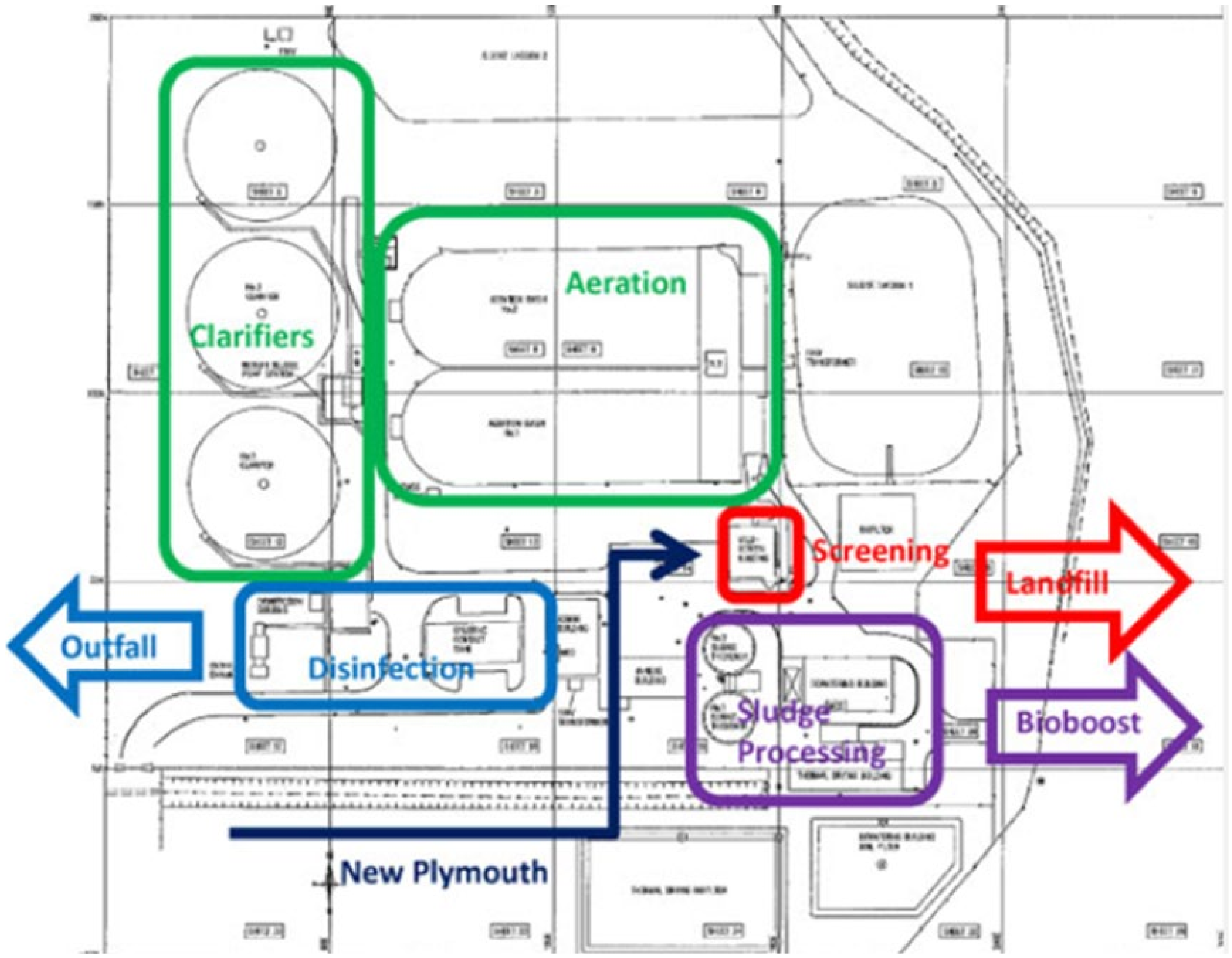
Current resource consents, which allow discharge to the sea or watercourses for treatment plant assets are detailed on the Council's Intranet: https://intranet/sites/Projects/Infrastructure/Quality/Lists/Resource%20Consents/AllItems.aspx

1.1 Asset Descriptions

1.1.1 New Plymouth Wastewater Treatment Plant

The general layout and main process components of the NPWWTP are shown in **Figure 2**.

Figure 2: New Plymouth Wastewater Treatment Plant proces diagram



The NPWWTP has the following characteristics:

- It is located in the eastern area of New Plymouth, on the lower Waiwhakaiho River Basin
- It takes raw sewage and trade wastes from New Plymouth city, Bell Block, Inglewood, Waitara, and Oakura
- It treats an average of 25 million litres of wastewater daily
- It uses a biological treatment process known as activated sludge aeration to produce a high quality effluent
- It discharges clean effluent to the Tasman Sea via a 480m ocean outfall
- It dries the sludge (solid) component thermally to produce Bioboost®

Asset Capacity/Performance

The original plant was designed for a peak flow of 840 l/s. Following the aeration upgrade in 2015 it is anticipated that the plant has capacity to sustain growth through to 2040, with a predicted future peak instantaneous flow of 1,220 l/s in 2025.

A significant proportion of the total waste received at the NPWWTP comes from trade waste. Raw untreated waste from industry is accepted by individual agreements, sometimes with consent conditions applied under the Trade Waste Bylaw.

The COD is monitored seven times per month by a 24 hour proportional flow sampler. In March 2017, the average COD was 9,277kg/day and maximum 15,047kg/day. The industrial COD level is 20%, of which Tegel Foods in Bell Block contributes 13%.

Milliscreens

New inlet works were commissioned in 2018/19 have three band screens each with 765 l/s capacity at 50% blinding. With both the new band screens in service the capacity is 1,530 l/s.

Grit Removal

A new grit trap was commissioned in 2019 to addresses historic grit removal problems. The capacity of the new grit trap is 915 l/s but is capable of handling 1,220 l/s at reduced efficiency.

Aeration Basins and Clarifiers

The two bioreactors have a hydraulic capacity of 610 l/s each (1,220 l/s total). The current inlet works struggle to pass this flow rate. A peak instantaneous flow of 1,102 l/s was measured in 2013 and the anticipated peak instantaneous flow of 1,220 l/s is predicted for 2025.

The new inlet works commissioned in 2019 are capable of passing 1,220 l/s and flows above this rate will have to be throttled at the Te Henui Pump Station and other wastewater pump stations.

Storage at the Shearer Reserve Pump Station and the Waitara Pump Station help to reduce peak flow to the NPWWTP. It is anticipated that storage at the NPWWTP will need to be increased to handle peak flows in the future.

Clarifiers

There are three clarifiers which have adequate capacity to handle future peak flows up to 1,220 l/s.

Chlorination

The current chlorination plant has a design capacity of a maximum daily flow of 28,800m3/day. This is adequate for both the current and forecast average daily flows through up to 2040, but it is not adequate for the current and forecast peak daily flows. On this basis, additional contact volume will need to be provided in the near future or the chlorine dosage will need to be increased to meet the chlorine contact time requirements of the current discharge consent. New dosing and bulk storage equipment were installed in 2019 to ensure that chemical storage is compliant with the Health and Safety at Work (Hazardous Substances) Regulations (2017) and dosing equipment is fit for future plant capacity and usage.

Outfall

The outfall has a design capacity of 1,250 l/s under gravity flow. Therefore, the future peak flow of 1,220 l/s can be accommodated without pumping.

Sludge Stream

The existing sludge processing consists of:

- Gravity thickeners reconditioned in 2017 and one converted to a buffer tank
- Belt press dewatering replaced in 2017 with new screw press thickeners
- TDF with all dried product being sold as Bioboost®
- Sludge lagoon – used for emergency storage of sludge (usually when the dryer is out of service)

Settling Lagoons

The small lagoon is used to buffer plant solids inventory in case of prolonged TDF breakdowns. Two 7.5kW aerators were installed in 2017 on this lagoon to address potential odour releases. The large lagoon is not used but contains historic quantities of contaminated sludge. This will be decommissioned

Thermal Drying Facility

As noted above, the TDF is used to produce Bioboost® from the surplus bugs (micro-organisms) that eat waste in wastewater in the aeration basins at the NPWWTP. The bugs are separated from the effluent (water) in clarifiers; concentrated in the thickeners; squeezed of excess water in the belt presses; then dried, sterilised and palletised in the rotary drier. At the end of this process, the bugs are dead and in a material form suitable for beneficial reuse.

Biosolids are manufactured in accordance with the Guidelines for the Safe Application of Biosolids to Land in New Zealand (2003), which grade the product according to its quality and level of contaminants. Bioboost® has the highest grade for pathogens, ‘A’, which means the product is sterilised and safe to use. Bioboost® meets the highest grade ‘A’ for the eight metals of concern, apart from zinc and copper. Zinc is over the 300mg/kg limit, with a recent annual average of

580mg/kg and copper [at 180mg/kg] is marginally over the 100mg/kg limit. When used at the correct agronomic nitrogen rates of 200kg total nitrogen per hectare per year, metal contaminants are not an issue and comply with recommended soil limits in the guidelines. This equates to a maximum Bioboost® application rate of 33kg/100m2/year (or 330g/m2/year).

The typical nutrient analysis advertised by Bioboost Ltd for the Bioboost® product is shown in **Table 1**.

Table 1: Typical nutrient analysis

Element	Percentage
Nitrogen (N)	5.50%
Phosphorus (P)	2.40%
Potassium (K)	0.40%
Calcium (Ca)	1.20%
Magnesium (Mg)	0.30%
Sulphur (S)	0.80%
Iron (Fe) + TE	0.80%

A report prepared by an external consultant titled ‘NPWWTP Review of Dewatering Technology’ (dated 15 July 2014) identified that replacing the existing belt dewatering process with a screw press would be advantageous and a project for this was completed in 2017. Sludge cake dry solids fed to the TDF are now at 19-20% DS compared to a historic typical value of 14%.

A Net Present Value analysis showed a clear cost advantage with the new technology, extending the life of the TDF and widening the options as far as sludge disposal is concerned in the event the TDF becomes inoperable.

Assuming the dewatering plant is upgraded to produce a sludge cake of >20% DS, the TDF will not require replacement to increase capacity. However, the plant is now 18 years old and requires major refurbishment to maintain it in service, estimated at $15.7m over the next 10 years. Given that the TDF is very expensive to operate in terms of energy, maintenance and operator time, in 2016 the Three Waters Team investigated alternate drying technologies to establish whether it is more beneficial to replace the current TDF facility with a more cost effective technology than continue to repair and renew the existing facility. This investigation resulted in the production of a Solids Master Plan and further scoping studies for replacement technologies were undertaken in 2017. The design work to replace the TDF is now underway based on the outcomes of these investigations.

1.1.2 Inglewood Oxidation Ponds

The oxidation ponds are no longer used in the water treatment process. They now work as equalisation ponds to store wastewater during high flow events when the pump station is overloaded, mainly during heavy rain.

2. Lifecycle

2.1 Identify Need and Plan

We are planning on building a new wastewater treatment plant and disposal facility to service the Urenui and Onaero Townships and Campgrounds..

2.1.1 Asset Condition

No formal asset conditions are recorded in the asset inventory for the NPWWTP.

2.1.2 Asset Remaining Lives

The life expectancy data for treatment plant assets has been recorded in EAM.

2.1.3 Critical Assets

Criticality ratings for treatment plant assets have not yet been conducted; therefore, there is currently no data recorded in EAM.

Following asset criticality assessments, the Three Waters Team will develop a focused management plan to ensure the integrity and resilience of critical assets (including Critical Spares – see **Section 2.1.3.1**). This is a data integrity issue and is recorded as an improvement action in the **Wastewater AMP: General Volume - Section 9 (Improvement Plan)**.

2.1.3.1 Critical Spares

An assessment of the critical spares required has not yet been conducted for treatment plant assets. This is a data integrity issue and is recorded as an improvement action in the Wastewater AMP: General Volume (Section 9 – Improvement Plan). However, there are NPWWTP assets recognised as being critical for monitoring and controlling wastewater discharge water quality. These are:

- Air distribution control valves
- Anaerobic mixers (Bioreactors)
- Butterfly isolation valves (Bioreactors)
- Pumps
- Transmitters
- Level radar

2.2 Design and Build

See **Section 6: Lifecycle of the Wastewater AMP: General Volume** for general information about the design and build of wastewater assets.

2.3 Operations and Maintenance

2.3.1 Operations

The operations and maintenance plan for the NPWWTP includes routine monitoring of key processes by operations staff. Staff utilise daily, weekly and monthly work schedules to ensure the plant equipment is monitored, cleaned, and serviced appropriately. Operations staff undertake first level diagnosis of any faults before engaging mechanical or electrical contractors to carry out repairs.

Outside of manned hours, a dedicated on call operator monitors key trends via a laptop with remote access to the SCADA system.

2.3.2 Maintenance

The general approach to asset maintenance is outlined in **Section 6.3: Operations and Maintenance of the Wastewater AMP: General Volume**. Specific details for the NPWWTP is provided below:

Instrumentation and Electrical Maintenance
The in-house water and waste Electrical and Systems Team maintains I&E equipment at the NPWWTP. Any faults are either reported automatically or via the duty operator. The Electrical and Systems Team administers a dedicated I&E contractor who undertakes all required I&E repairs, servicing, and maintenance.

Planned and reactive maintenance for electrical equipment and instrumentation at the NPWWTP is managed by the Wastewater Treatment Plant Coordinator, who is supported in-house by the Wastewater Treatment Technicians and the Electrical and Systems Team. Faults are managed via the duty operator who contacts the electrical contractor directly and if necessary escalates it to the Electrical and Systems Team. The Electrical and Systems Team maintains an inventory of all instrumentation and electrical preventative and predictive maintenance required at the NPWWTP.

Mechanical Maintenance
The Wastewater Treatment Plant Coordinator with the assistance of the Mechanical Maintenance Coordinator oversees mechanical maintenance, ensuring

maintenance activities are planned and carried out. The Maintenance Scheduling module in EAM is used to plan and issue maintenance tasks. Implementation and development of the maintenance management regime at the plant is a key focus for the coming years. The Three Waters Team use contractors to provide dedicated mechanical maintenance services at the NPWWTP. Subcontractors may also be used to provide mechanical maintenance.

Planned and reactive mechanical maintenance at the NPWWTP and facilities is managed by the Wastewater Treatment Plant Coordinator with the assistance of the Mechanical Maintenance Coordinator and Optimisation Engineer, and supported by the Council's Wastewater Treatment Technicians. External support is provided by the mechanical maintenance contractor and by various specialist suppliers/providers. Plant technicians conduct front line reactive maintenance and some smaller planned works. The duty technician will typically contact the mechanical contractor as a first responder. The Projects Team and other specialist service providers are called upon to facilitate works beyond reactive maintenance e.g. major repairs, upgrades, and major works in general. All preventative and predictive mechanical maintenance activities are recorded and managed in EAM.

Building and Grounds Maintenance

Building and ground maintenance work is managed on the same basis as mechanical maintenance. Approved building services contractors provide building maintenance services, including 10 yearly painting of buildings. Grounds keeping work is mainly conducted by the in-house Parks and Open Spaces Team or by approved contractors under a grounds keeping agreement. Any grounds work required outside of the agreement is undertaken by approved contractors as required.

Major Maintenance

Major repairs are conducted on a case-by-case basis, subject to prior justification and approval, and within approved budgets.

Each year a shutdown of the TDF is programmed to repair equipment, typically for three weeks. Work undertaken is based on a planned replacement/renewal regime and also on plant condition investigations carried out prior to the shutdown. If the shutdown reveals any previously un-observable equipment faults, any reactive maintenance required is conducted.

2.4 Renewals

As treatment plant assets continue to age, investment in renewal will be required to maintain current reliability levels. Prior to confirming expenditure on Renewals Projects, the Three Waters Team will undertake condition and criticality assessments and review the RUL of the assets to ensure optimum value from the assets is being achieved.

General provisions for P&E renewals are included in **Table 17** in **Section 8: Financial Summary** of the **Wastewater AMP: General Volume**, which is sufficient to cover any planned or unplanned renewals that may occur.

2.5 Disposals

Project **WW2301** requires the disposal of the old TDF assets and one of the bio-filters that will be removed for

There is a project to decommission and remediate the large lagoon at the WWTP

2021-2031 Wastewater Asset Management Plan

2021-2031: He Rautaki Whakahaere Rawa mō Te Wai Paranga

Volume 2 - Pump Stations

Pukapuka Tuarua - Ngā Taupuni Mapu

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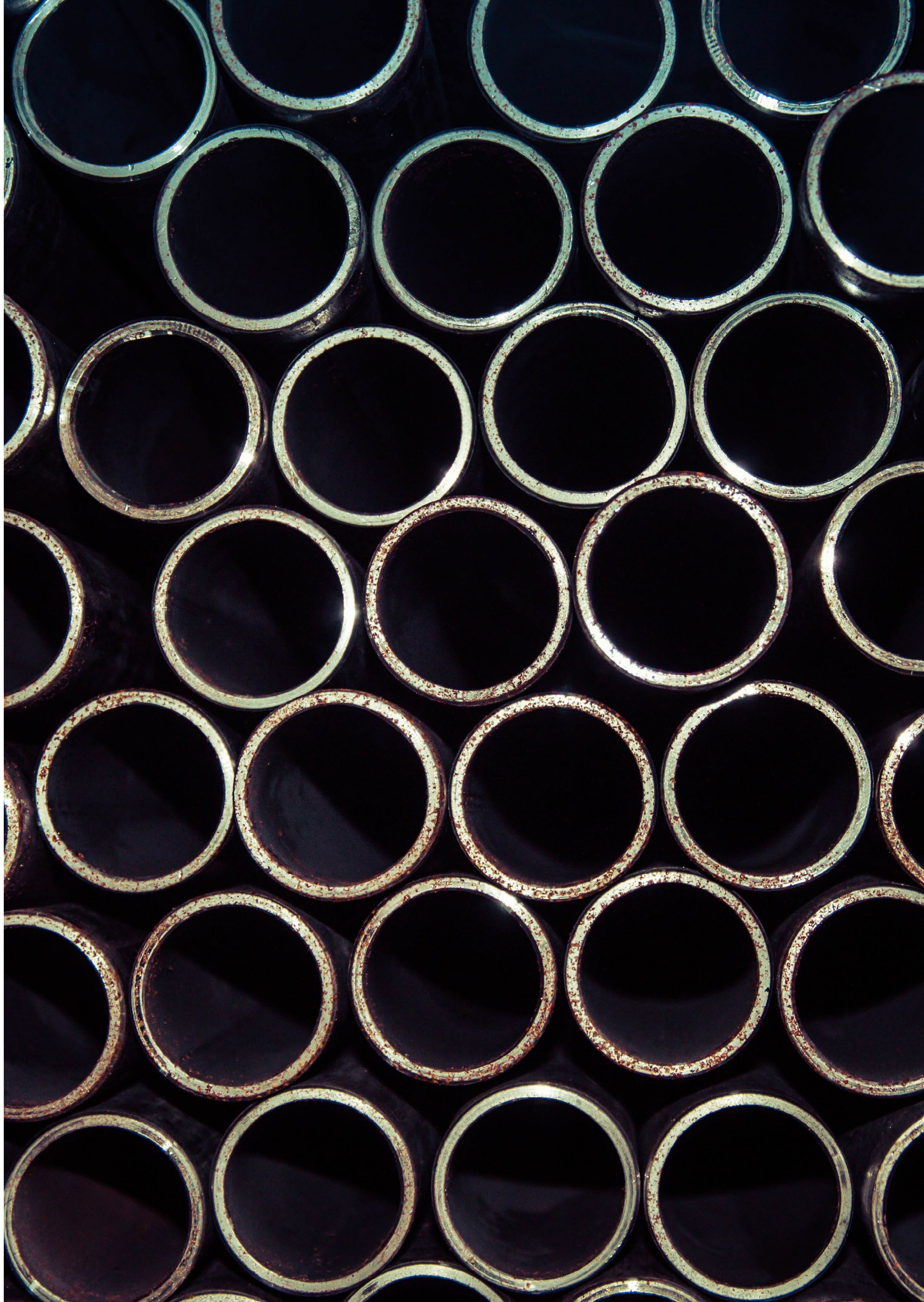


1. Introduction

This volume provides descriptions of the assets covered by the pump station asset category of the Wastewater AMP. It also contains details for the asset lifecycle management of these assets.

The purpose of pump stations is to transfer wastewater within the reticulation system and ultimately to the NPWWTP where it is not otherwise possible because of topographical constraints.

1.1 Asset Descriptions

The wastewater network and its associated pump stations cover the NPDC approved drainage districts. These are predominantly the urban and industrial zones of New Plymouth, Bell Block, Inglewood, Oakura, and Waitara.

Situated on a volcanic ring plain and extending to the coast, the sloping nature of drainage districts¬ means that the wastewater system generally requires less pumping than is typical for similar sized provincial centres. There are; however, situations where cost and/ or construction difficulties make a gravity wastewater system unfeasible. In such cases, pump stations are installed to pump from the lowest end of a local reticulation to a suitable point on an adjacent gravity system.

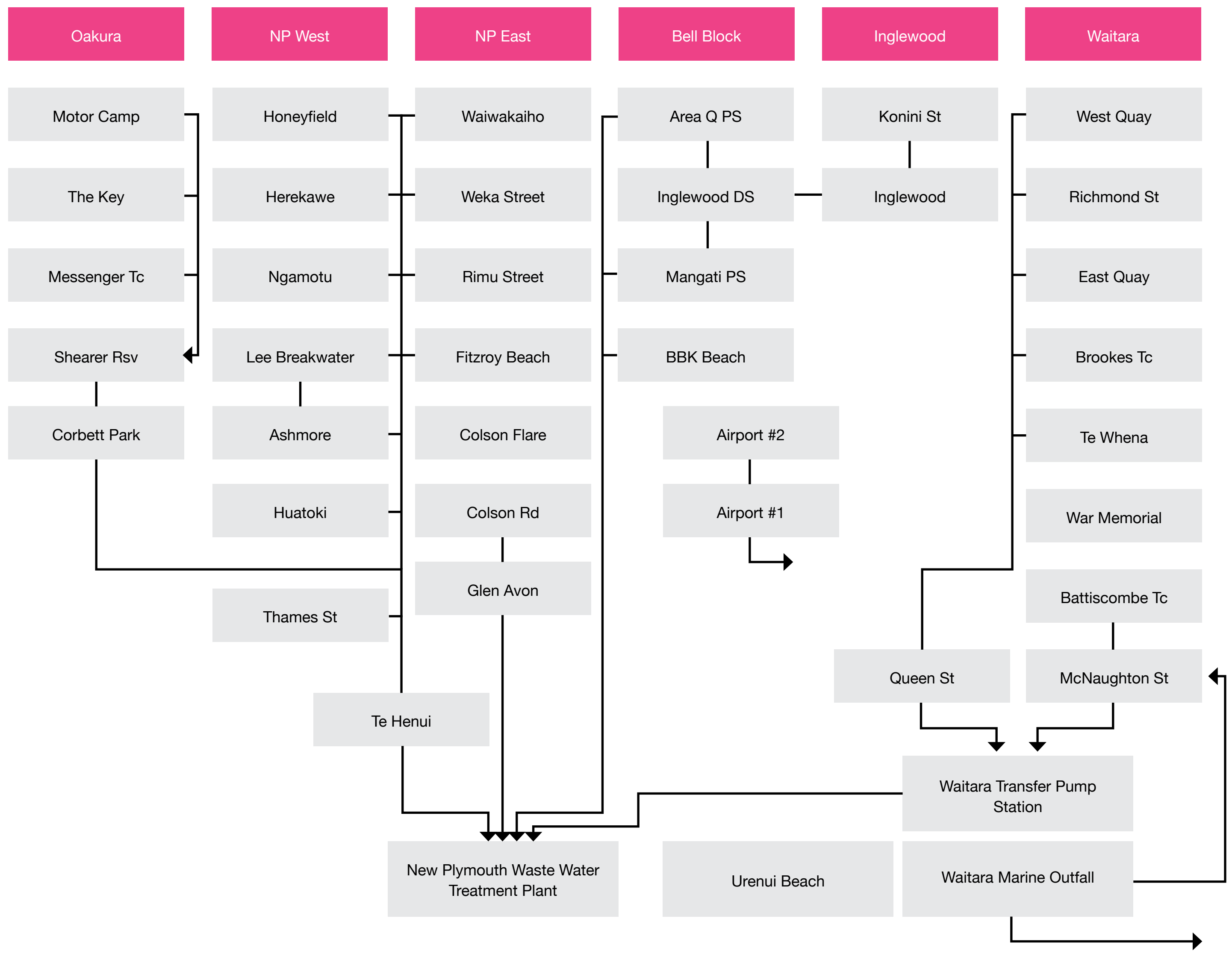
The Three Waters Service currently operates 34 pump stations as part of the public wastewater reticulation network. These range from small local pump stations serving two or three properties (e.g. Konini Street, Inglewood) to community pump stations serving residential catchments of between 10-100 properties (e.g. Herekawe Pump Station). They also include major transfer pump stations on wastewater trunk mains required to transfer significant volumes of wastewater to the NPWWTP or adjacent drainage districts (e.g. Te Henui Pump Station).

Individual pump stations are those that service a single property where it is not possible to connect to the public wastewater network without pumping. Such pump stations are normally installed by the property owner who has ownership and responsibility for pump operation and maintenance.

The Three Waters Team are planning to build a new wastewater system for Urenui and Onaero. This is currently in the early stages of planning and aims to be commissioned by 2031.

The links between pump stations and the NPWWTP are shown in the schematic in **Figure 1**.

Figure 1: Pump station link schematic



The 34 pump stations and their location codes are shown in **Table 1**.

Table 1: List of pump stations

Site Number	Name
200	Huatoki Pump Station
201	Te Henui Pump Station
202	Herekawe Pump Station
203	Lee Brekwater Pump Station
204	Fitzroy Pump Station
205	Rimu Street Pump Station
207	Waiwakaiho Pump Station
208	Colson Road Pump Station
211	Ngamotu Pump Station
212	Airport Pump Stations
213	Glen Avon Road Pump Station
215	Bell Block Pump Station
216	Mangati Pump Station
217	Weka Pump Station
218	Konini Pump Station
219	Waitara Outfall Pump Station
220	Queen Street Pump Station
221	McNaughton Street Pump Station
222	West Quay Pump Station
223	Richmond Street Pump Station
224	East Quay Pump Station
225	Battiscomb Terrace Pump Station
226	Te Ehena Place Pump Station
227	Brookes Terrace Pump Station
229	Ashmore Grove Pump Station
230	Thames Street Pump Station
231	Shearer Reserve Pump Station
232	Corbett Park Transfer Pump Station
233	Messenger Terrace Pump Station
234	Oakura Motor Camp Pump Station
235	The Key Pump Station

236	Onaero Motor Camp Pump Station
237	Urenui Motor Camp Pump Station
238	Area Q Pump Station

All pumps are powered by electrical motors driven via a connected gearbox. Two pumps are installed at each pump station, configured in working/standby mode, high/low demand mode or twin duty at times of high demand. This provides some redundancy for outages due to failures or maintenance.

The asset components of pump stations include pumps, valves, piping, meters, cables, controls/SCADA, and associated buildings. Pump station buildings are included in the **Property AMP: Volume 8 – Water and Wastes Buildings**.

Onaero Motor Camp and Urenui Motor Camp pump stations discharge into dry fields. The intermediate transfer pump stations at Shearer Reserve, Corbett Park, Te Henui, Waitara, and Area Q pump waste into rising pressurised mains. The remaining pump stations discharge into gravity mains.

2. Lifecycle

2.1 Identify Need and Plan

Any new pump stations installed by developers to serve new domestic and non-domestic developments are usually vested in NPDC. Assets are built to the NZS4404:2010 – Land Development and Subdivision Standard and to the specific requirements as defined in the NPDC, SDC and STDC adopted standard for Land

Development and Subdivision Infrastructure, which is based on NZS 4404:2010 with local amendments.

When an asset is vested in NPDC, the Council has full responsibility for the asset and it is included in operations, maintenance and future renewal plans.

2.1.1 Asset Condition

No formal asset condition assessments have been conducted for pump stations and all asset conditions.

2.1.2 Asset Remaining Lives

The life expectancy data for Pump Stations assets has been recorded in EAM.

2.1.3 Critical Assets

Criticality ratings for pump station assets have not yet been conducted; therefore, there is currently no data recorded in EAM.

Following asset criticality assessments, the Three Waters Team will develop a focused management plan to ensure the integrity and resilience of critical assets (including critical spares). This is a data integrity issue and is recorded as an improvement action in the **Wastewater AMP: General Volume - Section 9 (Improvement Plan).**

2.1.3.1 Critical Spares

An assessment of the critical spares required has not yet been conducted for pump station assets. As noted above, there is an improvement action for this data integrity issue.

2.2 Design and Build

See **Section 6: Lifecycle** of the **Wastewater AMP: General Volume** for general information about the design and build of wastewater assets.

2.3 Operations and Maintenance

2.3.1 Operations

Contractors visit major transfer pump stations at least weekly to perform routine checks and to log pump status (hours run, duty load etc.). They visit other pump stations at least once per month to check pump status, hose out debris and fat accumulation in the wet wells, check for correct operation of switches and valves, and to check if vandalism has occurred.

Normally, the only above ground structures for minor pump stations are the main control cabinet and switchboard, the telemetry gear (also housed in a weather proof lockable cabinets) and the communications antenna.

2.3.2 Maintenance

Maintenance contractors provide specialist maintenance services for reactive and preventative maintenance at pump station sites, including: the mechanical maintenance contractor for pumps and fittings; the electrical maintenance contractor for electrical control gear and telemetry; and the reticulation maintenance contractor for the rising mains. Each contractor operates under the instruction of the relevant water and wastewater technical team.

Routine maintenance is scheduled annually.

2.4 Renewals

Pump station components with moving parts i.e. motors, gear boxes, and pumps have finite lives in the region of 15-20 years depending on usage. As pump stations continue to age, investment is required in renewals to maintain current reliability levels. Prior to confirming expenditure on Renewal Projects, the Three Waters Team will undertake condition and criticality assessments and review the RUL of the assets to ensure optimum value from the assets is being achieved.

General provisions for P&E renewals are included in **Table 17** in **Section 8: Financial Summary** of the **Wastewater AMP: General Volume**, which is sufficient to cover any planned or unplanned renewals that may occur.

2.5 Disposals

No asset disposals are planned over the 10 year AMP period.

2021-2031 Wastewater asset management plan

2021-2031: He Rautaki Whakahaere Rawa mō Te Wai Paranga

Volume 3 - reticulation network

Pukapuka Tuatoru - Te Tūhononga Kōrere Wai

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1. Introduction

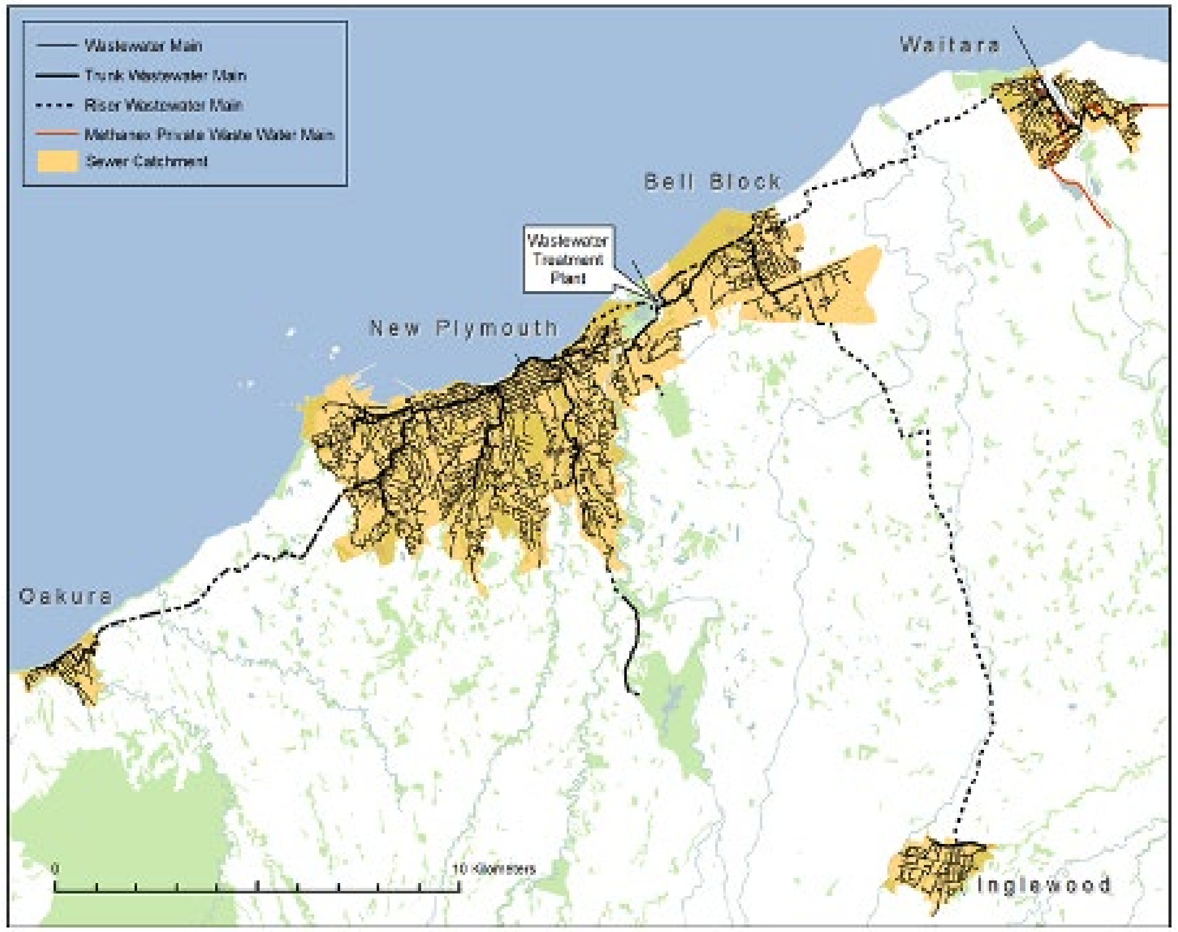
This volume provides descriptions for the assets included in the reticulation network asset category of the Wastewater AMP. It also contains details for the asset lifecycle management of these assets.

The purpose of the reticulation network is to collect wastewater from residential, industrial and commercial properties and convey it to the NPWWTP. The wastewater network consists 454km of reticulation mains made up of a variety of materials reflecting the history of the construction of the system. From the early 1900s Glazed Earthen Ware (GEW) and concrete pipes were used. During the 1960-70s, Asbestos Cement (AC) pipes were introduced. These became less popular as polyethylene and Polyvinyl chloride (PVC) pipes became cheaper and stronger. In some instances steel pipes were used.

The reticulation network also contains, valves, manholes, and laterals (wastewater service connections).

The location of the reticulation system in the district is shown in **Figure 1**.

Figure 1: Wastewater network



1.1 Asset Descriptions

A summary of reticulation network assets is provided in **Table 1**.

Table 1: Asset summary

Pipe type	Purpose	Quantity
Overflow	Emergency overflow from Pump Stations	0.5km
Rising mains	Wastewater mains operating under pressure	53km
Reticulation mains	Wastewater mains operating by gravity	363km
Trunk mains	Wastewater mains collecting wastewater from various rising mains and/or reticulation mains	38km
	Total (Mains)	454.5km
Laterals (Services)	Conveys wastewater from individual buildings/properties to a common gravity wastewater line	190km

The individual asset details are provided in **Table 2.**

Table 2

Asset description	Details	Quantity
Pipes	Asbestos cement	82km
	Ductile iron	13km
	Concrete	114km
	Flexible pipes (including polyethylene and polyvinyl chloride)	94km
	Glazed earthenware	135km
	Steel	6km
Pipe bridges[1]	Three Waters Service own 75 specifically built structures that support the water reticulation network	75 bridges
Valves	The majority are scour and air valves with a few isolation valves.	199 valves
Manholes	Manholes provide access for inspection, CCTV surveys and maintenance. They are sometimes used to vent wastewater gases. Manholes can also facilitate vertical and horizontal angles in otherwise straight pipelines.	7,214 manholes
Laterals	Laterals, or service connections, comprise the mains connection and the small diameter pipework that conveys wastewater from customer owned pipework to the wastewater system	25,204 laterals, having a total length of 245km

1Bridges are installed, owned, and maintained by other groups e.g. the Transportation Service. The pipes supported or contained by pipe bridges have been valued as part of the reticulation stock. The pipe bridges themselves were not valued as separate assets and it is planned to correct this during the statutory valuation due in 2019.

2. Lifecycle

2.1 Identify Need and Plan

When developers install new assets to serve new domestic and non-domestic developments, the assets are usually vested in the Council. Assets are built to the NZS4404: 2010 – Land Development and Subdivision Standard. NPDC's specific requirements are defined in the NPDC, STDC and SDC adopted standard for Land Development and Subdivision Infrastructure, which is based on NZS 4404:2010 with local amendments. NPDC assumes full responsibility for any assets vested in the Council, and includes them included in operations, maintenance and future renewal plans.

2.1.1 Asset Condition

Even though some of the assets are inspected by CCTV, these condition ratings are not recorded in the asset inventory in EAM. It is not possible to conduct formal condition assessments for some assets because they are buried. Further information for reticulation network assets is below.

2.1.1.1 Asbestos Cement Pipes

AC pipes carrying wastewater deteriorate differently to AC pipes carrying drinking water. The external surface of the pipe is affected by the aggressiveness of the soil they are buried in, with silty material containing more acidity than stony, sandy material. This is an important factor when predicting the relative priorities of the renewal works programme. The pipe will deteriorate more rapidly internally than externally, with the bottom of the pipe deteriorating faster because of flow characteristics. However, unlike in water supply pipes, water is not pressurised and fluid velocities are slower. This means deterioration will occur more slowly in wastewater pipes.

2.1.1.2 Ductile Iron, Concrete, Flexible, Glazed Earthenware or Steel Pipes

There is no asset condition information regarding the condition of DI, concrete, flexible, glazed earthenware or steel pipes.

2.1.1.3 Pipe Bridges

The Operations Team reported that pipe bridges are in Good Condition (Grade 2); however, the formal condition assessment that began in 2017 has not yet been completed.

2.1.1.4 Valves

The condition of valves is assessed during scheduled three or 12 monthly visual inspection/maintenance and performance checks. In general, valves are found to be in Good Condition (Grade 2) but may require repairs to stem leakage caused by vibration from traffic.

2.1.1.5 Manholes

The condition of a sample of trunk main manholes is assessed annually, by visual inspection. Manholes are mainly located at the side of roads making their inspection easier.

2.1.1.6 Laterals

There is no information regarding the condition of laterals.

2.1.2 Asset Remaining Lives

Asset condition is a key parameter in determining the Remaining Useful Life (RUL) of an asset and can be used to predict how long it will be before an asset needs to repaired, renewed or replaced. Asset condition is also an indicator of how well an asset is able to perform its function. The reporting of the RUL of assets is currently recorded in the Wastewater AMP. However, most information regarding asset condition has not yet been added to EAM; therefore, information about RUL is also generally not up to date. There is an improvement action in **Section 10: Asset Management Improvement Programme** of the **Asset Management Strategy to address this**.

2.1.3 Critical Assets

Criticality ratings for wastewater reticulation network assets have not yet been conducted; therefore, there is currently no data recorded in EAM.

Following asset criticality assessments, the Three Waters Team will develop a focused management plan to ensure the integrity and resilience of critical assets. This is a data integrity issue and is recorded as an improvement action in the **Wastewater AMP: General Volume - Section 9 (Improvement Plan)**.

2.1.3.1 Critical Spares

An assessment of the critical spares required has not yet been conducted for the wastewater reticulation network. The majority of spares are held by contractors and used for day-to-day repairs of the reticulation system.

2.2 Design and Build

See **Section 6: Lifecycle** of the **Wastewater AMP: General Volume** for general information about the design and build of wastewater assets.

2.3 Operations and Maintenance

2.3.1 Operations

Typical wastewater reticulation system operations activities include:

- Response to customer service requests e.g. for blockages, pipe repairs
- Flushing pipes
- Investigating pipes

2.3.2 Maintenance

The preventative and predictive (proactive) maintenance activities for each asset type are detailed in **Table 3**.

Table 3: Reticulation maintenance activities

Wastewater Reticulation Maintenance Schedule	
Activity	**Frequency**
Reticulation Pipes	
Preventative Maintenance	
Trunk Main Inspections	12 monthly (sample based)
Wastewater Main Flushing	1, 2, 3, 6 and 12 monthly
Valves Exercising	3, 6 and 12 months
Manholes Inspections	6 yearly
Unplanned (Reactive) Maintenance	
Blockages repairs	By customer service request
Installing new connections	When required
Valve Repairs	When required
Manhole Repairs	When required

Preventative and predictive maintenance schedules are stored against each asset in EAM and monthly schedules are produced for internal staff and contractors.

To assist with maintenance optimisation and renewal planning, the details and costs of completed maintenance activities are recorded and monitored. Corrective (reactive) maintenance activities include the following:

- Rising wastewater mains with pressure problems

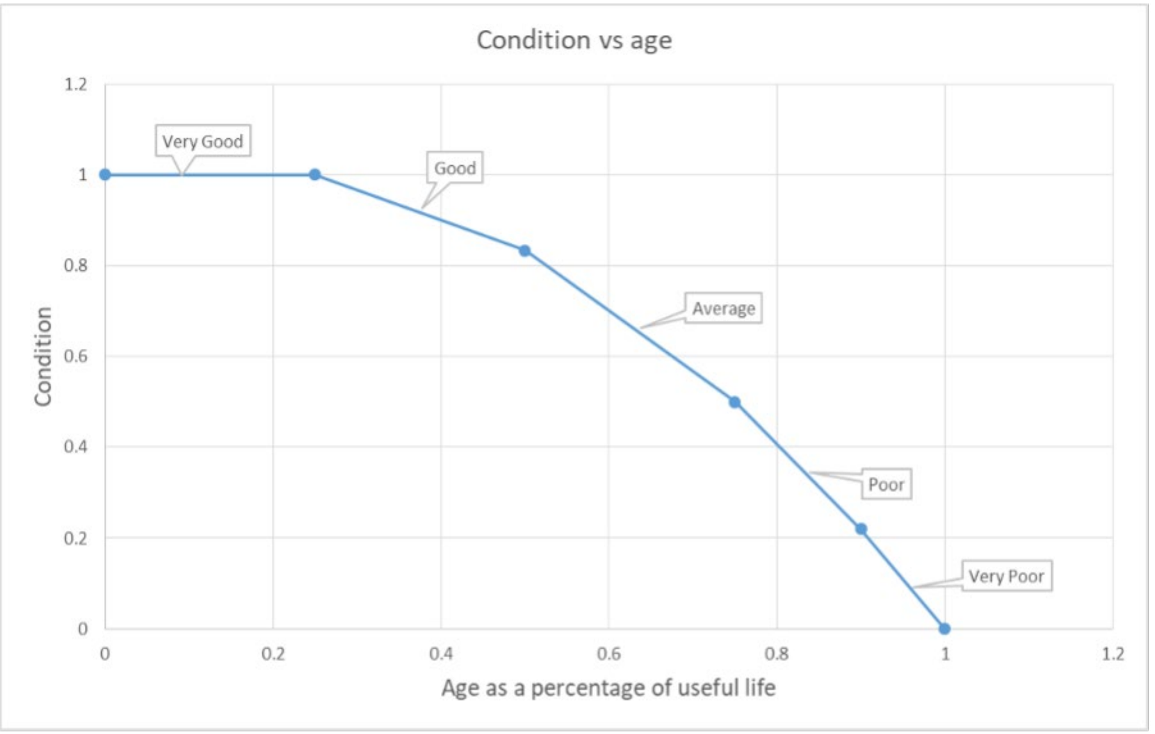
- Valves exercise (specific procedure to be follow for some of them)
- Repair of blockages
- CCTV programme in place
- Maintenance/repair activities identified during pipe bridge inspections
- Detect and mark the location of underground water pipes before any digging takes place.

2.4 Renewals

The renewal strategy for all three water assets is assessed on either an aged based condition rating or an inspection based condition rating. Age based condition ratings have been applied for wastewater rising mains and wastewater gravity pipes that do not have CCTV. Inspection based condition ratings have been applied is for wastewater pipes with CCTV results.

The age based condition rating follows the definition in IIMM represented by the following graph, Figure 2. The inspection based condition rating follows the New Zealand (NZ) Pipe Inspection Manual from CCTV results.

Figure 2: IIMM condition grading



All assets are classified as either critical assets, important assets, moderately critical assets or low criticality assets. The analysis for asset renewal has been undertaken using Monte Carlo Simulation, a mathematical technique, which is used to estimate the possible outcomes of an uncertain event.

The IIMM technique allows for the fact that the true condition of these pipes has not been inspected, yet acknowledges that, for example, critical pipes should not fail. An applied example of this is the renewal of critical pipes when they change from poor to very poor condition with an uncertainty of ±5% of their design life. In theory this means we will be (on average) sacrificing 10% of their design life due to proactive replacement.

The NZ Pipe inspection manual method has been applied to pipes that have been inspected. For example, NPDC will aim to renew the critical pipes before they reach poor condition with an uncertainty of ±5% of their design life. In theory this means we will be sacrificing 10 years of their useful life due to proactive replacement.

These principles are used to produce a realistic renewal programme, recognising asset condition, and guarding against the unnecessary and premature replacement of assets.

2.5 Disposals

No asset disposals are planned over the 10 year AMP period.