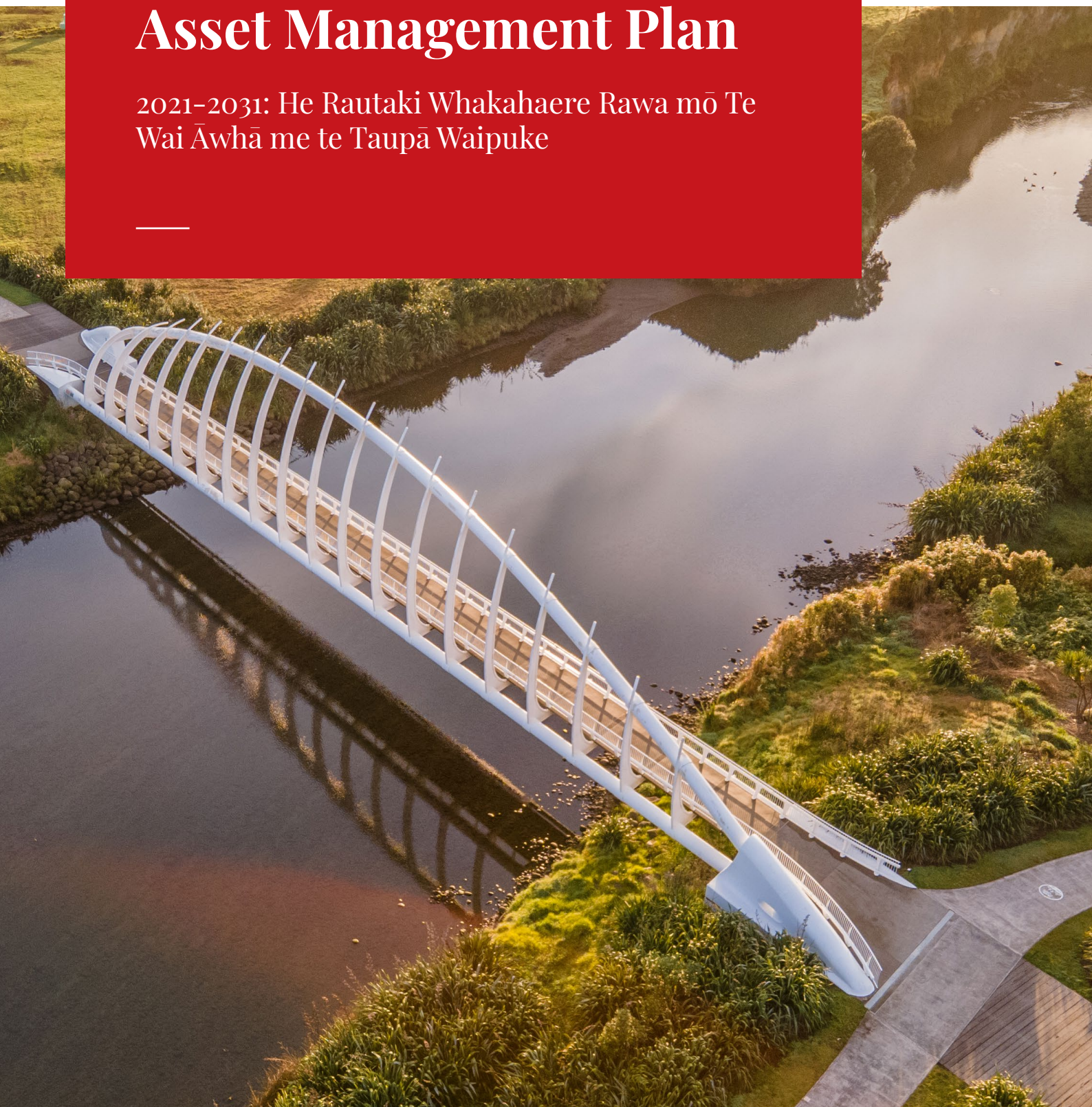
Te Kaunihera-ā-Rohe o Ngāmotu
New Plymouth District Council

2021-2031 Stormwater And Flood Protection Asset Management Plan

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



2021-2031 Stormwater And Flood Protection Asset Management Plan

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This Stormwater and Flood Protection Asset Management Plan (AMP) outlines how New Plymouth District Council (NPDC or the Council) manages the assets associated with the Council's stormwater and flood protection 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 Stormwater and Flood Protection AMP focuses upon the next 10 years in alignment with the LTP, asset management planning tends to consider much longer time frames. The majority of the Council's assets have life cycles far greater than 10 years.

The Council's Three Waters Service mitigates against the potential negative effects of stormwater and flooding on communities and the environment by:

- Having robust stormwater management and planning processes
- Having robust maintenance, operation and renewal practices
- Ensuring work carried out within pipe network rehabilitation/renewal programmes meets industry standards
- Ensuring prompt response and repair in accordance with defined standards
- Modelling of catchments to identify drains and pipes that are below capacity, risking constraints on future development or flooding
- Developing and updating stormwater catchment management plans

The Council's stormwater services are also designed to be highly reliable in emergency situations.

The Three Waters Team collect, manage and dispose of stormwater runoff from around 6,600 hectares of urban area in the New Plymouth district (the district), covering New Plymouth, Bell Block, Waitara, Inglewood, Urenui, Onaero, Lepperton, Egmont Village, Oakura and Okato. They also monitor and maintain three flood protection dams and two diversion tunnels. The stormwater and flood protection assets in the district include the Waitara War Memorial Pump Station, the reticulation network (including manholes, reticulation, and service connections), inlets and outlets, the Mangati Ponds wetland, Peringa Park wetland, and flood protection structures (including dams, bunds, diversion tunnels, and the Huatoki Plaza weir).

The key objectives for the Three Waters Service in regard to stormwater and flood protection assets are detailed below:

A. Provide a safe, healthy and efficient service at relatively low cost

B. Minimise the impact of high density human populations on the environment.

C. Ensure that infrastructure has the capacity to meet current and future demand within defined levels of service

D. Comply with the TRC's Regional Fresh Water Plan.

E. Ensure that public health and the environment is protected, and that we provide a high level of reliability in emergency situations. .

1. Incomplete inspection/condition rating data and programme.
2. Lack of asset inventory data and standards and guidelines.
3. Lack of design guides and 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 stormwater and flood protection services have been defined:

- *Provide a stormwater management system that protects people and property* – in 2019-20 there was a target of zero flooding events in the district, and the target for the number of habitable floors affected in each flooding event (per 1,000 properties connected to the Council's stormwater system) was one or less. During this period there were zero flooding events or habitable floors affected; therefore, these targets were met.

- *Respond to service requests in a timely manner* – the target for the median response time to a flooding event in 2019/20 was one hour. This target was achieved as the actual median response time was 0.54 hours.

- *Ensure customers are satisfied with the performance of our stormwater system* – in 2019/20 the target for the number of complaints received about the performance of the Council's stormwater system (per 1,000 properties connected) was seven or less. This target was achieved as the actual number of complaints was 2.55.

- *Comply with all resource consents for discharges from our stormwater system* – the target in 2019/20 was zero abatement notices received. During this period, six abatement notices were received.

- *Manage demand to minimise the impact of water supply activities on the environment* - in 2019/20 the target for the number of infringement notices,

enforcement orders, and convictions received was zero. This target was achieved.

Managing and maintaining the Three Waters Service, and stormwater and flood protection assets is resource intensive. To sustain current Levels of Service, the existing built asset base will require baseline Operational expenditure (Opex) of approximately $18.9 million and approximately $73.5 million Capital expenditure (Capex) for Renewals Projects 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, the Waitara stormwater system needs to be upgraded **(Project: ST2001)**, minor augmentations of the Council's stormwater network may be required **(Project: ST2004)**, and stormwater network modelling is required for the district **(Project: ST2005)**. These projects require Capex of approximately $19.9 million over the next 10 years.

As at 30 June 2019, the certified fair value of stormwater assets was approximately $217.1 million and the certified fair value of flood protection assets was approximately $19.2 million.

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 (e.g. the need for a Stormwater Master Plan, Modelling Management Plan, and Maintenance Management Plan. A number of improvement actions relate to all the AMPs (i.e. the need for a robust data quality system) and are therefore included in the **Asset Management Strategy.**

2. Introduction

This Stormwater and Flood Protection AMP outlines how NPDC manages the assets associated with stormwater and flood protection. It also demonstrates how the Three Waters Service will contribute to the community outcomes and priorities identified in the 2021-2031 LTP.

The Council owns and operates stormwater and flood protection assets and services as part of its duty to ensure that public health and wellbeing is protected efficiently. The Three Waters Service mitigates against the potential negative effects of stormwater and flooding on communities and the environment by:

- Having robust stormwater management and planning processes

- Having robust maintenance, operation and renewal practices
- Ensuring work carried out within pipe network rehabilitation/renewal programmes meets industry standards
- Ensuring prompt response and repair in accordance with defined standards

- Modelling of catchments to identify drains and pipes that are below capacity, risking constraints on future development or flooding

- Developing and updating stormwater catchment management plans

The Council's stormwater services are also designed to be highly reliable in emergency situations.

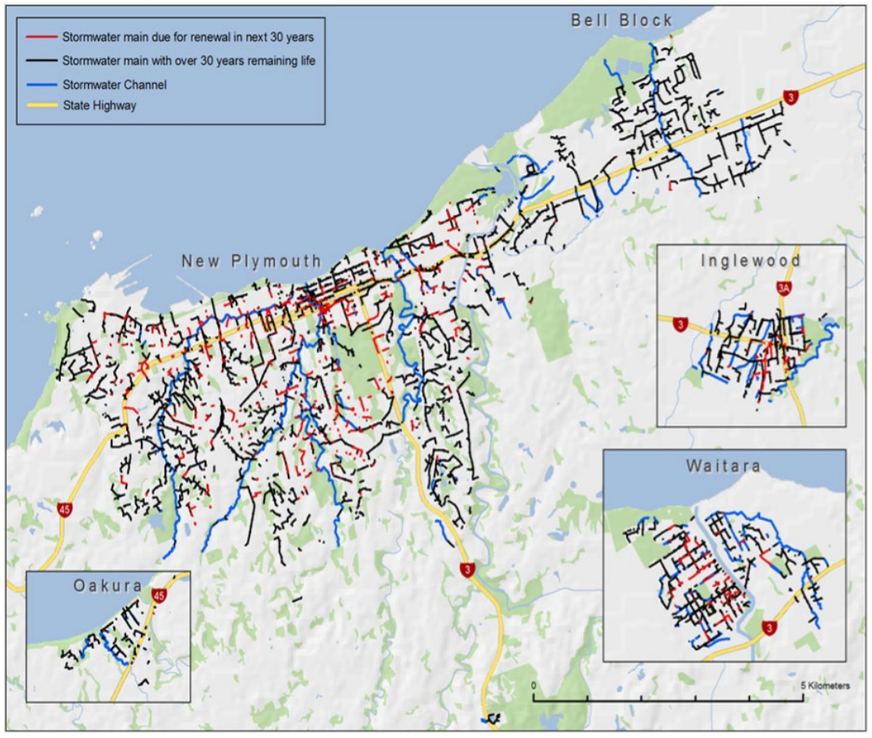
A range of Council staff are involved in preparing and delivering the Stormwater and Flood Protection AMP and providing support services for asset management. How these responsibilities are allocated, managed and delivered are shown in **Figure 1** in the **Asset Management Strategy**. The framework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

2.1 Asset Descriptions

The Three Waters Team collect, manage and dispose of stormwater runoff from around 6,600 hectares of urban area in the district, covering New Plymouth, Bell Block, Waitara, Inglewood, Urenui, Onaero, Lepperton, Egmont Village, Oakura and Okato. They also monitor and maintain three flood protection dams and two diversion tunnels.

The map in **Figure 1** shows the location of the stormwater reticulation network assets in the district.

Figure 1: Stormwater network in the district



An overview of all stormwater and flood protection assets in the district is provided in **Table 1**. Further details about each asset category can be found in the **Stormwater and Flood Protection AMP: Volumes 1-4.**

Table 1: Asset Summary

Asset Category	Description	Quantity	AMP Volume
Pump Station	Waitara War Memorial	1	Volume 1
Reticulation Network	Manholes	4,911	Volume 2
	Reticulation	284 Km	
	Service Connections	12 Km	
Inlets, Outlets and Wetlands	Inlets and Outlets	9,117	Volume 3
	Mangati Ponds - Wetland	1	
	Peringa Park - Wetland	1	
Flood Protection	Dams	3	Volume 4
	Bunds	8	
	Diversion Tunnels	3	
	Huatoki Plaza - Weir	1	

2.2 Asset Information and Data

The Three Waters Service store and manage information and data for stormwater and flood protection 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 for monitoring compliance with resource consent conditions
- 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 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 Stormwater and Flood Protection Objectives, key issues for stormwater and flood protection, and the relevant statutory and regulatory requirements.

3.1 Strategic Alignment

NPDC's strategic framework for the district is detailed in **Section 2: Strategic Framework** in the **Asset Management Strategy**.

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 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 Stormwater and Flood Protection 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 Stormwater and Flood Protection Objectives

Stormwater and Flood Protection 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. Minimise the impact of high density human populations on the environment	✓	✓	✓	✓
C. Ensure that Infrastructure has the capacity to meet current and future demand within defined levels of service	✓	✓	✓	✓
D. Comply with TRC's Regional Fresh Water Plan	✓	✓	✓	✓
E. Ensure that public health and the environment is protected, and that we provide a high level of reliability in emergency situations.	✓	✓	✓	✓

3.2 Key Issues for Stormwater and Flood Protection

A problem statement gap analysis has been undertaken for stormwater and flood protection 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
1.	Incomplete inspection/ condition rating data and programme	The Council has not operated a comprehensive inspection and condition rating programme resulting in incomplete data and to limited knowledge of the actual condition and deterioration rate of assets, there is a likelihood of asset failures	• Incomplete plan and resourcing for the inspection and condition rating of: o Plant and equipment (P&E) o Gravity mains and general reticulation including manholes o Diversion tunnels o Detention dams	• Closed-Circuit Television (CCTV) inspection for some stormwater reticulation systems • Additional Opex funding for manhole inspections • Additional Opex funding for P&E inspectors • Condition assessment methodology research project
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 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
3.	Lack of design guides and standards	The Council has not developed and adopted a fit for purpose stormwater design guides and standards that clearly established 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 both nuisance and major flooding	• Inconsistent and low quality infrastructure development • Road blocks to the use of • Sustainable Urban Drainage (SUDS)	• LiDAR project • Develop formal design guide and standards

4.	System design does not meet current and future demands	Poor system design, legacy performance issues and a lack of future development considerations, particularly for older facilities has resulted in poor asset performance and a failure to meet the stated flooding Level of Service and/or protection and increased health and safety risks	• A number of structures may be classed as notifiable dams under proposed new legislation but they do not currently have the appropriate management plans in place • Urenui Domain system breaching consent partially due to Inflow and Infiltration (I&I) • Onaero Domain system breaching consent partially due to I&I • Known flooding issues on Govett Avenue, South Road, Doralto Road, Devon Street West, and in the Mangatoku catchment • Extensive flooding issues in the Waitara catchments • There is a consent for Barrett Lagoon outlet dam which is not on the Council's land and has no scheduled maintenance in place	

5.	Lack of a robust renewal programme for telemetry and communications technology	Parts of the telemetry and communications networks used to control the automation of the system have become aged and outdated. Without modernization they will continue to cause inaccurate data recording, delayed notification of emergency events and non-compliance with standards	• 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 • Narrow bandwidth connections between (SCADA) sites • Lack of spares inventory • 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.	• Extra Opex to purchase more software licenses • PLC Replacement Programme • Create and update functional descriptions and P&IDs

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	• Inconsistent and low quality infrastructure development • Road blocks to the use of • Sustainable Urban Drainage (SUDS)	• LiDAR project • Develop formal design guide and standards
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	• Climate change is eroding the Level of Service of flood detention dams • Climate change is leading to more intense rainfall events which are eroding Levels of Service and protection • Inglewood fault lines • Impacts of volcanic ash fall • Above ground assets are at risk of land movement • Residential development in areas at risk of flooding	• LiDAR 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 which has resulted in many items of P&E receiving no routine servicing. This 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 • Increase in funding required as current maintenance budget is insufficient • Lack of Operations and Maintenance (O&M) manuals for some P&E	• Maintenance scheduling Opex project to create missing schedules and compile maintenance manuals • Create or update operating manuals

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 models and catchment management plans for some areas • Catchment management plans for some areas are out of date • Pipe and manholes reaching capacity, surcharging and ultimately causing flooding • Growth is occurring and needs to be accommodated	• Stormwater network models and catchment management plans • Creation of growth assumptions • LiDAR project • Subdivision services upgrades budget
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 • Waiwaka culvert has collapsed	• Stormwater P&E and Instrument and Electrical (I&E) Renewals • Resource consent Renewals • Reticulation renewals • Waiwaka culvert replacement project
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	• People connecting stormwater to the wastewater network • Lack of maintenance of private stormwater systems (soak hole cleaning etc.) • Urbanisation of catchments resulting in hardstanding runoff and rapid river/ stream rise	• Wai Warrior education campaign • Stormwater design guides

3.3 Statutory and Regulatory Requirements documents

The relationships between AMPs and other Council-wide planning documents are detailed in the **Infrastructure Strategy** in the LTP. The documents specific to Stormwater and Flood Protection planning are detailed in **Table 5**.

Table 5: Relevant legislation and other documents

Document	Relevance to the Stormwater and Flood Protection 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 Stormwater and Flood Protection 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 water supply site needs to comply with the HSNO Act.
Climate Change Response Act 2002	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.
Stormwater and Flood Protection Services Management System and Contracts	The service levels, strategies, and information requirements described in the AMP are incorporated within contract specifications, Key Performance Indicator (KPIs) 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.
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.

Document	Relevance to the Stormwater and Flood Protection AMP
Other Documents	
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 11 of this Bylaw covers specific requirements for stormwater additional to the general requirements in the Bylaw.
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.
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 document ID. 983033	This Pandemic Plan specifies the actions to be taken by the Three Waters Team and Resource Recovery team in response to the threat of or in the event of an actual pandemic or epidemic.

4. Levels of Service

The Levels of Service for stormwater and flood protection 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 practices 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.** The alignment of the Levels of Service to the Asset Management Drivers and Objectives are also shown in the table.

Table 6: Stormwater and Flood Protection Customer Levels of Service

Asset Management Driver	Stormwater Objective	What you can expect	How we measure performance	Actual 2019/20		Target 2021/22	Target 2022/23	Target 2023/24	Target 2030/31	Comments
1 & 4	A, C & E	Provide a stormwater management system that protects people and property.	The number of flooding events in the district per financial year.	0		0	0	0	0	
1 & 4	A, C & E		The number of habitable floors affected in each flooding event (per 1,000 properties connected to the Council's stormwater system)	0		1 or less	1 or less	1 or less	1 or less	
1, 3 & 4	B & C	Respond to service requests in a timely manner.	The median response time to a flooding event (from the time that the Council receives notification to the time service personnel reach the site).	0.54 hours		one hour	one hour	one hour	one hour	
1 & 4	A & E	Ensure customers are satisfied with the performance of our stormwater system.	The number of complaints received about the performance of the Council's stormwater system (per 1,000 properties connected).	2.55		8 or less	8 or less	8 or less	7 or less	Increased targets had been set following budget cuts in 2015. Assuming budgets are reinstated then a lower target by 2030 is possible.
1, 2 & 4	A, B, C & E	Comply with all resource consents for discharges from our stormwater system.	The number of abatement notices received.	6		0	0	0	0	
1, 3 & 4	B & C	Manage demand to minimise the impact of water supply activities on the environment.	The number of infringement notices received.	0		0	0	0	0	
1, 3 & 4	B & C		The number of enforcement orders received.	0		0	0	0	0	
1, 3 & 4	B & C		The number of convictions received.	0		0	0	0	0	

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 Stormwater as well as general requirements for the Three Waters
- **CS-Vue** - The Council's consent compliance management system. It is a web based software solution specifically for compliance with Resource Management Act 1991 requirements. Resource consents are stored on CS-VUE and the system identifies and retrieves consent conditions and provides quality assurance.
- Requirements and conditions of resource consents from Taranaki Regional Council (TRC) and NPDC
- **NZ Standard NZS 4404:2010** – Land development and subdivision infrastructure. NPDC's specific requirements are defined in NPDC, STDC and SDC's adopted standard for Land Development and Subdivision Infrastructure.

Stormwater and flood protection levels are required for different functions. **Table 7** shows the design levels for the functions.

Table 7: Stormwater and flood protection levels

Function	AEP (%)	Return Period (years)
Parks, Reserves, Sports Grounds Land	20	5
Residential Land	20	5
Commercial/Industrial/Public Land	10	10
Residential/Commercial/Industrial/Public Floors	1	100
Road Culverts (urban)	10	10
Road Culverts (rural)	2	50
Bridges	1	100

TRC's preference to design all assets to 100 year return periods is currently being considered by 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 8**. The alignment of each project to the Asset Management Drivers and key issues for stormwater and flood protection (see **Section 3: Strategic Framework**) is also identified.

Table 8: Level of Service Projects

Project Budget Code	Project Description	Asset Management Driver	Key Issues
ST1050	Installing fish passes at existing culverts	1, 2 & 4	3 & 10
ST2001	Waitara Stormwater Upgrades	1, 2 & 4	3, 4, 7 & 10
ST3003	Stormwater Upgrade Works - Govett Doralto South Road	1, 2 & 4	3, 4, 7 & 10
ST3004	38 Egmont Road Stormwater	1, 2 & 4	3, 4, 7 & 10
ST3005	Stormwater Reticulation Minor Augmentations	1, 2 & 4	3, 4, 7 & 10

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

Details for key Level of Service Projects are provided below:

ST1050: Installing fish passes at existing culverts
Required under existing consent conditions however are not currently in place and/or up to standard

ST2001: Waitara Stormwater Upgrade
The general performance of the existing stormwater system is inadequate and extensive works are required to meet current Levels of Service and to provide for future growth.

NPDC is not meeting stormwater and flood protection Levels of Service for a significant number of properties in Waitara due to a number of factors, including:

- The township was developed in a flood-prone area
- The stopbank prevents water leaving during a flood
- Existing infrastructure is not in line with current standards (such as roads being higher than properties, limited kerb and channel)

In addition to this there are opportunities to improve the health of the natural waterways in Waitara and the community's relationship and connectivity with the natural environment.

ST3003: Stormwater Upgrade Works – Govett Doralto South Road

Govett Avenue

10 Govett Avenue is located on the intersection with Govett Avenue and Frankley Road, and is in close proximity to a low point in Frankley Road. Water drains down the hill on Frankley Road and over top of the kerb running into 10 Govett Avenue prior to reaching the inlet sump downhill of the property. The kerb has been raised locally to increase the kerb's capacity to carry stormwater.

South Road

Between 88 and 96 South Road the stormwater pipe capacity is not adequate to discharge stormwater, resulting in local flooding of State Highway 45 and surface runoff via the driveway of 88A, 88B, 92A and 92B South Road to Ngamuto Domain.

Doralto Drive

49 and 50 Doralto Drive experience flooding during high intensity rainfall events. In the event of surcharge of this inlet sump, water could overtop the curb and drain across 48 Doralto Drive, then naturally follow the gradient across to 50 Doralto Drive as it follows the natural lie of the land down towards the drainage channel located to the north of 54A and 54B Doralto Drive.

The piped network in the area comprises of a 300mm concrete pipeline which starts at the inlet sump outside 49 Doralto Drive and follows the berm in a westerly direction towards the shared driveway serving properties 54A, 54B and 52 Doralto Drive. At this point the pipe changes direction to a northerly direction, goes up the shared driveway and then traverses private property until reaching the outlet at the lower end of 89 Govett Avenue.

ST3004: 38 Egmont Road Stormwater

The flooding frequency experienced at 38 Egmont Road exceeds the frequency normally associated with the acceptable service level standard associated with the Council's Infrastructure Standard, section 4. Not only is the flooding the direct result of previous NPDC approvals of development that were based on anticipated Stormwater improvements, but planned development upstream will result in additional stormwater demands that will further exacerbate the current challenges.

ST3005: Stormwater Reticulation Minor Augmentations

This project covers minor expansions to the stormwater network as a result of improvements to levels of service.

The Capex expenditure forecast for the Level of Service Projects over the 10 year period of the AMP is shown in **Table 16** in **Section 8: Financial Summary.**

5. Future Demand

By 2045, the district's population is expected to grow by 19%, from 71,000 to approximately 88,000 people. The development resulting from population growth will lead to an increase in paved areas and a decrease in permeable areas in the district, creating additional demand on the existing stormwater network infrastructure. Climate change is also likely to place more demand on the existing network.

Over the period of this AMP the Three Waters Team will conduct further studies of potential future growth to ascertain system capacity limits and to produce a Stormwater Master Plan. Any plans to provide additional capacity at the Waitara War Memorial Pump Station (the Pump Station) or to build new pump stations for specific land developments will be developed as part of the planning process.

The Council recently developed a strategic Water Master Plan to manage the expected growth of the district in relation to water supply. During the 2021-2031 LTP period, the Council plans to develop a Stormwater Master Plan to ensure they cater for forecast population growth and climate change in a coordinated way. This is an improvement action and is recorded in **Section 9: Improvement Plan**.

The Stormwater Master Plan will provide a number of benefits, including:

- Clearly defined technical standards for stormwater system performance
- Clarity for the development community about expectations for low impact design
- Strategic approach to growth and development so that up-stream development is planned for
- More consistent and reliable delivery of defined Levels of Service

To develop an effective and informed Stormwater Master Plan the Three Waters Team will need a better understanding of how the network is performing. This requires improvements to data collection and analysis of catchment areas. The Three Waters Team also needs to examine areas prone to flood and to establish programmes of works. All of this requires effective Stormwater hydraulic modelling systems, which are essential tools for optimising capital works programmes, particularly those related to service level and growth.

Modelling tools are assets in their own right and require renewal on a regular basis. Many of the Three Waters Team's current stormwater hydraulic models are out of date. Some catchments require models to be rebuilt and/or validated, while other catchments require introduction of models for the first time. The Three Waters Team also requires a system to ensure models remain up to date in the future. This is an improvement action and is recorded in **Section 9: Improvement Plan.**

The modelling requirements of each catchment are as follows:

- Waitara (completed)
- New Plymouth (needs updating)
- Bell Block (needs updating)

• Inglewood (needs to be created)

• Urenui (needs to be created)

• Onaero (needs to be created)

• Okato (needs to be created)

As the district's urban areas are extended, opportunities for subdivisions and development are created. In some instances there are no stormwater services in new growth areas and developers are expected to extend the stormwater systems from their proposed subdivisions themselves, which can discourage them from proceeding. To encourage development and facilitate growth, the Three Waters Service has made an annual allocation to extend stormwater services in urban areas.

The catchment plans for different areas in the district dictate the design capacity for the inlets and outlets. The catchment plans account for demand and climate change, which is reflected mainly in the number of sumps for inlets and the size of outlets.

5.1 Growth Projects

The Growth Projects related to stormwater and flood protection assets are listed in **Table 9**. The alignment of each project to the Asset Management Drivers and Key Issues for Stormwater and Flood Protection (see **Section 3: Strategic Framework**) are also identified.

Table 9: Growth Projects

Project Budget Code	Project Description	Asset Management Driver	Key Issues
ST2001	Waitara Stormwater Upgrades	3	
ST2004	Stormwater Subdivision Services	3	9 & 11
ST2005	Stormwater Network Modelling	3	9

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

Information for key Growth Projects is provided below:

ST2001: Waitara Stormwater Upgrades
The general performance of the existing stormwater system is inadequate and extensive works are required to meet current Levels of Service and to provide provision for future growth.

ST2004: Stormwater Subdivision Services
Minor augmentations of the Council's stormwater network is often required in order to accommodate small subdivisions connecting to the network.

ST2005: Stormwater Network Modelling
The bulk of the stormwater catchment management plans for the district are out of date leading to:

• Development occurring in flood prone areas

• Insufficient information to manage the H&S and financial risks associated with flooding

• Environmental degradation due to poor stormwater management practices

• Delays, confusion and inconsistent messaging to the development community about what is acceptable where

• Existing flooding issues getting worse due to insufficient information to manage development of upstream areas

• Lack of consideration of the kaitiakitanga in the approach to each catchment

• Lack of a prioritised program of stormwater upgrades for the district

• Climate change not being considered appropriately

This project is to update the catchment management plans and to broaden their scope to include consideration of non-flood risk issues including kaitiakitanga and the impact on the environment.

Note: This project has linkages to the wastewater network modelling and containment standard projects due to the interrelationship between wastewater and stormwater.

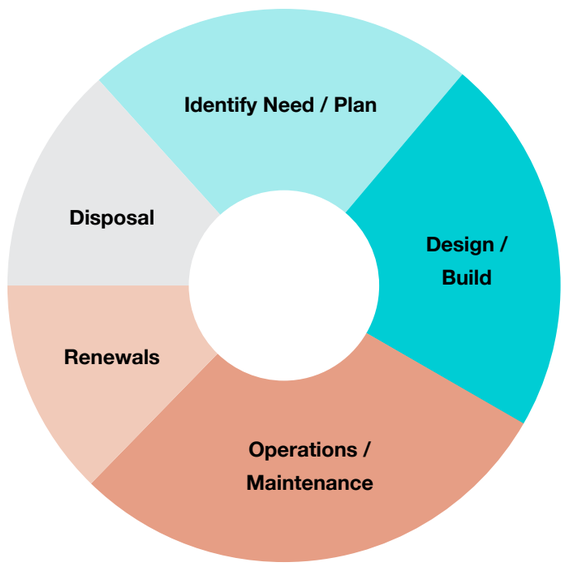
The Capex expenditure forecast for the Growth Projects over the 10 year period of the AMP is provided in **Table 17** in **Section 8: Financial Summary**.

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 stormwater and flood protection assets is below. Detailed lifecycle management is covered in each of the **Stormwater and Flood Protection AMP: Volumes 1-4.**

Figure 2: Asset lifecycle



6.1 Identify Need and Plan

The Three Waters Team determines the need for new stormwater and flood protection 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, where possible. 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 10 outlines available condition assessment methods for stormwater and flood protection pipes and examples of each technology.

Table 10: Current available technologies for stormwater and flood protection 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
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 10** 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 (AC) 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 **Stormwater and Flood Protection AMP: Volumes 1-4.** 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 Stormwater assets, which attributes a condition rating in line 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 stormwater and flood protection assets have been identified in the **Stormwater and Flood Protection AMP: Volumes 1-4**, where possible. This information is based on the Three Waters Team's knowledge and experience.

The criticality scores for stormwater and flood protection reticulation mains in this AMP are assessed using the process and scoring system detailed in the Water, Wastewater and Stormwater Mains Criticality and Renewals Prioritisation Process (ECM#: 988741). These scores are converted into criticality ratings and recorded in the EAM asset inventory to assist the Three Waters Team with asset maintenance and renewal planning.

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.**

6.1.3.1 Critical Spares

Critical spare parts 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 **Stormwater and Flood Protection AMP: Volumes 1-4** for information about critical spares for stormwater and flood protection assets.

6.2 Design and Build

The design and build of stormwater and flood protection 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 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 stormwater and flood protection assets is undertaken by several different teams within the Council. Further details are below:

- The Water 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 works with the maintenance contractor to operate the water supply system. This team also works closely with the Mechanical Maintenance Team on water values and pumps, 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 stormwater and flood protection 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 stormwater and flood protection assets (see **Tables 19, 20 and 21 in Section 8: Financial Summary**).

Table 11 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 stormwater and flood protection (see **Section 3: Strategic Framework**) is also identified.

Table 11: Opex Projects related to Capex Projects

Project Budget Code	Project Description	Asset Management Driver	Key Issues
ST1050	Installing fish passes at existing culverts	1 & 2	3 & 10
ST2005	Stormwater Network Modeling	1 & 3	9
ST3003	Stormwater Upgrade Works - Govett Doralto South Road	1 & 2	3, 4, 7 & 10
ST3004	38 Egmont Road Stormwater	1 & 2	3, 4, 7 & 10
FP3000	Inglewood Southern Catchments Flood Diversions	1 & 3	3, 9
FP3001	Future Of The Mangamahoe Low Head Dam	1 & 2	4, 7 & 10

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

Several of the projects in Table 11 have already been described in the Asset Management Plan. Further details are provided on the following:

FF3000: Inglewood southern catchments flood diversions
There are a number of challenges with flooding in Inglewoods southern catchments which will be exacerbated by growth if not well managed. This project is to investigate a integrated solution to these challenges.

FF3001: Future Of The Mangamahoe Low Head Dam
The Mangamahoe Low Head Dam is a redundent dam left over from when NPDC owned the Mangamahoe

Power Scheme. The dam spillway is in poor condition and either requires reinstatement or decomissioining. As there is no operational function for this dam the likely outcome is decomissioning.

The expenditure forecasts for Opex Projects which are related to Capex Projects over the 10 year period of the AMP are provided in **Tables 19 and 20** in **Section 8: Financial Summary**.

There is one Opex Project for stormwater and flood protection assets that is not related to a specific Capex Project, being:

• Stormwater Design Guidelines

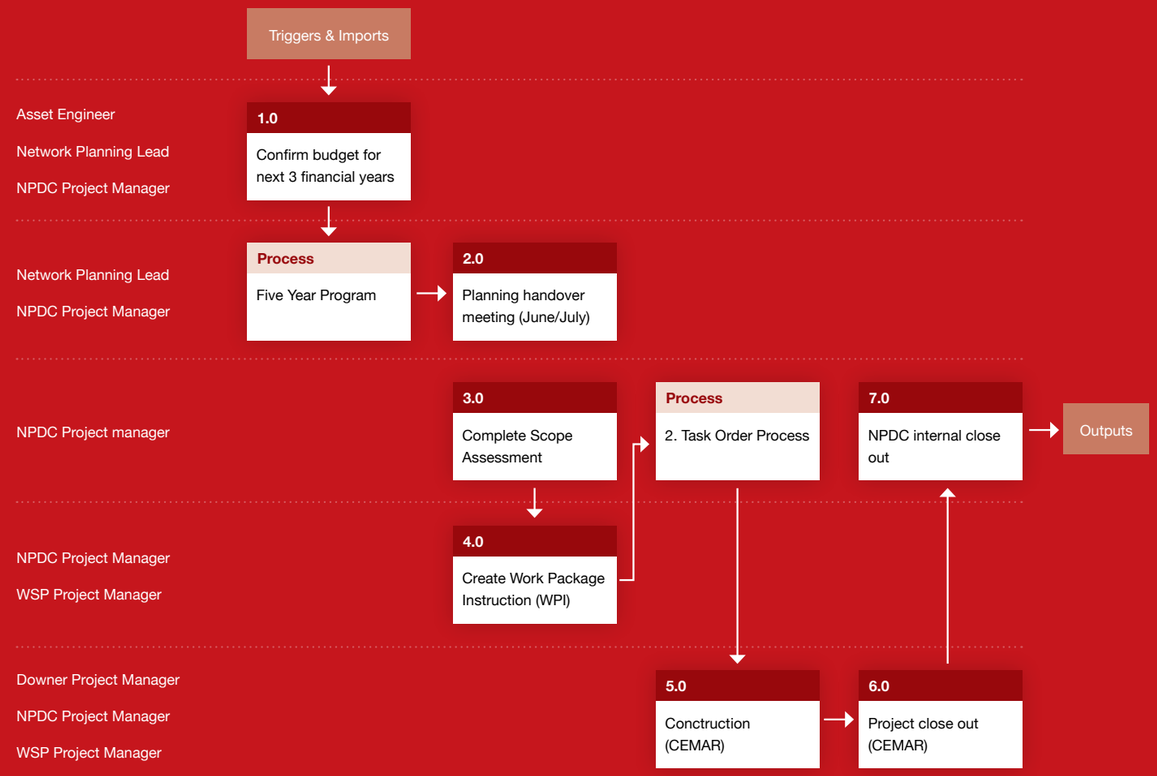
The expenditure forecast for this Opex Project over the 10 year period of the AMP is provided in **Table 20** in **Section 8: Financial Summary.**

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 3 shows the process for the renewal of stormwater and flood protection assets.

Figure 3: Renewals of stormwater and flood protection 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 stormwater and flood protection (see **Section 3: Strategic Framework**) is also identified.

Table 12: Renewal Projects

Project Budget Code	Project Description	Asset Management Driver	Key Issues
ST1059	Resource Consent Renewals Stormwater	1	4 & 10
ST3001	Stormwater Reticulation Renewals Full Budget (Medium)	1 & 2	10
FP1003	Monitoring equipment at Detention Dams	1 & 2	1, 4, 7 & 10
FP2001	Flood Control Planned P&E Renewals	1 & 2	10
FP3002	Resource Consent Renewal - Flood Protection	1	4 & 10

Information for key Renewals Projects is provided on the next page.

ST1059: Resource consent renewals Stormwater
This project captures the work required to obtain resource consent for various stormwater infrastructure.

ST3001: Stormwater Reticulation Renewals Full Budget (Medium)
This project captures the routine renewals for the stormwater network

FP1003: Monitoring equipment at detention dams
One of the requirements of the Dam Safety Guidelines relates to the monitoring of the Council's three detention dams. This has been a manual process to date with associated limitations, resource requirements and safety risk. The installation of monitoring equipment will automate the monitoring which will not only address some of the challenges but will also allow for the increased monitoring frequency and data.

FP2001: Flood control planned P&E renewals
This project captures the routine plant and equipment renewals associated with the flood control infrastructure.

FP3002: Resource consent renewals Flood Protection
This project is to renew a number of resource consents associated with the Flood Protection assets.

The Capex expenditure 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 stormwater and flood protection 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 stormwater and flood protection projects and shows the level of risk and prioritization for each project. Information for the risk levels is provided in S**ection 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 stormwater and flood protection projects

Project Budget Code	Project Description	Priority	Risk Level
Level of Service Projects			
ST1050	Installing fish passes at existing culverts	1	High
ST2001	**Waitara Stormwater**	**1**	**Extreme**
ST3003	Stormwater Upgrade Works - Govett Doralto South Road	2	Medium
ST3004	38 Egmont Road Stormwater	2	High
ST3005	Stormwater Reticulation Minor Augmentations	1	High
Growth Projects			
ST2004	Stormwater Subdivision Services	1	High
ST2005	**Stormwater Network Modelling**	**1**	**Extreme**
ST1059	Resource Consent Renewals Stormwater	1	High
ST3001	Stormwater Reticulation Renewals Full Budget (Medium)	1	High
FP1003	Monitoring equipment at Detention Dams	1	High
FP2001	Flood Control Planned P&E Renewals	Unknown	Unknown
FP3002	Resource Consent Renewal - Flood Protection	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 stormwater and flood protection 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 drinking water supply system to enhance security and integrity and increase performance against the Levels of Service. The items that have been 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
- 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 modeling 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
- We have not completed seismic assessments on pump stations
- 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 stormwater and flood protection assets are listed in **Table 5** in **Section 3: Strategic Framework**. The Three Waters Service 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 stormwater and flood protection assets when required.

7.2.3 Pandemics

The Three Waters Team follow the Three Waters and Resource Recovery Pandemic Plan (Document ID. 983033, version 12). The Pandemic Plan specifies the actions to be taken by the 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 these 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 its workforce and manage exposure to risk. The Pandemic Plan comes into effect in the event of an Alert Level 1 issued by the New Zealand Government.

This Pandemic Plan should be read in conjunction with the Three Waters and Resource Recovery Business Continuity Plan (WWMS-BCP) and the Three Waters and Resource Recovery Incident Response Plan (WWMS-IRP).

8. Financial Summary

This section provides a summary of the relevant financial information for the Stormwater and Flood Protection AMP. All financial forecasts are shown in inflation adjusted dollar values.

8.1 Funding Strategy

Stormwater and flood protection services are funded through general rates. Capital improvements are loan-funded while the renewal and replacement of assets come from renewal reserves. The replacement value of Stormwater assets is **$217m** (including land and buildings) and replacement value of flood protection assets is **$19.2m.**

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 valuation also includes onsite pipelines as they are typically not constructed in a manner where NZS 4404 would be applicable.

The valuation of stormwater and flood protection assets is based on the criticality of assets and is summarised in **Table 14.**

Table 14: Stormwater and flood protection assets valuation

	2019					
Asset Type	Critical	Important	Moderate	Non-Critical	To Be Determined	Grand Total
Stormwater P&E	23,337,710	70,532,711	71,672,070	14,465,696	37,045,813	217,054,001
Flood Protection P&E	14,240,834	0	0	0	4,924,909	19,165,743

8.3 Expenditure Forecast Summary for Opex and Capex

A summary for general Opex and Capex total expenditure during the LTP period (2021-2031) is provided in **Table 15**. The total forecast for stormwater and flood protection assets is $102.3m. Of this, the total general Opex expenditure is $18.9m excluding depreciation and the total Capex expenditure is $83.4m.

Table 15: Stormwater and Flood Protection Expenditure Forecast Summary for Opex and Capex

Stormwater and Flood Protection 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 Expenditure	227,118	236,142	245,885	255,766	266,117	276,912	288,131	299,945	312,304	325,201	**2,733,521**
Direct Cost of Activities	596,593	860,517	884,884	783,993	815,794	902,444	986,687	1,012,505	1,039,847	1,067,935	**8,951,199**
Internal Charges	664,877	668,824	686,532	710,071	737,172	725,308	739,828	761,713	786,871	770,093	**7,251,289**
Total Opex	**1,488,589**	**1,765,483**	**1,817,301**	**1,749,829**	**1,819,082**	**1,904,664**	**2,014,646**	**2,074,162**	**2,139,022**	**2,163,229**	**18,936,008**
Renewals	553,034	1,654,097	2,904,653	3,589,130	5,000,506	6,191,441	6,377,264	6,655,980	6,992,181	7,346,295	**47,264,581**
Level of Service	2,074,654	3,108,348	2,412,583	6,227,682	1,937,838	1,986,210	2,035,800	2,088,696	2,145,072	2,203,014	**26,219,897**
Growth	181,804	278,783	1,093,787	1,119,758	1,124,965	1,153,046	1,182,508	1,211,852	1,244,561	1,278,907	**9,869,969**
Total Capex	**2,809,492**	**5,041,228**	**6,411,023**	**10,936,570**	**8,063,309**	**9,330,697**	**9,595,572**	**9,956,528**	**10,381,814**	**10,828,216**	**83,354,449**

8.4 Level of Service Project Capex Expenditure Forecast Summary

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

Table 16: Level of Service Projects expenditure forecast

Stormwater and Flood Protection Level of Service Forecast ($)															
Project Budget Code	**21/ 22**	**22/ 23**	**23/ 24**	**24/ 25**	**25/ 26**		**26/ 27**	**27/ 28**	**28/ 29**	**29/ 30**	**30/ 31**	**LTP Total**	**% Renewal**	**% Levels of Service**	**% Growth**
ST1050 Installing fish passes at existing culverts	25,150	25,753	0	0	0		0	0	0	0	0	**50,903**	100	0	0
ST2001 Waitara Stormwater Upgrades	1,948,904	2,979,586	2,094,583	2,098,982	1,603,728		1,643,760	1,684,800	1,728,576	1,775,232	1,823,184	**19,381,334**	96	4	0
ST2005 Stormwater Network Modelling	0	0	212,000	217,300	222,740		228,300	234,000	240,080	246,560	253,220	**1,854,200**	20	80	0
ST3003 Stormwater Upgrade Works - Govett Doralto South Road	0	0	0	977,850	0		0	0	0	0	0	**977,850**	100	0	0
ST3004 38 Egmont Road Stormwater	0	0	0	2,824,900	0		0	0	0	0	0	**2,824,900**	100	0	0
ST3005 Stormwater Reticulation Minor Augmentations	100,600	103,010	106,000	108,650	111,370		114,150	117,000	120,040	123,280	126,610	**1,130,710**	100	0	0
Total	2,074,654	3,108,348	2,412,583	6,227,682	1,937,838		1,986,210	2,035,800	2,088,696	2,145,072	2,203,014	**26,219,897**			

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

8.5 Growth Project Capex Expenditure Forecast Summary

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

Table 17: Growth Projects expenditure forecast

Stormwater and Flood Protection Growth Forecast ($)														
Project Budget Code	**21/ 22**	**22/ 23**	**23/ 24**	**24/ 25**	**25/ 26**	**26/ 27**	**27/ 28**	**28/ 29**	**29/ 30**	**30/ 31**	**LTP Total**	**%R**	**%LoS**	**%G**
ST2001 Waitara Stormwater Upgrades	81,204	124,149	87,274	87,458	66,822	68,490	70,200	72,024	73,968	75,966	**807,556**	96	4	0
ST2004 Stormwater Subdivision Services	100,600	154,633	158,512	163,100	167,183	171,356	176,308	179,508	184,353	190,061	**1,645,614**	0	100	0
ST2005 Stormwater Network Modeling	0	0	848,000	869,200	890,960	913,200	936,000	960,320	986,240	1,012,880	**7,416,800**	20	80	0
Total	**181,804**	**278,783**	**1,093,787**	**1,119,758**	**1,124,965**	**1,153,046**	**1,182,508**	**1,211,852**	**1,244,561**	**1,278,907**	**9,869,969**			

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

8.6 Stormwater Drainage 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 (Stormwater) expenditure forecast

Stormwater Drainage Opex related to Capex Forecast ($)												
Project Budget Code	**21/ 22**	**22/ 23**	**23/ 24**	**24/ 25**	**25/ 26**	**26/ 27**	**27/ 28**	**28/ 29**	**29/ 30**	**30/ 31**	**LTP Total**	**Driver**
ST1050 Installing fish passes at existing culverts	0	0	15,806	16,200	16,605	17,021	17,447	17,900	18,383	18,879	**138,239**	LOS
ST2005 Stormwater Network Modelling	0	307,200	316,110	340,200	348,705	357,431	17,447	17,900	18,383	18,879	**1,742,253**	STG
ST3003 Stormwater Upgrade Works - Govett Doralto South Road	0	0	210,740	0	0	0	0	0	0	0	**210,740**	LOS
ST3004 38 Egmont Road Stormwater	0	0	52,685	0	0	0	0	0	0	0	**52,685**	LOS
Total	**0**	**307,200**	**595,341**	**356,400**	**365,310**	**374,451**	**34,893**	**35,799**	**36,765**	**37,758**	**2,143,917**	

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

8.7 Flood Protection Opex Projects Related to Capex Projects Expenditure Forecast Summary

The overall 10 year Opex expenditure forecast for Flood Protection Projects that are related to Capex Projects is shown in **Table 19.**

Table 19: Opex Projects related to Capex Projects (Flood Protection) expenditure forecast

Flood Protection 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**
FP3000 Inglewood Southern Catchments Flood Diversions	0	0	73,759	216,000	0	0	0	0	0	0	**289,759**	STG
FP3001 Future Of The Mangamahoe Industrial Low Head Dam	0	0	0	0	0	0	0	0	0	188,790	**188,790**	LOS
Total	**0**	**0**	**73,759**	**216,000**	**0**	**0**	**0**	**0**	**0**	**188,790**	**478,549**	

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

8.8 Opex Project Expenditure Forecast Summary

The overall 10 year Opex expenditure forecast for the Opex Project that is not related to any Capex Projects is shown in **Table 20.**

Table 20: Opex Project

Opex Forecast ($)											
Project	**21/ 22**	**22/ 23**	**23/ 24**	**24/ 25**	**25/ 26**	**26/ 27**	**27/ 28**	**28/ 29**	**29/ 30**	**30/ 31**	**LTP Total**
Stormwater Design Guidelines	0	150,288	149,712	0	0	0	0	0	0	0	**300,000**
Total	0	150,288	149,712	0	0	0	0	0	0	0	**300,000**

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

8.9 Renewals Capex Project Expenditure Forecast

The Capex expenditure forecast for Renewals Projects is shown in **Table 21.**

Table 21: Renewals Projects expenditure forecast

Stormwater & Flood Renewals 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**
ST1059 Resource Consent Renewals Stormwater	5,030	0	0	5,433	38,980	62,783	29,250	0	0	0	**141,475**	0	0	100
ST3001 Stormwater Reticulation Renewals Full Budget (Medium)	502,726	1,612,885	2,862,245	3,540,229	4,861,285	6,020,207	6,301,205	6,607,955	6,942,860	7,295,642	**46,547,238**	0	0	100
FP1003 Monitoring equipment at Detention Dams	10,060	10,301	10,600	10,865	11,137	11,415	11,700	12,004	12,328	12,661	**113,071**	0	0	100
FP2001 Flood Control Planned P&E Renewals	30,188	30,911	31,808	32,603	33,420	34,254	35,109	36,021	36,993	37,993	**339,300**	0	0	100
FP3002 Resource Consent Renewal - Flood Protection	5,030	0	0	0	55,685	62,783	0	0	0	0	**123,498**	0	0	100
Total	**181,804**	**278,783**	**1,093,787**	**1,119,758**	**1,124,965**	**1,153,046**	**1,182,508**	**1,211,852**	**1,244,561**	**1,278,907**	**9,869,969**			

9. Improvement Plan

This section provides information about stormwater and flood protection 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 stormwater and flood protection 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 stormwater and flood protection asset management practices from current ratings to Basic, Core, Intermediate and Advanced levels is shown in **Table 22.**

Table 22: 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					
Asset Register Data					
Asset Condition					
Decision Making					
Risk Management					

Key: Maturity rating status at 2020

Proposed improvements to 2023

Element	Aware	Basic	Core	Intermediate	Advanced
	0	1	2	3	4
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 stormwater and flood protection assets and specific areas of improvement identified for different asset categories are listed in **Table 22.**

Table 23: Stormwater and Flood Protection AMP improvements summary

No.	Title	Description	Status	BAU
General Improvements				
1	Master Plan	Produce Stormwater Master Plan.	In progress	
2	Modelling Management Plan	Produce Modelling Management Plan and up to date validated stormwater models.	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	I&E scheduled maintenance tasks to be recorded and managed in EAM.	In progress	
7	Assets identification tags	Check and install tagging to all P&E.	In progress	
8	RedEye	Following survey in item 2 update P&IDs and layout drawings.	In progress	SharePoint

No.	Title	Description	Status	Business as usual or Sharepoint
General Improvements				
9	Critical Spares List	Conduct update of critical spares analysis and procure any required items.	In progress	
Pump stations				
10	Condition assessment	Assess asset condition and record results in EAM.	In progress	
11	Critical spares list	Conduct update of critical spares analysis and procure any required items.	In progress	
12	Critical asset management plan	Produce focused management plan for those assets identified as critical.	In progress	
13	Critical asset assessment	Conduct criticality assessment and record results in EAM.	In progress	
Reticulation Network				
14	Condition assessment	Conduct asset condition assessment and record results in EAM.	In progress	

No.	Title	Description	Status	Business as usual or Sharepoint
Intakes and Outlets				
15	Condition assessment	Assess asset condition and record results in EAM.	In progress	
16	Critical asset management plan	Produce focused management plan for those assets identified as critical.	In progress	
17	Critical asset assessment	Conduct criticality assessment and record results in EAM.	In progress	
Intakes and outlets				
18	Condition assessment	Conduct asset condition assessment and record results in EAM where not currently assessed. Record asset condition ratings where already known.	In progress	
19	Critical asset assessment	Conduct criticality assessment and record results in EAM.	In progress	
20	Critical asset management plan	Produce focused management plan for those assets identified as critical.	In progress	

Glossary

AC	Asbestos Cement
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
Infra/Enterprise	NPDC customer support services information system
IRP	Incident Response Plan
IWWF	Instantaneous Wet Weather Flow (sewage)
KI	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
MI	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
O&M	Operations and Maintenance
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)
P&ID	Piping and Instrumentation Diagram
SCADA	Supervisory Control and Data Acquisition system
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
Stormwater And Flood Protection Asset Management Plan

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

Volume 1 - Pump Station

Pukapuka Tuatahi - Ngā Taupuni Mapu

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1. Introduction

This volume provides descriptions for the assets covered by the pump station asset category of the Stormwater and Flood Protection AMP. It also contains details for the asset lifecycle management of this asset.

Three Waters Service owns one stormwater pump station, located in Waitara. The Pump Station was built in 1975 and upgraded in 2002. It provides an emergency contingency to pump floodwater from the New Plymouth Central Business District through the stopbank and into the Waitara River.

1.1 Asset Descriptions

The Pump Station has two pumps and two pump Variable Speed Drives (VSDs) with telemetry used to boost stormwater flow and to meet Levels of Service. The pumps are powered by electrical motors driven via a connected gearbox. They are configured in either 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 Pump Station's components include pumps, valves, piping, meters, cables, controls/SCADA and the associated buildings, civil and ground structures. The Pump Station buildings are included in the **Property AMP: Volume 8 – Water and Wastes Buildings**. The layout of the Pump Station is shown in **Figure 1.**

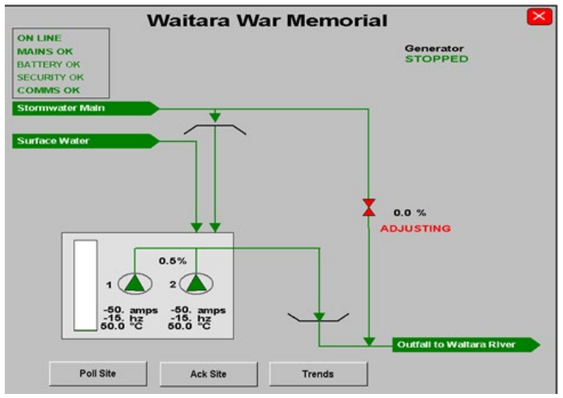

Figure 1: Waitara War Memorial Pump Station layout

2. Lifecycle

2.1 Identify Need and Plan

There are no acquisitions of assets for the Pump Station planned over the next 10 years.

2.1.1 Asset Condition

No formal asset conditions are recorded for the Pump Station in the asset inventory. Despite this, Pump Station assets are generally considered to be in Good Condition (Grade 2) with a few known exceptions that have been addressed or will be addressed in either renewals plans or through reactive maintenance planned over the next 10 years.

2.1.2 Asset Remaining Lives

An external consultant provided estimates of the expected lives and RUL for the Pump Station's components as part of the 2019 plant and equipment valuation. These are recorded in the EAM asset inventory.

The RUL for the components are shown in **Table 1.**

Table 1: Pump Station component remaining lives

Asset ID	Description	Year new	Age	Expected Lives	Remaining Lives
C-701-001	Waitara War Mem Structure	1975	44	100	56
G-701-01	Generator	1975	44	80	36
MCC-701-01	Motor Control Centre	1975	44	50	6
VV-701-001	Penstock	1975	44	70	26
P-701-100	Pump 2	1975	44	60	16
P-701-200	Pump 1	1975	44	60	16
VSD-701-100	Pump 1 VSD	1975	44	60	16
VSD-701-200	Pump 2 VSD	1975	44	60	16
MSUB-701-CABLE	Cable	1975	44	80	36
TEL-701-001	Telemetry	1975	44	60	16
PLC-701-001	PLC	1975	44	60	16
LT-701-001	Wet well LT	1975	44	60	16
LT-701-002	River LT	1975	44	60	16

2.1.3 Critical Assets

Criticality ratings for Pump Stations 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 **Stormwater and Flood Protection 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 Pump Station. This is an asset data integrity issue and is **recorded as an improvement action in the Stormwater and Flood Protection AMP: General Volume – Section 9 (Improvement Plan).**

2.2 Design and Build

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

2.3 Operations and Maintenance

2.3.1 Operations

A maintenance contractor is responsible for the operations and maintenance of the Pump Station and conducts general monthly inspections.

Electrical power costs only represent a small proportion of operational expenditure due to its occasional use.

2.3.2 Maintenance

The Three Waters Service maintains the Pump Station on a regular basis, which includes evaluating pump performance and identifying any remedial work required.

The Electrical and Systems Team maintains the electrical equipment at the Pump Station. This includes annual checks and calibration of flow transmitters and pressure gauges.

The general 10 year expenditure forecast for operations and maintenance is included in **Table 15** in **Section 8: Financial Summary** of the **Stormwater and Flood Protection AMP: General Volume**. Further, the expenditure forecasts for Opex Projects which are related to Capex Projects over the 10 year period of the AMP are provided in **Tables 19 and 20** in **Section 8: Financial Summary** of the **Stormwater and Flood Protection AMP: General Volume.**

2.4 Renewals

Pump station components containing moving parts such as motors, gear boxes and pumps have finite lives in the region of 15-20 years, depending on usage. As the Pump Station continues to age it will require investment in renewals to maintain current levels of reliability. Prior to confirming expenditure on Renewals Projects, the Three Waters Team will undertake condition and criticality assessments, and will review the RUL of the assets to ensure optimum value from the assets is being achieved. The general 10 year expenditure forecast for Renewals Projects is included in **Table 20** in **Section 8: Financial Summary** of the **Stormwater and Flood Protection AMP: General Volume.**

2.5 Disposals

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

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Volume 2 - Reticulation Network

Pukapuka Tuarua - Tūhononga Kōrere Wai

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1. Introduction

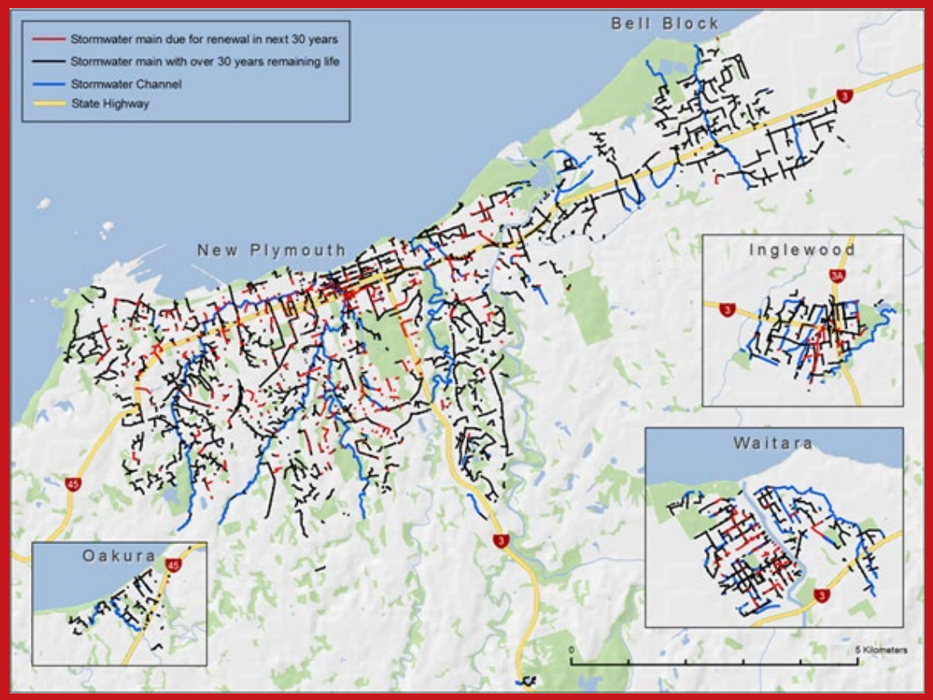
This volume provides descriptions for the assets covered by the reticulation network asset category of the Stormwater and Flood Protection AMP. It also contains details for the asset lifecycle management of these assets.

The purpose of reticulation network assets is to drain stormwater from roads and public property in a manner that minimises effects on people and property and conveys the stormwater to an acceptable discharge point.

The stormwater network has 284km of reticulation mains made up a variety of materials. The majority, 270km or (95%), are concrete pipes with the remaining 14km (5%) consisting of flexible pipes (PE and Un-plasticised Polyvinyl chloride (uPVC)), steel pipes and GEW. The reticulation network also contains manholes and stormwater service connectors.

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

Figure 1: Location of reticulation network assets



As new land developments occur, the capacity of the existing reticulation systems will be assessed to ensure additional stormwater generated can be catered for. Renewals are also assessed at the planning stage for potential future capacity requirements.

As detailed in the **Stormwater and Flood Protection AMP: General Volume**, the Three Waters Team also plan to conduct further studies of potential future growth to ascertain system capacity limits and to produce a Stormwater Master Plan.

1.1 Asset Descriptions

A summary of the stormwater reticulation assets is provided in the following Table 1. Existing stormwater reticulation assets

Asset description	Details	Quantity
Pipes	Concrete	270km
	Other pipe materials	14km
Manholes	Installed in reticulation to change direction in the flow and breach jumps in topography. They are typically installed at 100-110m intervals and provide access into the pipes for cleaning and clearing blockages.	4,911 manholes
Service connections	Service connections (or laterals) comprise the mains connection and the small diameter pipework serving domestic, commercial and industrial premises	12km

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 with 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. The Three Waters Service assumes full responsibility for any assets vested with the Council and includes them in operations, maintenance and future renewal plans.

2.1.1 Asset Condition

No formal asset condition grades are recorded for reticulation network assets in the asset inventory. However, concrete pipes, other pipes, manholes, and service connections are generally in Good Condition (Grade 2).

2.1.2 Asset Remaining Lives

The majority of stormwater reticulation assets are constructed from concrete. The expected life of concrete stormwater pipes is 100 years but because they run dry for periods, are not pressurised and have a relatively neutral pH, stormwater pipes remain in relatively good condition and will generally exceed their expected life.

2.1.3 Critical Assets

The Three Waters Team assess the criticality of stormwater reticulation mains using the process and scoring system contained in the Water, Wastewater and Stormwater Mains Criticality and Renewals Prioritisation Process (ECM#: 988741).

2.1.4 Critical Spares

An assessment of the critical spares required has not yet been conducted for reticulation network assets. This is an asset data integrity issue and is recorded as an improvement action in the **Stormwater and Flood Protection AMP: General Volume - Section 9 (Improvement Plan).**

Critical spares for the stormwater reticulation network have been identified and procured. 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 **Stormwater and Flood Protection AMP: General Volume** for general information about the design and build of reticulation network assets.

2.3 Operations and Maintenance

2.3.1 Operations

Typical reticulation system operations activities include:

• Response to customer service requests

• Flood monitoring and response

2.3.2 Maintenance

No regular preventative and predictive (proactive) maintenance activities on pipes, connections or manholes is currently being conducted as it is not considered a requirement. Some of the more critical assets (e.g. Colson Road culvert) are inspected every 12 months.

Corrective (reactive) maintenance activities include the following:

• Investigating and repairing blockages

• Reacting to flood situations

• Repairing general damage to manhole lids etc.

The general 10 year expenditure forecast for operations and maintenance is included in **Table 15** in **Section 8: Financial Summary** of the **Stormwater and Flood Protection AMP: General Volume**. Further, the expenditure forecasts for Opex Projects which are related to Capex Projects over the 10 year period of the AMP are provided in **Tables 19 and 20** in **Section 8: Financial Summary** of the **Stormwater and Flood Protection AMP: General Volume**.

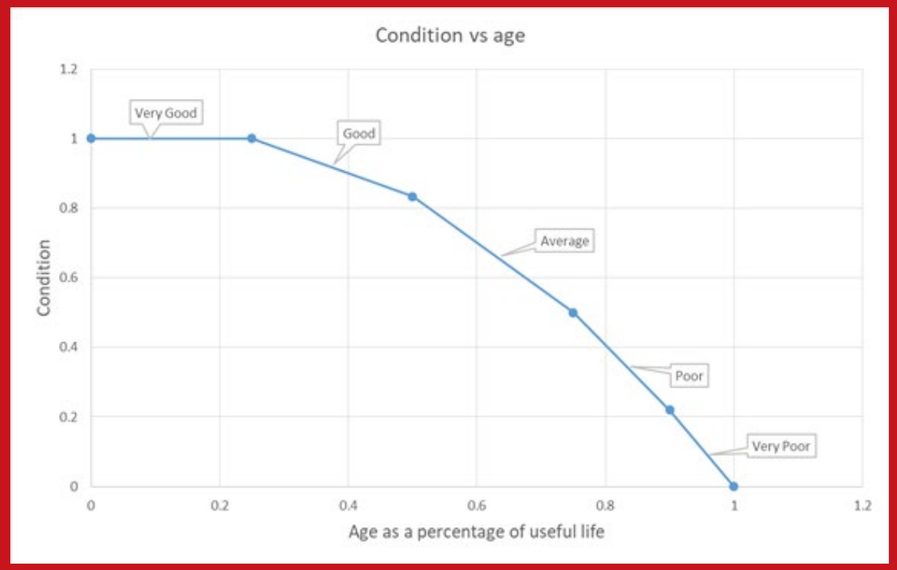
2.4 Renewals

As stormwater reticulation assets continue to age, investment in renewal will be required to maintain current levels of reliability.

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 most stormwater reticulation pipes as NPDC have very little CCTV inspection footage of the stormwater reticulation network. Inspection based condition ratings has been used for a few stormwater pipes where CCTV results are available.

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 renew of critical pipes when they change from poor to very poor condition with a 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 a uncertainty of ±5% of their design life. In theory this means we will be sacrificing 10yrs of their useful life due to proactive replacement.

2.5 Disposals

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

2021-2031 Stormwater and Flood Protection Asset Management Plan

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

Volume 3 - Inlets, Outlets, and Wetlands

Pukapuka Tuatoru Ngā Ngote Wai / Ngā Putanga Wai

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1. Introduction

This volume provides descriptions for the assets covered by the inlets, outlets, and wetlands asset category of the Stormwater and Flood Protection AMP. It also contains details for the asset lifecycle management of these assets.

The purpose of inlets is to collect stormwater into the stormwater network. The purpose of outlets is to discharge the stormwater into waterways, the sea and wetlands. Asset components include sumps, manholes, and grilles.

Inlets and outlets link stormwater pipes to open channels and ponds. They are predominantly concrete structures and are installed as standard precast units. The majority of the sumps are installed in the transportation network to collect stormwater from the kerb and channel.

In some locations inlet grilles prevent large objects from entering and blocking the system. They also act as a safety mechanism to prevent people or animals from entering into the stormwater system.

The wetlands at Mangati Ponds in Bell Block and Peringa Park in Fitzroy are used for containment and provide a ‘refining’ process for improving stormwater quality prior to discharge to the natural receiving environment.

1.1 Asset Descriptions

1.1.1 General

The stormwater network delivers stormwater to the open water surfaces. It has inlets at the entry points into the reticulation network and outlets at the end of the system. There are 9,117 inlets, outlets, and nodes.

Inlets and outlets are generally constructed from concrete or rip-raps (outlets) to prevent scouring. As recorded in EAM, the inlets are mainly double sumps, sumps, well up sumps, wing walls, and open pipes.

The number and types of inlets is shown in **Table 1.**

Table 1: Inlet summary by type

Inlets	Number
Double Sump	503
Inlet Grill	47
Open Pipe End	295
Other	90
Side Entry Sump	23
Sump	5,661
Super Sump	1
Wellup Sump	838
Wingwall	60
TOTAL	**7,518**

The number and types of outlets is shown in **Table 2.**

Table 2: Outlet summary by type

Outlets	Number
Bridge Abutment	4
Drainage Screen	6
End Point	361
Open Pipe End	335
Stormwater Outlet	547
Stormwater Soakhole	15
Y-T-Junct	174
Other	157
TOTAL	**1,599**

There are also two constructed pond systems – the Mangati Ponds in Bell Block (completed in 2003) and Peringa Park (commissioned in 2009). Further details are provided below.

1.1.2 Mangati Ponds

Stormwater from industrial areas is captured and passed through a constructed wetland to trap litter, sediment, hydrocarbons (and chemical contaminants to the extent that it is feasible) before being discharged to the Mangati Stream.

The Three Waters Service hold TRC Discharge Permit Consent 4302-2 for stormwater discharge to the Mangati Stream, although because TRC manages the individual discharge consents for industrial premises, NPDC's control over what enters the stormwater system is limited. TRC reports in the 1990s highlighted poor water quality in the Mangati Stream, Bell Block, and included references to a significant number of reported industrial spills.

The construction of wetlands were proposed as part of a broader scope to develop an integrated water and land management system for the middle Mangati catchment in which:

- Industrial land uses are physically and hydrologically isolated from the Mangati Stream by a riparian reserve
- A riparian reserve provides public access, a utilities corridor and machine access for stream maintenance
- Flood detention structures and ponding areas are developed as required and integrated into the riparian reserve development

Wetland construction was completed in 2003 and further enhanced in 2006, with the installation of two oil traps in pond 4.

The Three Waters Service acknowledge that the wetlands largely provide a containment and 'polishing' process rather than any real treatment of discharges into the system. Therefore, TRC's on-site monitoring and management of those industrial premises from where the stormwater is drained remains critically important to enhancing the Mangati Stream. The Three Waters Service maintain a close working relationship with TRC in monitoring individual discharge consents and identifying any non-compliance from industrial premises.

1.1.3 Peringa Park Wetlands

In 2008-09, a further wetland was constructed in Peringa Park, Fitzroy. This consists of a single pond with a floating plant mass to receive and 'polish' the stormwater from Fitzroy East before it discharges to Lake Rotomanu. This project and its associated planting have significantly enhanced the aesthetic and recreational amenity of this area, incorporating a pedestrian walkway. Water quality into Lake Rotomanu has also improved.

Importantly, the Peringa Park wetland ponds are the outlet to the $8m staged Fitzroy stormwater improvements constructed 2002-10. The Three Waters Service intends to further extend the Peringa Park wetlands in the future.

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 with the Council. Assets are built to the NZS4404:2010 – Land Development and Subdivision Standard. NPDC's specific requirements are defined in the NPDC and STDC and SDC adopted standard for Land Development and Subdivision Infrastructure, which is based on NZS 4404:2010 with local amendments. The Three Waters Service assumes full responsibility for any water related assets vested with the Council, and includes them in operations, maintenance and future renewal plans.

2.1.1 Asset Condition

No formal asset conditions are recorded for inlets, outlets, and wetlands in the asset inventory.

2.1.2 Asset Remaining Lives

The expected lives of inlets and outlets range, depending on their construction materials and use. The Three Waters Team assess the condition of inlets and outlets during preventative and reactive maintenance and have observed that the materials are generally performing well. The average age of the inlet and outlet assets was 35 years at 30 June 2016. The average age of the inlet and outlet assets at 30 June 2013 was 32 years.

2.1.3 Critical Assets

Criticality ratings for inlets, outlets, and wetlands assets have not yet been conducted; therefore, there is currently no data recorded in EAM.

Following asset criticality assessment, 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 **Stormwater and Flood Protection 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 inlets, outlets, and wetlands assets. This is an asset data integrity issue and is recorded as an improvement action in the **Stormwater and Flood Protection AMP: General Volume (Section 9 - Improvement Plan)**.

2.2 Design and Build

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

2.3 Operations and Maintenance

2.3.1 Operations

During any storm event, one of the key features of the performance of the stormwater drainage system is the susceptibility of Inlets to blockages. Inlets are attended to as required if they become blocked during storm events.

2.3.2 Maintenance

The following routine inspection and maintenance tasks are conducted:

- Inspect stormwater inlets weekly or two monthly (depending on their tendency to block and level of risk associated with any blockage). Remove debris likely to cause an obstruction. Outlets in the Waitara and Waiwhakaiho Rivers area need to be inspected every two months to avoid backflows from the river.
- Inspection of inlets that otherwise require weekly inspection immediately after a heavy rainfall warning is issued by TRC. Remove debris likely to cause an obstruction.
- Remove debris blocking grates of sumps
- Clean sumps

The Three Waters Team systematically install blue fish markers at all stormwater inlets and sumps to encourage the public not to dispose of any environmentally harmful pollutant to the stormwater system.

The general 10 year expenditure forecast for operations and maintenance is included in **Table 15** in **Section 8: Financial Summary** of the **Stormwater and Flood Protection AMP: General Volume**. Further, the expenditure forecasts for Opex Projects which are related to Capex Projects over the 10 year period of the AMP are provided in **Tables 19 and 20** in **Section 8: Financial Summary** of the **Stormwater and Flood Protection AMP: General Volume**.

2.4 Renewals

As inlets, outlets, and wetlands assets continue to age, investment in renewals 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.

Inlets and outlets perform similarly to the reticulation network and they are generally in good material condition. However, to maintain Levels of Service their performance capacity requires upgrading in association with reticulation upgrades. Renewals are included as part of reticulation network renewals included in the **Stormwater and Flood Protection: Volume 2 – Reticulation Network.**

2.5 Disposals

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

2021-2031 Stormwater and Flood Protection Asset Management Plan

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

Volume 4 - Flood Protection

Pukapuka Tuawhā - He Taupā Waipuke

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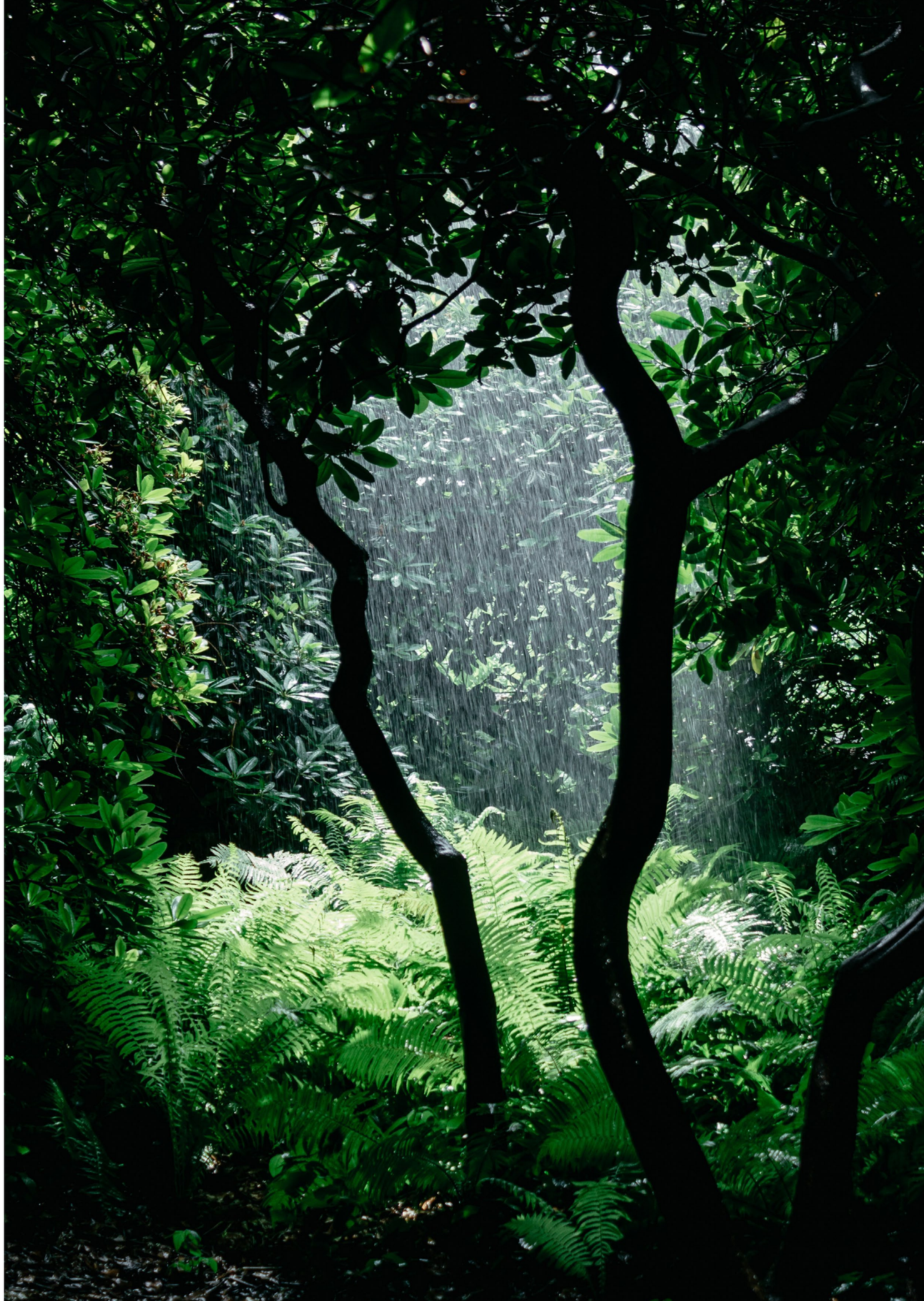

1. Introduction

This volume provides descriptions for the assets covered by the flood protection asset category of the Stormwater and Flood Protection AMP. It also contains details for the asset lifecycle management of these assets.

Flood Protection assets are designed to protect floodplains (the land adjacent to streams and rivers), streams, rivers and riparian areas from the effects of major storm events i.e. storm events of a magnitude greater than a 100 year storm event. They are based on the requirements of TRC.

1.1 Asset Descriptions

The Three Waters Service provides flood protection within the district through upstream detention dams, bunds, flood diversion tunnels, and through a weir on the Huatoki Stream in the New Plymouth Central Business District.

Diversion tunnels divert a stream from its normal path during high water flow. Detention dams and bunds reduce flood flows in a stream by temporarily detaining (storing) water to spread the total released flow over a longer period.

Flood Protection Dams
These are structures that detain and store the peak flows from the catchment above the dam, allowing a design flow to pass and gradually releasing the flood waters at a maximum allowable flow that does not cause unacceptable risk downstream of the dam.

There are three earth dams protecting the district:

1. Huatoki dam (commissioned in 1987)

2. Mangaotuku dam (commissioned in 1986)

3. Waimea dam (commissioned in 1985)

Detention Bunds
Bunds provide a temporary buffer to peak flows on a waterway or within a sub-catchment by detaining and storing flood flows to a designed peak.

There are eight earth bunds, all within the city:

1. Huatoki bund (built in the 1960s)

2. Sutherland Park bund (built in the 1970s)

3. Brois Street bund (built in the 1970s)

4. Vogeltown bund (built in the 1990s)

5. Waimea Street bund (built in the 1980s)

6. Rugby Park bund (built in 2002)

7. Magnolia bund (built in 2004)

8. Highlands Park bund (built in 2005)

Diversion Tunnels
These tunnels divert potentially damaging flood flows from their natural drainage path to another catchment or outfall, where the discharge effects are less harmful or can be mitigated.

The three diversion tunnels, include:

1. Mangaotuku diversion tunnel (built in 1972)

2. Lower Mangaotuku diversion tunnel (built in 1995)

3. Gilbert Street diversion tunnel (built in 1997)

Huatoki Plaza Weir
This barrier was constructed across the Huatoki Stream (in the Huatoki Plaza) and provides aesthetic amenity value. In times of normal flow the weir is raised, causing the flows in the stream to ‘pool’ behind the weir structure, which creates a tranquil area of water of constant depth alongside the plaza. The weir lowers completely in high flows to remove any impediment to the stream flow, and to prevent localised flooding.

2. Lifecycle

2.1 Identify Need and Plan

There is no acquisition of flood protection assets planned over the 10 year period of the AMP.

2.1.1 Asset Condition

The three earth dams are each classified as High Potential Impact Category (PIC) dams. A consultant conducts an intermediate level inspection of the three dams annually and a Comprehensive Safety Review (CSR) every five years. Changes in Building Act legislation, and particularly in Building (Dam Safety) regulations, came into force on 1 July 2015. To comply with this legislation, the Three Waters Team prepared an Emergency Action Plan (ECM#: 1520213) that contains instructions, advice and information for emergency management of these dams. The plan covers all three dams with information specific to each site clearly identified, where necessary.

Condition assessments of the Mangaotuku diversion tunnel showed that overall, the tunnel is an excellent condition (Grade 1). No formal condition assessments have been carried out for any other diversion tunnels. The Huatoki Weir was constructed in 2010 and is in excellent condition (Grade 1).

No formal asset conditions are recorded for flood protection assets in the asset inventory.

2.1.2 Asset Remaining Lives

All stormwater dams, bunds and tunnels were constructed to meet a 200 year life expectancy. Associated structures have different expected lives dependent on their construction material and function.

2.1.3 Critical Assets

Criticality ratings for flood protection 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 **Stormwater and Flood Protection 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 flood protection assets. This is a data integrity issue and is recorded as an improvement action in the **Stormwater and Flood Protection AMP: General Volume - Section 9 (Improvement Plan).**

2.2 Design and Build

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

2.3 Operations and Maintenance

2.3.1 Operations

Operations consist of general site attendance to conduct routine weekly visual checks/inspections. Pore pressures inside the dam walls and groundwater flow from inside the dam walls are measured and recorded monthly.

The Three Waters Team installed telemetry for alarms to control water levels at the Huatoki Weir to monitor operations.

2.3.2 Maintenance

The Three Waters Service engages a consultant to carry out an annual intermediate level inspection of the three dams.

Although they are not formally inspected, the Three Waters Team undertake regular maintenance on the bunds e.g. mowing of grass and weeds.

The height adjustable weir has weekly inspections and removal of debris. It also undergoes routine maintenance including checking of oil, drive maintenance, and air dry function.

The general 10 year expenditure forecast for operations and maintenance is included in **Table 15** in **Section 8: Financial Summary** of the **Stormwater and Flood Protection AMP: General Volume**. Further, the expenditure forecasts for Opex Projects which are related to Capex Projects over the 10 year period of the AMP are provided in **Tables 19 and 20** in **Section 8: Financial Summary** of the **Stormwater and Flood Protection AMP: General Volume**.

2.4 Renewals

Dams, bunds and tunnels have a life expectancy of 200 years. All assets are currently around 30 years old; therefore, no renewals have been identified as being required during the 10 year forecast period of the AMP.

There are a number of P&E assets associated with operating flood protection assets that have shorter life expectancies. The Three Waters Team also need to install and update rainfall and stream stage monitoring equipment at Waimea and Mangaotuku dams to maintain continuous records, to generate automatic alarms to trigger increased monitoring, and to mitigate the impacts of a potential dam breach. Annual allowances have been provided for these renewals. Renewal expenditure is aimed at maintaining assets in a safe and fit for purpose condition by replacing them at or before the end of their useful life. Renewals are selected using the general principles described in **Section 7: Asset Lifecycle** of the **Asset Management Strategy**.

The general 10 year expenditure forecast for Renewals Projects is included in **Table 20** in **Section 8: Financial Summary** of the **Stormwater and Flood Protection AMP: General Volume**.

2.5 Disposals

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