KAIPARA DISTRICT COUNCIL

draft

Kaipara District Council

Asset Management Plan 2018

Northern Area Land Drainage

January 2018

Status: Draft

KAIPARA DISTRICT

QUALITY STATEMENT

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CONTENTS

1 Executive summary 1
1.1 Introduction 1
1.2 The key risks 2
1.3 Key issues 3
1.4 Continuous improvement 3
1.5 Assets, valuation and budget summaries 6
1.6 Financial and Lifecycle Strategy 9
2 Strategic context 11
2.1 Purpose 11
2.2 Service description and scope 12
2.3 Key issues 12
2.4 Relationship to community outcomes, Council policies and strategies 13
2.5 Stakeholders and consultation 16
2.6 Community engagement 19
2.7 Potential significant negative effects 20
3 Level of Service (LOS) 23
3.1 Overview 23
3.2 Legislative framework and linkages 24
3.3 Industry standards and guidelines 30
3.4 Proposed LOS – customer and technically focused 31
3.5 Strategies for achieving service levels 32
4 Drivers of change 35
4.1 Overview 35
4.2 Growth and demand change 35
4.3 Population growth 37
4.4 National Policy Statement on Urban Development Capacity 2016 41
4.5 Increase in land drainage services 42
4.6 Technological change 42
4.7 Legislative change 44
4.8 Environmental considerations 44
4.9 Summary of drivers of change 49
5 The Assets: extent and valuation data 50
5.1 Asset description 50
5.2 Stopbanks 55
5.3 Floodgates 56
5.4 Drains and canals 61
5.5 Total asset valuations for each northern area land drainage scheme 63
5.6 Culverts 64
5.7 Critical assets 65
5.8 Asset values 67
6 Lifecycle strategy and management 69
6.1 Introduction 69
6.2 Design parameters 69
6.3 Work categories 69
6.4 General standards and specifications used 71
6.5 Lifecycle management strategies – operations and maintenance 72
6.6 Lifecycle Management Strategy – renewals 80
7 Financial summary 87

draft

8 Service management 89
8.1 Organisation 89
8.2 Asset management systems and processes 90
8.3 Health and safety 94
9 Risk management 95
9.1 Overview 95
9.2 Risk Management Policy 95
9.3 Risk identification 97
9.4 Risk analysis and evaluation 98
9.5 Application to land drainage 102
9.6 Risk treatment 103
9.7 Health and Safety: 105
10 Continuous improvement 106
10.1 Asset Management Improvement Plan (AMIP) 107
10.2 Monitoring and review 108

Appendices

Appendix A: Resource Consent Register 109
Appendix B: List of acronyms and abbreviations 111

draft

LIST OF TABLES

Table 1-1: Improvement Programme 2018/2028 4
Table 1-2: Overview of assets 8
Table 2-1: Overview of assets 12
Table 2-2: NALD services and community outcomes 15
Table 2-3: Stakeholders 17
Table 2-4: Potential significant negative effects 21
Table 3-1: Relevant legislation 24
Table 3-2: Relevant regulatory requirements 25
Table 3-3: Relevant Council planning and policy documents 25
Table 3-4: Relevant Council Bylaws 26
Table 3-5: LOS targets 31
Table 4-1: Examples of LD demand management strategies 36
Table 4-2: Annual rating unit growth forecasts 2017 41
Table 4-3: Effects of climate change on land drainage 47
Table 4-4: Summary of issues impacting on LD 49
Table 5-1: Current status of northern area LD districts 53
Table 5-2: Overview of assets 55
Table 5-3: Floodgate locations, type and valuation 58
Table 5-4: Comparison of NALD schemes and Raupo asset valuations 60
Table 5-5: NALD scheme, extent and valuation 62
Table 5-6: Total scheme valuations 64
Table 5-7: Criticality of LD assets 65
Table 6-1: Maintenance activities 72
Table 6-2: Planned inspections 73
Table 6-3: Baseline and periodic cleaning 75
Table 6-4: Operating activities 77
Table 6-5: Scheme operational budget by type 78
Table 6-6: Operational budget by scheme 79
Table 6-7: Renewal prioritisation 81
Table 6-8: Asset life expectancies 82
Table 6-9: Weighted average renewal expenditure required 85
Table 7-1: Capital expenditure vs depreciation 87
Table 8-1: Management systems 90
Table 9-1: Likelihood of failure 99
Table 9-2: Consequence of failure 99
Table 9-3: Risk matrix 101
Table 9-4: Summary of extreme/high risk for Council 102
Table 9-5: Specific risk responses 104
Table 10-1: Improvement Programme 2018/2028 107

draft

LIST OF FIGURES

Figure 1-1: Overview of locations 6
Figure 1-2: Overview of assets 8
Figure 1-3: Operating cost forecast 9
Figure 1-4: Capital works cost forecast 10
Figure 2-1: Vision Statement 14
Figure 3-1: Extract from DIA Rules 30
Figure 3-2: Summary of LOS Achievement from Annual Report 2016/2017 32
Figure 4-1: NRC commentary on recreational water standards 45
Figure 5-1: Location of land drainage schemes 51
Figure 5-2: Various floodgate types 57
Figure 5-3: Drain types 61
Figure 6-1: Operational budget forecast 80
Figure 6-2: Theoretical floodgate renewal profile 83
Figure 6-3: Capital works forecast 85
Figure 7-1: Capital expenditure vs depreciation 88
Figure 8-1: Organisational structure 89
Figure 8-2: IntraMaps Screenshot 91
Figure 8-3: Data maintenance process 92
Figure 8-4: AssetFinda screenshot 93
Figure 9-1: Risk management process 96
Figure 10-1: Key AM inputs 106

draft

1 Executive summary

1.1 Introduction

The goals of the Northern Area Land Drainage (NALD) network are to achieve the following in a cost-effective manner:

- Protect land from tidal waters;
- Provide drainage of the soils to optimise agricultural production;
- Control surface water during flooding; and
- Divert run-off from inland hills.

As per the LGA 2002:

1. The purpose of local government is –
    a. To enable democratic local decision making and action by, and on behalf of, communities; and
    b. To meet the current and future needs of communities for good-quality local infrastructure, local public services and performance of regulatory functions in a way that is most cost-effective for households and businesses.
2. In this Act, **good-quality**, in relation to local infrastructure, local public services, and performance of regulatory functions, means infrastructure, services, and performance that are –
    a. Efficient; and
    b. Effective; and
    c. Appropriate to present and anticipated future circumstances

In order to do this a number of drains, floodgates and stopbanks have been constructed in the past and integrated with naturally formed channels to achieve these goals. These assets are overseen by small; drainage committees comprised of representatives of the area. Sometimes this is a single individual. The local representatives are assisted by Council staff and a Land Drainage Co-ordinator.

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1.2 The key risks

A number of high risks have been associated with the land drainage networks. These include, but are not limited to:

- Stopbanks being overtopped at their current height due to climate change and predicted sea level rise;
- Sea level rise results in land drainage assets inability to drain sufficiently at low tide;
- Changes in regulations inhibit Council's ability to manage and control undesirable vegetation;
- Lack of timely maintenance causing floodgate failures and localised flooding; and
- Stopbanks being overtopped due to lack of knowledge around assets and their condition.

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1.3 Key issues

Key issues requiring attention for northern area land drainage are:

- Knowledge of the network's capacity to adequately drain significant storm events is limited to observed performance during historical rainfall events. Historical evidence indicates that the network continues to provide the capacity for which it was designed;
- An assessment of the likely future demands on the drainage network's capacity has also identified potential changes as a result of global warming having the potential to result in moderate to significant impacts on the drainage network and its ability to achieve its stated goals and levels of service (LOS);
- While there is a reasonable understanding of the hazards that exist relating to land drainage this has not been assessed in relation to criticality and this limits Council's ability to manage risk;
- Management of the land drainage systems is primarily focused on managing the flow of water under 'normal' and 'storm' conditions to maintain land productivity and prevent flooding. It is expected that management of water quality, and its associated impact on the receiving environments, will become increasingly important in the future;
- There are numerous small land drainage schemes within the Northern Area. This reflects the process of their creation over the years. There may be opportunities to amalgamate schemes or revise boundaries to generate efficiencies;
- Allocation of asset ownership and responsibility for maintenance, renewal and upgrading between the landowners, drainage area committees and Council's land drainage activity is not entirely clear or consistent across the schemes;
- The desired LOS to be achieved by the schemes is not well-defined and largely reflects acceptance of historical performance;
- The current condition, valuation and life expectancy of assets is not well understood and this adversely impacts on the ability to undertake future planning for capital works; and
- Asset information is incomplete within Council's asset information system. This includes the recording of maintenance activity as it is undertaken.

1.4 Continuous improvement

Council has developed an Asset Management Improvement Plan (AMIP) to address the risks and issues described above. Timing for completion of the activities may vary depending on Council priorities. This may result in re-prioritisation of activities from year to year, while maintaining bottom-line budgets.

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Table 1-1: Improvement Programme 2018/2028

Improvement Programme 2018/2028	
Year 1 **Planned improvement / change 2018/2019**	• Populate a central database and geospatial framework for the recording of asset attributes and condition assessment information; • Provide a central management system for consents, compliance and monitoring; • Commence a hydraulic assessment of the Northern Area Land Drainage (NALD) schemes to be able to better prepare these schemes for climate change and sea level rise; and • Commence condition assessments of floodgates.
Year 2 **Planned improvement / change 2019/2020**	• Continue assessments of NALD schemes assets; • Update creation dates for floodgates in valuation system and review expected lives of these assets; • Review valuation of floodgates and drains compared to Raupo land drainage scheme in preparation for AMP 2021; • Continue assessments of existing drainage system to prepare for climate change and sea level rise; • Refine application of Criticality Framework to land drainage and review resulting risk assessment; • Commence consultation process with stakeholders to better define the expected land drainage LOS, clarify ownership of assets and maintenance/renewal responsibilities and clarify how long term funding of the schemes should be managed. This process will include assessment of current level of satisfaction with current arrangements; and • Assess existing drainage area and identify where, if possible, any can be reduced or amalgamated.
Year 3 **Planned improvement / change 2020/2021**	• Continue assessments of existing drainage system to prepare for climate change and sea level rise; • Commence assessment of the potential impacts of increasing the focus on water quality issues as this is impacted by land drainage activities; • Generate indicative renewal programme from the system including updated condition assessments, asset valuations, projected remaining lives and allocation of responsibility for renewals; • Commence consultation process to progress amalgamations or boundary changes of schemes where this has been identified as potentially beneficial; and • Generate updated AMP for 2021.

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Improvement Programme 2018/2028	
Years 4-10 **Planned improvement / change 2021/2028**	• The proposed programme in years 1-3 will yield a lot of information on asset condition, reviewed NALD boundaries, reviewed LOS and insight into how climate change will impact on the system; • The nature and extent of these changes are difficult to predict at this time however could conceivably require a significant rethink about how land drainage is managed in these areas; • The programme from years 4-10 will largely reflect the changes that are identified in years 1-3 and their progressive implementation.

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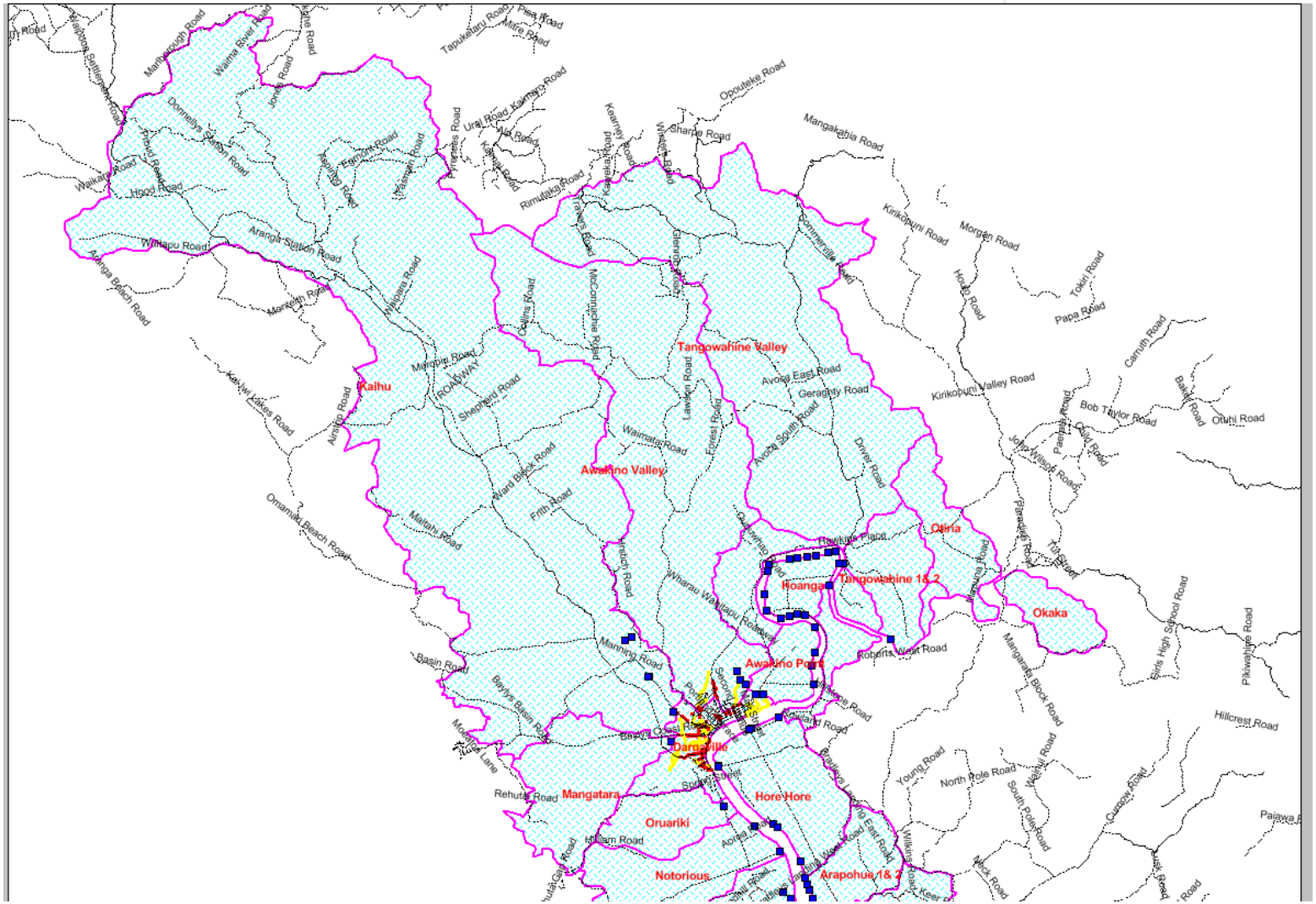
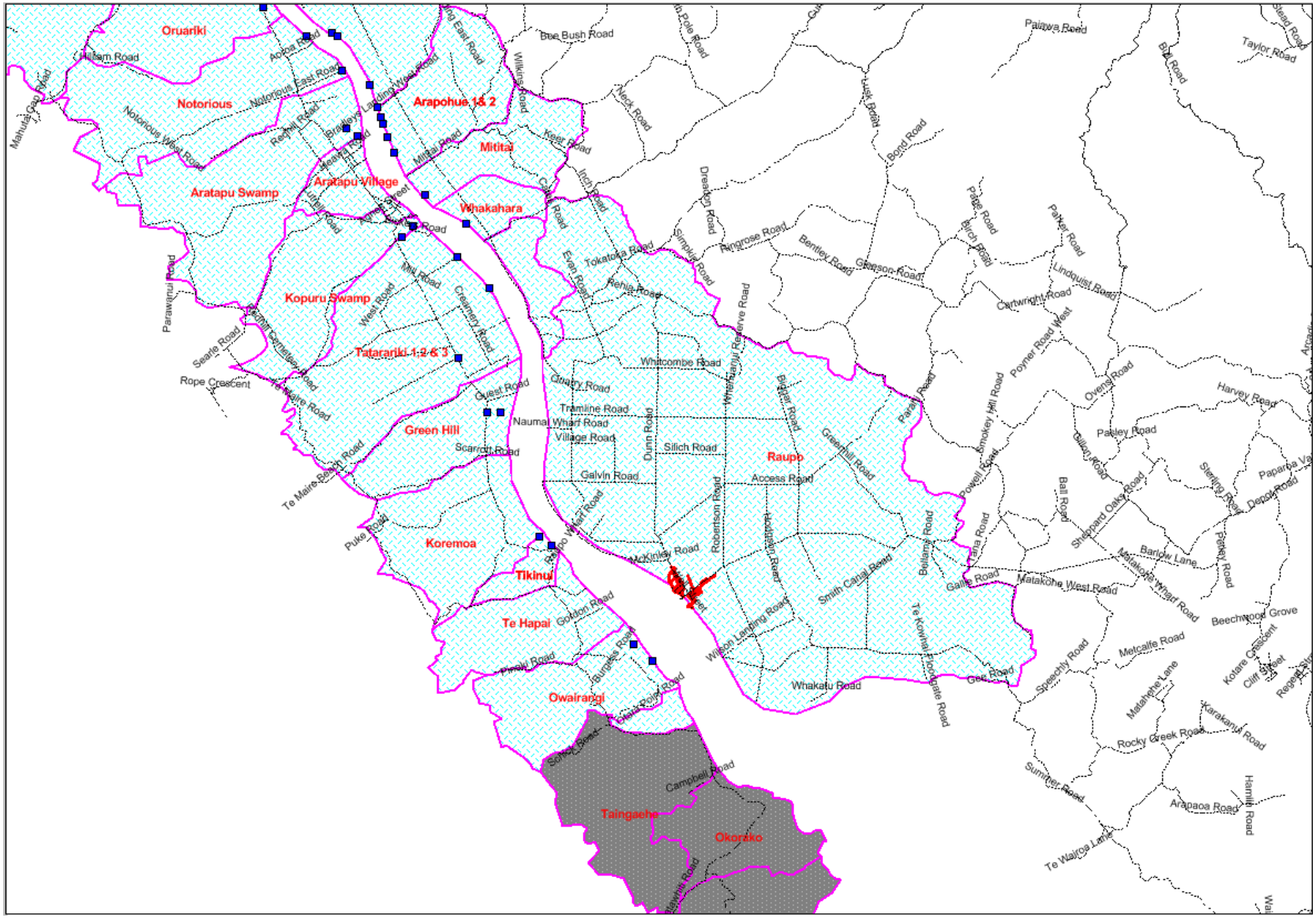
1.5 Assets, valuation and budget summaries

Figure 1-1: Overview of locations


Tangowahine Valley
Kaihu
Awakino Valley
Otiria
Tangowahine 1& 2
Hoanga
Okaka
Awakino Point
Dargaville
Hore Hore
Mangatara
Oruariki
Notorious
Arapohue 1& 2
Waimata Road
Ward Block Road
Frith Road
Maitahi Road
Omamari Beach Road
Basin Road
Manning Road
Whairau Waikopua Road
Roberts West Road
Mangawhata Block Road
Hillcrest Road
Pikiwahine Road
Girls High School Road
Avoca East Road
Geraghty Road
Avoca South Road
Kirikopuni Valley Road
Kirikopuni Road
Morgan Road
Mangakahia Road
Opoutoke Road
Papa Road
Tokiri Road
Carruth Road
Bob Taylor Road
Otuhi Road
John Wilshire Road
Piraroku Road
Tth Street
Young Road
North Pole Road
South Pole Road
Currow Road
Paiawa Road
Rawiuka Place
Waimata Road
Forest Road
Driver Road
Mangakahia Road
Rehuta Road
Ilkiam Road
Aoroa Road
Wilkinson Road
Keer Road
Mack Road
Tapuketaru Road
Mitre Road
Marlborough Road
Waima River Road
Donnellys Station Road
Egmont Road
Waiotaua Road
Kaihu Valley Road
Awakino Gorge Road
Arapohue Road
Waikare Road
Hood Road
Wiltapu Road
Aranga Station Road
Aranga Beach Road
Meredith Road
Mangapa Road
Shepherd Road
Airstrip Road
Kaihu Valley Road
Hukatea Road
Collins Road
McConnaghie Road
Glenbervie Road
Rimuputa Road
Kaihu Road
Kaihu Valley Road
Kaihu Valley Road
Kaihu Valley

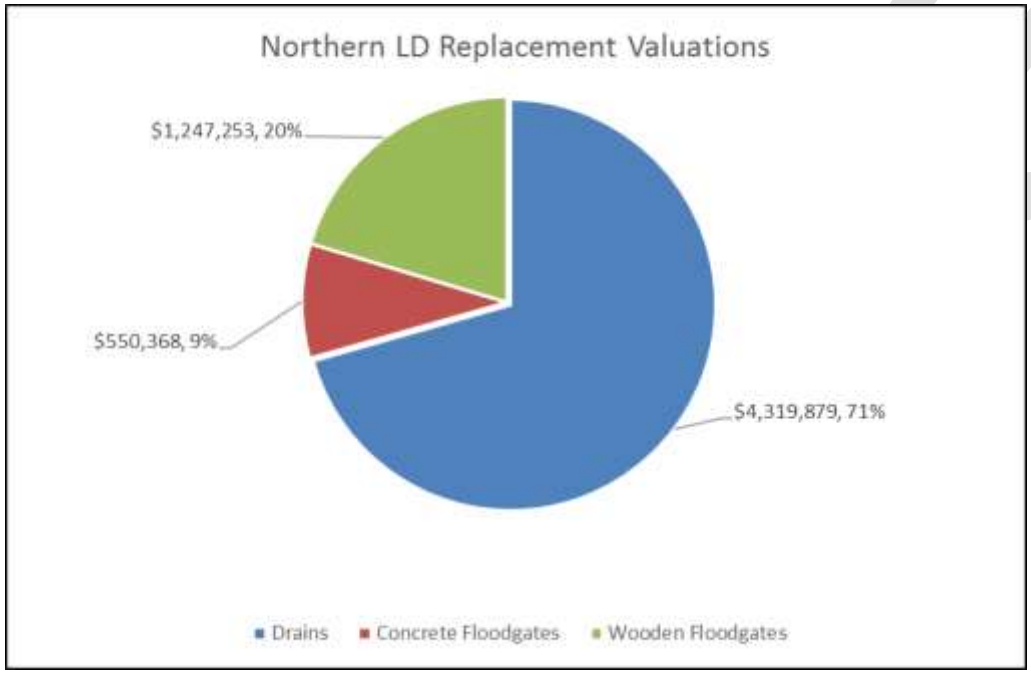

Oruariki
Notorious
Arapohue 1& 2
Mititai
Aratapu Village
Aratapu Swamp
Whakahara
Kopuru Swamp
Tatarariki 1,2 & 3
Green Hill
Koremoa
Tikinui
Te Hapai
Owairangi
Taingaehe
Okoraka
Raupo
Whitcombe Road
Tramline Road
Naumai Wharf Road
Village Road
Silich Road
Galvin Road
Access Road
Scarrott Road
Guest Road
Quarry Road
Dunn Road
Robertson Road
Hoban Road
Smith Canal Road
Bellamy Road
Wilson Landing Road
Whakatu Road
Te Kowhai Floodgate Road
Gee Road
Gaffe Road
Matakohe West Road
Matakohe Wharf Road
Beechwood Grove
Metcalfe Road
Matakohe Lane
Speechly Road
Rocky Creek Road
Karakanui Road
Arapaoa Road
Hamlin Road
Summer Road
Te Wairoa Lane
Campbell Road
School Road
Golden Road
Burgess Road
Puke Road
Te Maire Beach Road
Searle Road
Rope Crescent
Parawanui Road
Mititai Road
Keirl Road
Jinch Road
Tokatoka Road
Rehia Road
Whenuanui Reserve Road
Ringrose Road
Bentley Road
Gleeson Road
Bond Road
Paige Road
Birch Road
Parker Road
Lindquist Road
Cartwright Road
Poyner Road West
Ovens Road
Harvey Road
Paisley Road
Smokey Hill Road
Powell Road
Greenhill Road
Parish Road
Ball Road
Shepherd Oaks Road
Deeply Road
Barlow Lane
Peeley Road
Kotare Crescent
Cliff Street
Taylor Road
Bird Road
Paiawa Road
Bee Bush Road
Aotea Road
William Road
Notorious East Road
Notorious West Road
Redhill Road
Bradleys Landing West Road
Bradleys Landing East Road
Wilkinson Road
Mahuta Gap Road

1.5.1 Summary of NALD asset lives, extent and valuations (2016)

Table 1-2: Overview of assets

Useful Lives and Values for LD Assets	Useful Life (years)	Minimum Remaining Useful Life (years)	Unit Rate (Average)	Number	Total 2016 Replacement Valuation	Comment
Building	100	5		Nil		
Drains	Non depreciable	Non depreciable	$37	118,073	$4,319,879	Same rate for all
Earth stop bank	Non depreciable	Non depreciable		Nil		
Floodgates wooden	50	5	$23,097	54	$1,247,253	Same rate for all
Floodgates concrete	80	5	$32,374	17	$550,368	Varies from $12k to $65k
Pumps	20	10		Nil		
Pumping structure	80	5		Nil		
Rip rap	100	5		Nil		
			Total		**$6,117,500**	

Figure 1-2: Overview of assets



1.6 Financial and Lifecycle Strategy

The Financial and Lifecycle Strategy defines the operational, maintenance, renewal and new capital expenditure over the next 10 years. A summary of the planned expenditure by community and by category is shown in Figure 1-3 and 1-4 below.

Figure 1-3: Operating cost forecast

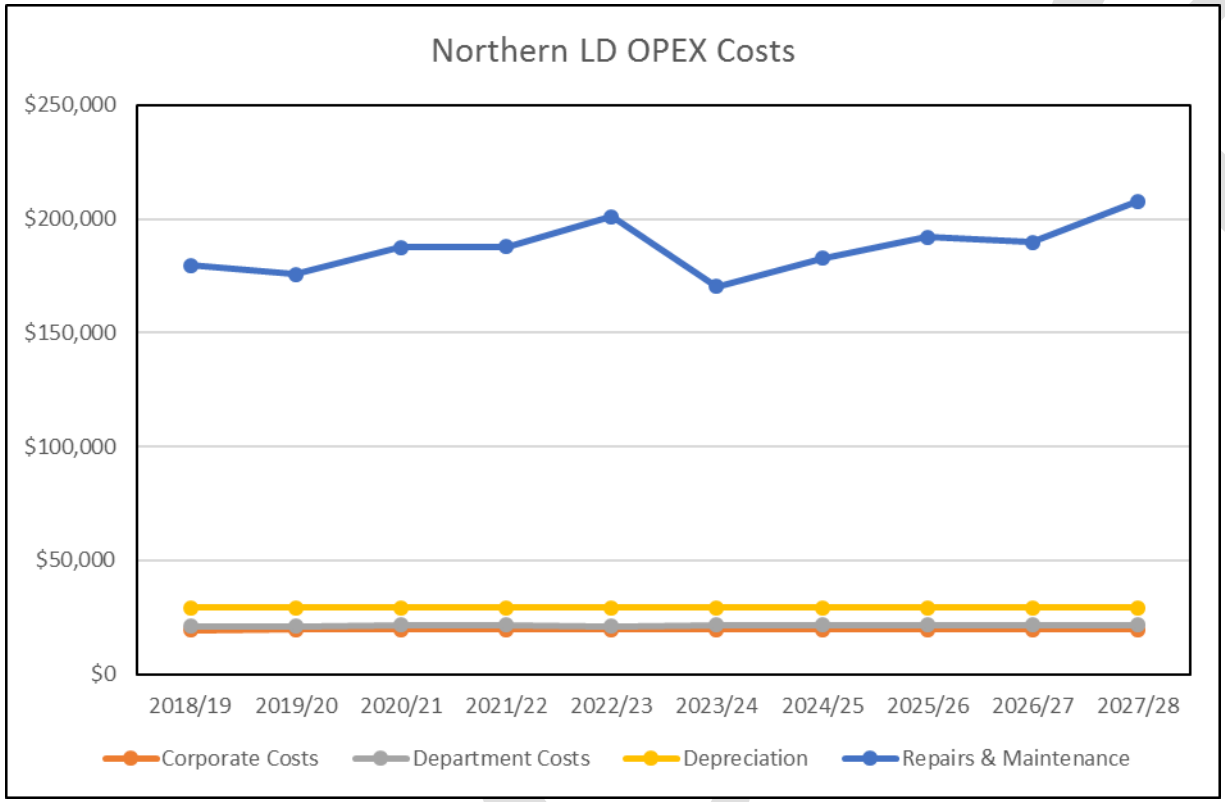
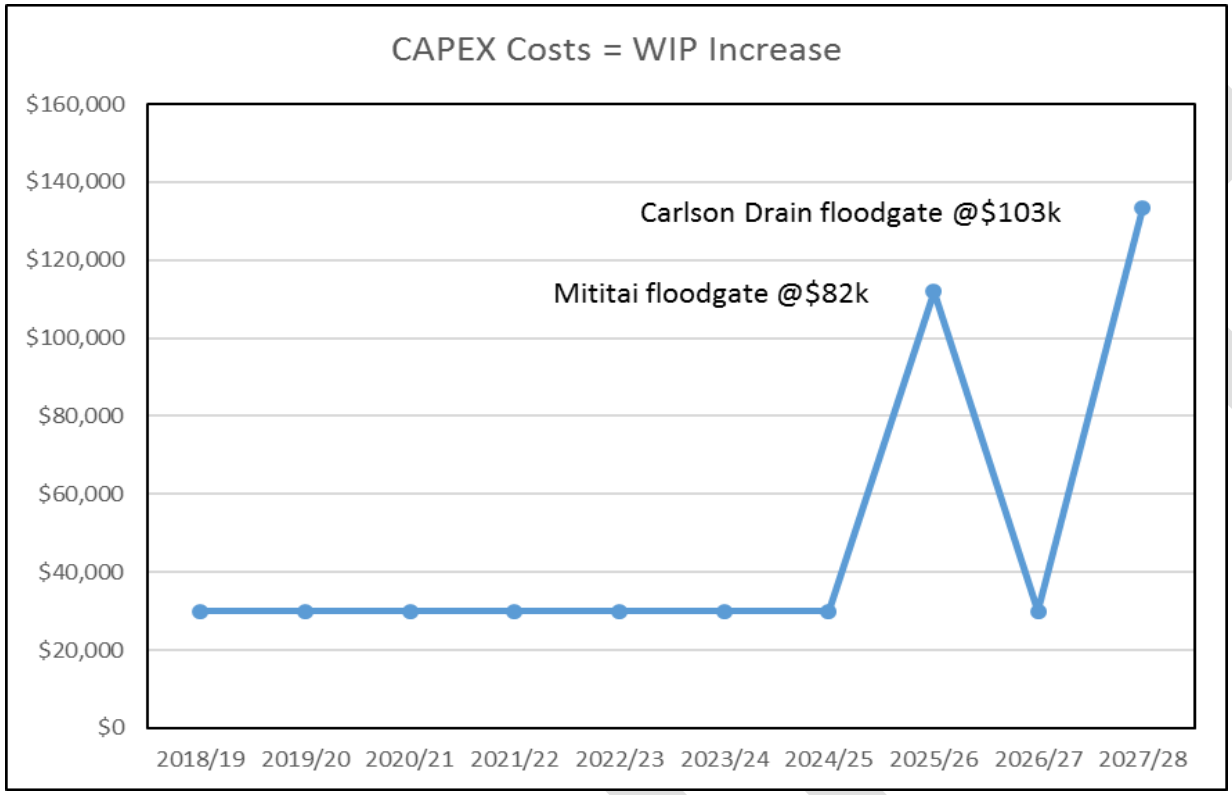


Figure 1-4: Capital works cost forecast



2 Strategic context

2.1 Purpose

The NALD networks represent a major investment by the various communities and is of vital importance to the quality of life of the respective district's residents and the sustainable management of both tidal and floodwaters. The community expectation that this investment in land drainage assets is secure and managed in a way which maximises return in terms of outputs and costs as reflected in the overall objective of AM, which is:

To meet the required level of service in the most cost-effective way through the creation, operation, maintenance, renewal and disposal of assets to provide for existing and future customers'.

The specific purpose of this AMP is to:

- Demonstrate responsible stewardship of land drainage assets;
- Manage risk of premature asset failure;
- Identify medium to long term financial requirements; and
- Identify long term issues and impacts and possible solutions for the land drainage assets.

The Local Government Amendment Act 2002 places an emphasis on prudent asset management. The Act requires local authorities to:

- Prepare and adopt, every three years, a (10 years plus) Council Long Term Plan (LTP) (was called the Long Term Council Community Plan LTCCP), which describes the local authorities activities, community outcomes and provides integrated decision-making and long term focus;
- In determining their LTP, consider all relevant information and assess the cost/benefit of options;
- Provide an opportunity for the public to participate in decision-making;
- Manage assets prudently in the interests of the district and its inhabitants; and
- Clearly identify significant forecasting assumptions and risks.

This AMP will provide the basis for identifying changes in service potential and determining long term strategies for NALD assets.

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2.2 Service description and scope

The scope and approximate value of the assets covered by this AMP are shown in Table 2-1.

Table 2-1: Overview of assets

Land drainage northern area	Quantity	Sum of replacement value	Calculated average unit rate
Drains	118073	$ 4,319,879	$ 37
Floodgates concrete	17	$ 550,368	$ 32,375
Floodgates wooden	54	$ 1,247,253	$ 23,097
	total	**$ 6,117,500**	

This AMP covers a period of three years commencing 01 July 2018. All expenditure is based on unit costs as at 30 June 2016.

Council's LTP identifies Council's purpose in relation to land drainage as "To minimise the risks and impacts of flooding attributed to inadequate land drainage" and "To enhance the sustainability of agriculture through cost-effective maintenance and enhancement of drainage networks".

In order to achieve this purpose Council and the Northern Land Drainage Committees, through professional and physical works contracts, undertake the following:

- Asset management;
- Floodgate maintenance;
- Drain spraying and machine cleaning;
- Network operations and maintenance;
- Capital and refurbishment programme; and
- Consent monitoring.

2.3 Key issues

The key issues Council is currently managing as part of the land drainage activity are summarised below.

- Knowledge of the networks' capacity to adequately drain significant storm events is limited to observed performance during historical rainfall events. Historical evidence indicates that the network continues to provide the capacity for which it was designed;

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- An assessment of the likely future demands on the drainage networks' capacity has also identified potential changes as a result of global warming having the potential to result in moderate to significant impacts on the drainage network and its ability to achieve its stated goals and levels of service;
- While there is a reasonable understanding of the hazards that exist relating to land drainage this has not been assessed in relation to criticality and this limits Council's ability to manage risk;
- Management of the land drainage systems is primarily focused on managing the flow of water under 'normal' and 'storm' conditions to maintain land productivity and prevent flooding. It is expected that management of water quality, and its associated impact on the receiving environments will become increasingly important in the future;
- There are numerous small land drainage schemes within the Northern Areas. This reflects the process of their creation over the years. There may be opportunities to amalgamate schemes or revise boundaries to generate efficiencies;
- Allocation of asset ownership and responsibility for maintenance, renewal and upgrading between the landowners, drainage district committees and Council's land drainage activity is not entirely clear or consistent across the schemes;
- The desired LOS to be achieved by the schemes is not well-defined and largely reflects acceptance of historical performance;
- The current condition, valuation and life expectancy of assets is not well understood and this adversely impacts on the ability to undertake future planning for capital works; and
- Asset information is incomplete within Council's asset information system. This includes the recording of maintenance activity as it is undertaken.

2.4 Relationship to community outcomes, Council policies and strategies

2.4.1 Broad planning context

The Local Government Act (LGA) provides an overall planning framework that Council is obliged to comply with. In broad terms this requires Council to engage with its community and stakeholders to determine what Council is to focus on achieving for the district. This is then translated to the types of activity Council will be involved in, the resources and assets it will need to provide for those activities and how this will be funded.

2.4.2 Long Term Plan (LTP)

This is developed, consulted and adopted every three years and covers the following three financial years in detail and provides indicative direction for the following seven years (10 years total). The next LTP will become operative on 01 July 2018. This process starts at a high level and works down to individual activities and the associated budgets and required rates and charges.

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Council has adopted a new Vision Statement that includes specific reference to managing (maintaining and improving) its infrastructure.

The LTP 2018/2021 is still being generated. It is not expected that the role of land drainage will significantly change from the LTP 2015/2025 as repeated below.

Figure 2-1: Vision Statement

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The Values: Ko nga uara

Our purpose is to make a positive difference for Kaipara. We aspire to work with:

Integrity

- ✓ We will do what we say we will
- ✓ We will act with good intent
- ✓ We will do the right thing in the right way

Team Work

- ✓ We will work together
- ✓ We will support each other

Delivering Value

- ✓ We will seek to understand needs and deliver to them
- ✓ We will apply our skills and knowledge for the benefit of others

Table 2-2: NALD services and community outcomes

NALD services contribute to the following Community Outcomes	How this service contributes
Safety and good quality of life	Minimise flooding of property through efficient land drainage practices. Ensure drainage paths and floodgates that are registered remain clear and unobstructed as designed. Ensure that land drainage systems do not present a safety hazard.
Sustainable economy	Minimise flood damage to properties by ensuring land drainage systems have adequate capacity.
Special character and healthy environment	Control flooding and flow of stormwater into the receiving environment, whilst protecting local interests.

This overall vision for the district provides a broad initial direction for the development of drainage priorities and how those assets may be managed. This information, along with community consultation and discussion with other interested parties contribute to the development of the community outcomes identified in the LTP. These outcomes have a direct influence on the management of the various water supply schemes.

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The community outcomes that the drainage activity contributes to most are largely expected to be unchanged from the LTP 2014/2015 i.e.

What We Want To See

- *To ensure that stormwater flooding and discharge to the environment is contained and managed to minimise impacts on people, property and the environment.*

Why We Do It

- *To protect people, dwellings, private property and public areas from flooding by removing flood water;*
- *To discharge stormwater and collect contaminants in a manner that protects the environment and public health; and*
- *Council's approach to Land Drainage is to minimise the impact on arable farm land by reducing adverse effects from stormwater runoff on the environment.*

The drainage network is subjected to high intensity rainfall events.

The Level of Service

- *Drains will have the capacity to enable floodwater to recede within three tidal cycles, design Average Recurrence Interval (ARI) for rural areas is 10%;*
- *Stopbanks are 2.6m above Mean Sea Level leaving 0.5m above extreme high tide for the land drainage areas;*
- *All flood protection activities outside of the Raupo district are administered by informal community committees supported, where practical, by Council's Land Drainage Co-ordinator, in accordance with each Committee's request for assistance. Maintenance on privately owned stopbanks is undertaken by the landowner; and*
- *NRC is responsible for catchment management.*

2.4.3 Infrastructure Strategy

As part of the LTP, Council is required to produce a Long Term Financial Strategy and an Infrastructure Strategy for its major asset using activities. These documents are required to look out not less than 30 years to identify the issues and challenges that Council will face during that period, how Council would likely respond to them, what this will cost and where the funding will come from. This recognises the long lived nature of the infrastructure assets that Council utilised to provide services, the potential for technology and expectations to change considerably and the potential for expenditure to be quite 'lumpy' as assets enter their renewal cycles.

2.5 Stakeholders and consultation

There are many individuals and organisations that have an interest in the management and/or operation of Council's land drainage assets. The following key external and internal stakeholders are identified for this AMP:

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Table 2-3: Stakeholders

External stakeholders	Interest
Kaipara district community	• Northern area land drainage district ratepayers; • Public safety; • Public health; • Protection of private property; • Environmental protection; and • Water quality of local harbours and ephemeral waterways for commercial and recreational activities.
Government agencies (e.g. Department of Health, Ministry for the Environment, Audit NZ)	• Adherence to government policies and framework; • Ensuring Council is transparent and accountable; • Public safety; and • Environmental health and protection.
Local Iwi	• Protection of historical relationship of Maori and their culture and traditions with their ancestral lands, water, sites, wahi tapu and other taonga.
Civil Defence and Emergency Management	• Understanding land drainage control and measures to ensure public safety, and to better understand flood issues within the local area.
Northland Regional Council	• Adherence to NRC policies and plans e.g. NRC – Regional Plan; • Environmental impacts and protection; • Protection and increase of water quality and water quality standards; and • Planning for climate change and sea level rise.
Maintenance contractor	• Maintain existing services; • Understand Council's LOS and their targets and requirements; and • Understand the local network and the Council's direction for the AMP period.

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External stakeholders	Interest
Visitors to the district	• Public safety; • Environmental protection; • Minimal flooding and flood protection of tourist areas within the surrounding district; and • Quality of ephemeral waterways and harbours for recreational activities.

Internal Stakeholders	Interest
Local Board/Committee members	• Representing the interests of the land drainage areas; • Protecting drainage ratepayers' interests and ensuring the transparency of Councils' actions and projects; • Maintaining and managing the LOS to the community and ensuring that necessary works are completed on time and in the right order; • Planning future works; and • Maintaining water quality.
Mayor and Councillors	• Representing the publics interests and those of the greater district; • Protecting the ratepayers' interests and ensuring the transparency of Council's actions and projects; • Planning of future works; • Maintaining water quality; • Allowing for future growth and the provision of services; and • Maintaining and increasing LOS to the communities.
Finance Manager	• Understanding the financial implications of the AMP period and how this will affect rates and ratepayers of the district; • Ensuring the completeness of asset data and how this affects current valuations and council's investment confidence ratings; • Ensuring that budgets are valid and able to be adhered to; and • Protection of public interest in regard to spending on public assets.

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Internal Stakeholders	Interest
Information Services Manager	• Ensuring that all information is recorded correctly; • Keeping track of assets and asset data; • Vested interest in completeness of asset data and value; and • Increasing the reliability of Council's asset registers
Records and Information Manager	• Ensuring Council's transparency on identified works; and • Retaining and cataloguing Council information for auditable purposes.
Northland Transportation Alliance (NTA)	• Protection of road assets from stormwater; • Planning flow of stormwater away from road assets; • Protection of road users; and • Identifying growth, renewal and LOS projects where stormwater and road asset projects coincide.

2.6 Community engagement

Council consults with the local land drainage committee members in the first instance who represent the greater community, if required Council will engage the public to gain an understanding of customer expectations and preferences. This enables Council to provide a LOS that better meets the community needs. Council's knowledge of customer expectations and preferences is based on:

- Meetings with local members;
- Meetings with affected landowners;
- Feedback from public surveys;
- Public meetings;
- Feedback from elected members;
- Analysis of customer service requests and complaints; and
- Consultation via the Annual Plan and LTP process.

Council undertakes customer surveys on a regular basis, using the National Research Bureau Ltd. These customer perception surveys assess levels of satisfaction with key services, and the willingness across communities to pay for service improvements.

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As an example the following key survey results came from the 2016 satisfaction survey regarding the stormwater service:

- 81% of residents that are provided with a piped stormwater system, responded with being very/fairly satisfied with the stormwater service (82% in 2014); and
- 18% were not very satisfied (19% in 2012).

Currently the LOS for the NALD network is set by the landowners themselves. There is no current satisfaction survey information that is specific to the land drainage areas. The various scheme participants are believed to be generally comfortable with the service they are receiving and any issues come direct to the Council officer in charge. While this is not a robust and scientific process it has worked well for many years. As the effectiveness of the schemes directly impact on the protected properties in relation to access, property damage, stock safety and economic impacts the participants take a very real, and personal interest, in how the schemes perform. As Kaipara is largely a rural district the property owners have a very direct line of contact with their local councillors and it is clear that issues would quickly surface as they arise.

2.7 Potential significant negative effects

The land drainage activity is an essential service that is provided to our communities and the environment. Discharges from the drainage network can impact cultural, social, environmental and economic well-being. In addition to managing the quantity of floodwater it is recognised that the activity also includes the quality of discharges from the network on the receiving environment. Both aspects of the land drainage discharge have the potential to have significant negative effects on the environment and these should be mitigated as best as is practicably possible.

The negative impacts identified by Council and mitigation measures in place are provided in Table 2-4 below:

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Table 2-4: Potential significant negative effects

Identified significant negative effect	Cultural	Social	Economic	Environmental	Mitigation
Level of Service vs Feasibility The construction and maintenance costs of infrastructure upgrades to meet a set LOS of service is beyond the means of the community to afford.		✓	✓		The determination of an appropriate LOS for a land drainage scheme should be assessed on a case-by-case basis. This will be managed through consultation with the drainage committee and the community to determine the most practicable way forward, without negatively impacting on public health and the environment or creating risk to persons or property. Council is committed to improving the natural environment, however acknowledges that this will take time to make significant improvements due to the low population of the district and the type of land use within. Council will work closely with NRC to ensure that conditions of resource consents are fair and justifiable from a risk and sustainability viewpoint.
Contamination of Rural Watercourses Rural stormwater runoff is likely to have a different contaminant profile than that from the urban areas. Depending on land use rural runoff potentially has elevated levels of nitrogen and phosphates than urban stormwater, due to fertiliser usage and the presence of farm animals.	✓	✓	✓	✓	Chapter 6 of Council's Engineering Standards (2011) provides general guidance for the management of rural stormwater runoff. The section primarily relates to quantity control of runoff, although there is a recommendation that appropriate water quality treatment options be considered in conjunction with attenuation.

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Identified significant negative effect	Cultural	Social	Economic	Environmental	Mitigation
Flooding Direct Impact Land drainage districts usually incorporate a large catchment area which has the capacity to generate large amounts of stormwater runoff and flows, this needs to be managed in a way that meets the required LOS and also protects the receiving environment.		✓	✓	✓	Within urban areas Council's Engineering Standards consider that attenuation of discharges up to the 100-year event should be no more than the pre-development condition. This allows for protection of the receiving environment from potential erosion and flooding. The attenuation of runoff allows for flooding to be controlled locally, within the specific device. Though the drainage areas are different form urban areas the methodologies are similar and they utilise different approaches to reaching the same goals. In this instance the bulk of floodwaters are managed through large open drains and canals which mainly self-clean with each tide. The effects of climate change on the district's weather patterns may result in a reduced LOS being provided by the drainage network. Although these systems will be upgraded over time, priority will be given to areas where flooding as a result of capacity issues impacts upon property or life, this will start in the first instance with better recording of the current state of assets and the provision of a catchment management plan.

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3 Level of Service (LOS)

3.1 Overview

Levels of Service (LOS) are performance related attributes that Council expects its assets to deliver to stakeholders. A key objective of an AMP is to match the LOS provided by the land drainage activity with agreed expectations of customers and their willingness to pay for that LOS. It is important to note that the LOS for the NALD schemes are essentially set by each committee as they accept differing LOS as they think appropriate. A large portion of the maintenance is completed by the landowners with KDC completing large scale works at irregular intervals as and when required upon consultation with affected stakeholders. If this was to change and KDC was to enforce a more consistent LOS, and a higher level of maintenance, then there will be a greater requirement for resources and funding to oversee, monitor and maintain the drainage areas.

The LOS provides the basis for the lifecycle management strategies and works programmes identified in the AMP.

The LOS should reflect the current industry standards and be based on:

- **Customer Research and Expectation** - information gained from stakeholders on expected types and quality of service provided;
- **Statutory Requirements** - legislation, regulations, environmental standards and Council bylaws that impact the way assets are managed. These requirements set the minimum LOS to be provided;
- **Strategic and Corporate Goals** - guidelines for the scope of current and future services offered and manner of service delivery, and define specific LOS that Council wishes to achieve;
- **Best Practices and Standards** - specify the design and construction requirements to meet the LOS and needs of stakeholders; and
- **Willingness / ability to pay** – while statutory obligations, where defined, must be met, a key driver of the LOS definition is the cost of delivering a particular LOS and whether the community thinks this is justified.

The LOS that Council has adopted for this AMP reflect historical levels and may need to be modified depending on the outcomes of the LTP 2018/2028 consultation process. The adopted LTP performance measures are reported through the annual reporting process.

The AMIP includes an action for Council to continuously review its land drainage LOS to identify if there is further opportunity for improved efficiencies and/or best practice that can be incorporated into the service framework.

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3.2 Legislative framework and linkages

The Land Drainage Northern Area AMP is related to national and local legislation, regulatory and policy documents as listed below. The legislation and guidelines below are listed by their original title for simplicity. Amendment Acts have not been detailed in this document however are still considered in the planning process.

Table 3-1: Relevant legislation

Acts
The Health Act 1956
The Local Government Act 2002, especially: • Part 7 • Schedule 10 • The requirement to consider all options and to assess the benefits and costs of each option • The consultation requirements.
The Climate Change Response Act 2002
The Civil Defence Emergency Management Act 2002 (Lifelines)
The Resource Management Act 1991
The Local Government (Rating) Act 2002
The Land Drainage Act 1908
The Rivers Boards Act 1908
The Soil Conservation and Rivers Control Act 1941
The Health and Safety in Employment Act 1999
The Utilities Access Act 2010
The Building Act 2004
The Consumer Guarantees Act 1993
The Sale of Goods Act 1908
The Fair Trading Act 1986
Public Records Act 2005

Table 3-2: Relevant regulatory requirements

National policies, regulation, standards and strategies
The Government's Sustainable Development Action Plan
Code of Practice for Urban Subdivision
NAMS Manuals and Guidelines
Office of the Auditor-General's publications
Standards New Zealand • AS/NZS 2032:2006 Installation of PVC Pipe Systems • AS/NZS 2280:2004 Ductile Iron Pressure Pipes and Fittings • AS/NZS 3725:2007 Design for Installation of Buried Concrete Pipes • AS/NZS 2566.1:1998 Buried Flexible Pipe Design • AS/NZS 2566.2:2002 Buried Flexible Pipe Installation • NZS 3101.1&2:2006 Concrete Structures Standard • NZS 3910:2003 Conditions of Contract for Building and Civil Engineering Construction • NZS 4404:2010 Land Development and Subdivision Infrastructure • SNZ HB 4360:2000 Risk Management for Local Government • NZWWA New Zealand Infrastructure Asset Grading Guidelines 1999 National Guidelines • NZ Pipe Inspection Manual 2006 • QV Cost Builder (Rawlinsons NZ Construction Handbook)

Table 3-3: Relevant Council planning and policy documents

Local Policies, Regulations, Standards and Strategies
Council District Plan
Council Long Term Plan
Land Drainage Asset Management Plan (previous versions)
Northland Regional Plan

Local Policies, Regulations, Standards and Strategies
NRC Regional Policy Statement
NRC Regional Air Quality Plan
NRC Regional Coastal Plan
NRC Regional Water and Soil Plan
Council Engineering Standards and Policies 2011 Guidance on the design and construction of new stormwater networks for urban and rural areas is provided in Chapter 6: Stormwater Drainage; Engineering Standards 2011, published by Council. These standards are also relevant for land drainage in respect to the stormwater design information and is supported by local knowledge and site specific designs. Council's Engineering Standards 2011 provides design rainfall for Dargaville, Tinopai, Maungaturoto and Mangawhai areas of the district, being the main population centres. The rainfall depths provided in the Engineering Standards have been estimated up to the 100 year event; 72 hour duration and include adjustment for 95% confidence. For developments in other areas the current Engineering Standards acknowledges NIWA's High Intensity Rainfall Design System (HIRDS) version 2, which outlines rainfall depths + 1.65 standard error + 17% climate change allowance.
Council Procurement Strategy and Policy Documents March 2012

Table 3-4: Relevant Council Bylaws

Council Bylaws
Land Drainage Bylaw

Preparation and implementation of this AMP and the associated long term financial strategies aids Council compliance with these requirements.

Particular elements of the above schedule that are relevant to the generation of the AMP are listed below. For consistency with the stormwater AMP many of the elements are expressed in terms of 'stormwater'. There is no material difference between stormwater and land drainage discharges.

Local Government Act 2002:

As per the LGA 2002:

3. The purpose of local government is –
    a. To enable democratic local decision making and action by, and on behalf of, communities; and
    b. To meet the current and future needs of communities for good-quality local infrastructure, local public services and performance of regulatory functions in a way that is most cost-effective for households and businesses.
4. In this Act, **good-quality**, in relation to local infrastructure, local public services, and performance of regulatory functions, means infrastructure, services, and performance that are –
    a. Efficient; and
    b. Effective; and
    c. Appropriate to present and anticipated future circumstances

This Act requires local authorities to:

- Prepare a range of policies, including Significance, Funding and Financial policies;
- Prepare an LTP at least every three years, which must identify:
    - Activities and assets;
    - How the AM implications of changes to demand and service levels will be managed;
    - What and how additional capacity will be provided, and how the costs will be met;
    - How the maintenance, renewal and replacement of assets will be undertaken and how the costs will be met; and
    - Revenue levels and sources.

Regarding Significance, all local councils must adopt a policy that sets out their approach to determining the significance of proposals or decisions relating to issues, assets and other matters, and any thresholds, criteria or procedures to be used by Council in assessing whether these are significant.

The new legislation puts a stronger emphasis on strategic planning (s121) that encompasses:

- the systems for supply of water and disposal of waste and stormwater (cl.3(a));

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- the quality of drinking water and wastewater (including stormwater) (cl.3(b));
- current and future demands for water and wastewater (including stormwater) services and related effects on the quality of supply and the discharges to the environment. (cl.3(c)); and
- options for meeting current and future demands with associated assessments of suitability (cl.3(d)).

Local Government (Rating) Act 2002, the funding companion to this proposed new LGA:

- permits councils to strike a rate or charge for any activity they choose to get involved in (Section 16).

Resource Management Act 1991 and amendments:

The RMA 1991 is an established planning framework covering land designation processes and resource consents for activities that affect the environment. NRC is responsible for monitoring compliance with certain environmental provisions of this Act.

The RMA is key legislation influencing how stormwater is managed, in particular the effect of the stormwater discharges on the environment. Council is required to gain approval to discharge from the drainage networks under the RMA. Council is working with NRC to understand the Regional Plans for managing stormwater discharges in urban areas.

Council is also involved in the control of development and subdivisions under the RMA and the District Plan, to manage effects on the environment.

Building Act 2004

The Building Act 2004 and its related provisions set standards for stormwater control as they relate to buildings. Under the Building Act, a territorial authority has a regulatory role in receiving and assessing building consent applications. Council is responsible for producing PIMs (Project Information Memoranda) and LIMs (Land Information Memoranda). Information on drainage plans, flood records, maintenance history, notices and correspondence should be included in these memoranda. Council may reject a building consent where there is a risk of flooding. The Building Act also stipulates the minimum level of flood protection for houses.

Health Act 1956

The Health Act requires Council to provide sanitary works, including drainage works for all lands, buildings, and pipes used in connection with such works.

The stormwater network is significant as defined in Council's Significance and Engagement Policy, due to its complexity, asset value and risk to the community. This service is expected to be delivered in perpetuity and the asset is maintained and replaced as required to enable this. For significant services, the Office of the

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Auditor-General defines a higher level of customer consultation. This includes evaluating level of service options, and undertaking consultation on LOS options with the community and other relevant stakeholders.

Health and Safety at Work Act 2015:

The Act introduces a new term, "Person Conducting a Business or Undertaking" (PCBU), which captures employers, self-employed, principals to contracts, manufacturers, designers, etcetera who have the primary health and safety duties. Workers also have duties under the Act. Workers include employees and contractors, the PCBU must ensure that its duties are carried out as per subpart 2 – Duties of PCBUs of the Act.

Public Records Act 2005

Council is required to create and maintain full and accurate records including all matters that are contracted out to an independent contractor. This includes records which relate to property or assets owned and/or administrated by the local authority such as contract documents and as-builts of public utilities and service such as: roading, drainage, sewerage and stormwater, water supply, flood control, power generation and supply, refuse disposal and public transport.

National Environmental Standards

The RMA promotes the sustainable use of resources. Its primary vehicle for addressing the discharge of effluent to the environment is via the Regional Waste and Soil Plan at regional level; and District Plans at district level. Given these plans are controlled at their respective jurisdictive levels there are now varying, inconsistent standards across regions and districts.

One method of ensuring consistent application across New Zealand is provided in sections 43 and 44 of the RMA. These allow the Minister for the Environment to enact regulations called National Environmental Standards. When a National Environmental Standard is enacted the same standards must be applied regardless of jurisdiction.

The following National Environmental Standards are in force:

- Air quality standards;
- Sources of human drinking water standard;
- Telecommunications facilities; and
- Electricity transmission.

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The National Environmental Standards listed below are at various stages of development, ranging from initiating consultation to being legally drafted:

- Contaminants in soil;
- Ecological flows and water levels;
- Future sea level rise; and
- Plantation forestry.

This AMP has considered the impact of those National Environmental Standards that are in force at the time of the current update.

Links with other documents

This AMP is a key component in Council's strategic planning function. This AMP supports and justifies the financial forecasts and the objectives laid out in the LTP. It also provides a guide for the preparation of each Annual Plan and other forward work programmes.

3.3 Industry standards and guidelines

The Department of Internal Affairs (DIA) has generated a range of mandatory measures that must be reported on for the various water services. The KDC LOS measures align with these requirements. This requirement is intended to provide for more transparent and consistent reporting across the country. The measures are also incorporated into the WaterNZ National Performance Review process. A summary of the DIA requirements follows:

Figure 3-1: Extract from DIA Rules

Flood Protection Non-Financial Performance Measures Rules 2013
Performance measure one (maintenance of works): The major flood protection and control works that are maintained, repaired and renewed to the key standards defined in the local authority's relevant planning documents (such as its activity management plan, Asset Management Plan, annual works programme or Long Term Plan).

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3.4 Proposed LOS – customer and technically focused

Table 3-5: LOS targets

Measuring Performance – Note that these measures are intended to be somewhat subjective and variable across the various NALD schemes					
What the community can expect from Council	**How Council measures this**	**LTP Year 1 Target 2018/2019**	**LTP Year 2 Target 2019/2020**	**LTP Year 3 Target 2020/2021**	**LTP Years 4-10 Target 2021/2028**
Drains will have the capacity to enable floodwater to recede within three tidal cycles, design ARI for rural areas is 10%. Stopbanks are 2.6m above Mean Sea Level leaving 0.5m above extreme high tide for the northern land drainage area.	The number of schemes maintained to their full service potential.	100% of schemes maintained to ensure that they provide protection to the agreed standard and the scheme assets are maintained as established in the adopted AMPs.	100% of schemes maintained to ensure that they provide protection to the agreed standard and the scheme assets are maintained as established in the adopted AMPs.	100% of schemes maintained to ensure that they provide protection to the agreed standard and the scheme assets are maintained as established in the adopted AMPs.	100% of schemes maintained to ensure that they provide protection to the agreed standard and the scheme assets are maintained as established in the adopted AMPs.
All flood protection activities outside of the Raupo district are administered by informal community committees supported where practical, by Council's Land Drainage Co-ordinator, according to each committee's request for assistance. Maintenance on privately owned stopbanks is undertaken by the landowner.	Non-performance of drainage network due to poor monitoring or maintenance causing an inability to contain a 1:5 year flood as measured by public feedback i.e. service requests that result in additional cleaning to drains needed.	< 5 service requests per year.	< 5 service requests per year.	< 5 service requests per year.	< 5 service requests per year.

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Measuring Performance – Note that these measures are intended to be somewhat subjective and variable across the various NALD schemes					
What the community can expect from Council	**How Council measures this**	**LTP Year 1 Target 2018/2019**	**LTP Year 2 Target 2019/2020**	**LTP Year 3 Target 2020/2021**	**LTP Years 4-10 Target 2021/2028**
	Council inspection of drainage network to ensure that a 1:5 year flood is contained by the network.	Twice yearly inspections.	Twice yearly inspections.	Twice yearly inspections.	Twice yearly inspections.

Figure 3-2: Summary of LOS Achievement from Annual Report 2016/2017

Levels of service statement	Performance measures	Status	Comments
Reliability Monitor drainage of rivers and streams. Ensure minimal flood risk and coastal erosion to the community.	The number of schemes maintained to their full service potential.		Achieved
	Council inspection of drainage network to ensure that a 1:5 year flood is contained by the network.		Not achieved Lack of resourcing meant that in some schemes inspection only occurred once this financial year
	Targeted maintenance of the stopbank system in the Raupo Drainage District to prevent tidal flows from inundating private property during high tide and/or when the river is in flood.		Achieved

3.5 Strategies for achieving service levels

To achieve the desired LOS specific improvements and management processes will be implemented.

3.5.1 System adequacy

This largely reflects the capacity of the system to capture and convey the flows arising from extreme weather events without damage occurring to habitable floors or arable land and also to achieve effective drainage of the land under normal circumstances. This is not well-defined across the district and it is intended to undertake a number of high level studies to determine the overall characteristics of the land drainage schemes and their susceptibility to storms and the potential impacts of climate change. This will identify capacity shortfalls, works that should be undertaken and also minimum floor levels that should be adopted for any new construction inside the land drainage boundaries.

There are two primary elements to the discharge of land drainage and floodwater and KDC has limited capability to influence either at this time:

- Water Quality – Floodwater discharges collect and convey whatever contaminants are on the ground surface into the receiving waterways. This includes gross contaminants such as rubbish, drink-bottles etcetera, biological contaminants such as e-coli, chemical contaminants such as zinc, fertilisers, etcetera and particle contaminants such as clay.

  There is a range of technologies available to reduce these contaminants including chemical treatment, physical filters and settling ponds together with natural processes that focus on reducing flow velocities, maintaining ground cover and encouraging natural filtration by directing flow through planted areas. These tend to work best with less intense storms when volumes and flow rates are lower.

  KDC has limited resourcing in this area with the main direction coming from the land drainage committees themselves. The main focus is currently on removing flood waters as soon as possible and not relying on retention/detention structures within the existing flow paths. There are currently no detention ponds within the drainage districts and there is no requirement or focus on implementing these at this date.

  While KDC supports a greater focus on water quality it can only be implemented where practicable and is not always possible in every situation. The members and stakeholders of the land drainage schemes understand and promote water quality but temper this with the requirement to allow floodwaters unfettered access to the discharge points to maintain the current levels of service to the greater community.
- Flow Rates – A discharge consent could specify flow rates for a particular return period storm however KDC has very limited capacity to influence this.

3.5.2 Response times

There are three key steps to achieving the target service levels for this consideration:

- Defining appropriate measures and targets – This is often defined by the following acronym and requires all elements to be in place to be successful. This applies to all targets defined by a LOS process.

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- Alignment with maintenance contracts and staff performance objectives – Response time targets are a key deliverable in maintenance contracts and there needs to be a direct alignment between the targets identified in any LOS process and the targets identified in the maintenance of the land drainage district. Similarly, if customer response forms a defined part of the role of a staff member this should be reflected in the performance objectives of this person.
- Contractor and organisational performance –The contractor must have effective measurement and reporting processes in place that allows accurate and timely reporting of actual performance against the contract specification for response times. For performance to be managed effectively requires regular reporting of performance and follow-up of any under-performance with a view to bringing it into compliance. This may be through bonuses and penalties built into the contract or the exercise of enforcing the contract. The latter might ultimately lead to the cancellation of the contract if the required performance is consistently not being achieved. Similarly, the performance of staff members in relation to response times also needs to be tracked if these measures are to be reported on be a focus for achievement.

3.5.3 Customer satisfaction

This is a much more difficult measure to influence as it reflects the customers overall perception of the quality of the land drainage service that they receive or experience. This will be heavily influenced by whether or not they have had a recent or historical personal experience (and the outcome of that), the unpredictable frequency and magnitude of storm events that have occurred in the survey period and overall satisfaction with the conduct of Council (via personal experience, experience of others and media coverage) and their understanding of how the land drainage system works, and its associated limitations. Feedback (both positive and negative) is most valuable when it identifies the specific reason for that view.

The management of the land drainage districts requires a high level of interaction between the local famers and committees and Council. If this is not working to the satisfaction of the local communities this will become evident quickly through complaints to Mayor and Councillors and Council management. Some moderation of this may be required to distinguish between the complaints of a particular aggrieved person and the overall perceptions of affected parties within that scheme, and their willingness to address the specific complaints.

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4 Drivers of change

4.1 Overview

This section of the AMP analyses factors affecting demand including population growth and social changes. The impact of these trends is examined and demand management strategies are recommended to address demand and ensure:

- Existing assets' performance and utilisation are optimised;
- The need for new assets is reduced or deferred;
- Council's strategic objectives are met;
- Provision of a more sustainable service; and
- Council is able to respond to customer needs.

4.2 Growth and demand change

The process of demand management provides Council with a high level tool to identify where infrastructure growth is likely to occur over a period of time. It enables a natural structured growth of the public system to occur. Without this type of assessment ad-hoc development of localised land drainage systems occurs and can leave a burdensome, somewhat redundant, legacy for Council to operate and maintain.

Demand management strategies provide alternatives to the creation of new assets in order to meet demand and look at ways of modifying customer demands so that the utilisation of existing assets is maximised and the need for new assets is deferred or reduced.

Precise demand forecasting for the management of land drainage infrastructure is a difficult undertaking. This AMP has largely been based on historical data and growth predictions provided by Statistics New Zealand in order to identify potential future demand on the land drainage infrastructure. While this may not specifically affect the NALD, growth across the district, how it impacts on asset investment and the likely changes to the current LOS are directly relatable. The largest portion of this undertaking will be to formulate an appropriate response to climate change and sea level rise.

The impact of growth is currently managed in multiple ways:

- **Regulatory control**

Integrating the land drainage management objectives in all new projects from initial planning and design stages. This is the basic approach of Council's Engineering Standards 2011.

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- **District Plan (DP)**

The DP is the legal framework that is used for land use planning.

- **Catchment management planning**

Catchment management planning is a key tool for facilitating the integrated approach to stormwater management to achieve the desired environmental outcomes. The NALD will need to follow a similar approach where possible to enable KDC and the committees to better understand the drivers and effects climate change will have and how this impact the current system. This will allow for better planning and implementation of flood protection methodologies.

- **Education**

Education is an important tool for providing property owners with an understanding of their role and responsibility for managing their private systems. Environmental awareness is increasing as the community realises the need to protect the environment. However, at the same time property owners expect to be able to develop and work their property without restriction. Council has undertaken limited education to date but it is a demand management mechanism that can be considered in the future and may be added to the AMIP. Education promotes environmental awareness of the effects of activities such as intensive land applications, where contaminants may enter the drainage system, and thus the receiving environment.

The components of demand management are shown in Table 4-1.

Table 4-1: Examples of LD demand management strategies

Demand component	Land drainage examples
Operation: Looks at LOS provided by the infrastructure and the application of Best Practice Options for sustainable long term management.	Maintaining the existing land drainage network through the application of efficient operations and maintenance will ensure that the current LOS is met whilst also identifying and highlighting any issues across the district. The better the network is maintained the more efficient it is. Integration of any National and International standards for land drainage design into Engineering Standards documents.
Design: Progressive updating of standards allow for better land drainage design and management, Low Impact Design (LID) and treatment at source.	Application of LID as per existing standards and improving technology allow for better stormwater management, reduced peak runoff and better water quality. Integration of improved technology and increased awareness of changes to stormwater management can

Demand component	Land drainage examples
	be achieved through attendance at conferences and allowing consultants to raise any improvements they feel will better suit environmental needs. This will ensure that the best solution to meet the required land drainage LOS will be constructed whilst also maintaining focus on environmental improvements and water quality.
Incentives: Encourage the application of LID throughout the community, soakage, rain gardens and other source treatment options.	Community education and interaction to promote the use of flow calming, detention/attenuation ponds and other source treatment options. This will enable the mitigation of damage from peak flows and to allow for water quality treatment prior to the discharge to the receiving environments.
Community Education/Interaction: Develop partnerships with the communities in the district.	Production of Engineering Standards to aid development in the selection of the Best Practicable Option for land drainage management. Working with schools and engaging the community at an earlier level to promote water health.
Connection Denial: Regulation of connections to the public system to promote long term stability.	Where development occurs within the urban areas of the land drainage districts, or where substantial increases in growth are identified, Council may consider the option to force developers to treat and attenuate stormwater runoff from the development within their site boundaries. This will help mitigate any large flows directly impacting on the current land drainage network.

4.3 Population growth

4.3.1 Overall growth scenario

Statistics New Zealand issued revised population *projections* on 22 February 2017, using an estimated resident population at 2013 as the new base.

The LTP 2014/2015 assumptions used the high growth scenario with population projections of:

- 20,000 in 2016 - already exceeded by the 2013 base of 20,500;
- 21,400 in 2026 - a figure now expected to be exceeded three years earlier in 2023 by even the updated low growth scenario of 22,600; and
- 22,000 in 2031 - a figure now expected to be exceeded three years earlier in 2028 by even the updated low growth scenario of 22,800.

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In moving to the latest 2017 projections data, a decision needs to be taken on whether to continue to use the high growth scenario or to use lower growth options. The annual average population increases under the three scenarios are:

- High - population increase of 8,300 over 30 years = 276 persons per annum;
- Medium - population increase of 4700 over 30 years = 157 persons per annum; and
- Low - population increase of 1,200 over 30 years = 40 persons per annum.

Even the recently updated Statistics New Zealand *high* growth scenario of 276 persons per annum is below the average of 315 persons per annum seen from 2006 to 2016. If one assumes some moderation of the 2006/2016 highs due to the cyclic nature of economic development and growth, then use of the updated *high* growth scenario is reasonable. This is supported by the increasing influence of Auckland over time, particularly in the southern part of the district, which should see sustained population growth over time.

The assumption is that population growth will be in line with Statistics New Zealand's 2013 base high series projections which will see population increases of:

- 2,900 (12.5%) from 23,100 to 26,000 between 2018 and 2028; and
- 2,000 (7.7%) from 26,000 to 28,000 between 2028 and 2038.

The Statistics New Zealand projections show the population growth rate slowing in all regions, cities, districts of New Zealand, including Kaipara district, between 2018 and 2038 because:

- all areas will be home to more people aged 65 years and over by 2038; and
- deaths will increase relative to births in almost all areas as the population ages.

4.3.2 Population growth distribution

It is expected that most population growth will continue to occur in the southern part of the district.

The table below shows shares of district growth over various time periods. With reference to the LTP 2018/2028 timeframe, it shows:

- Dargaville taking 10.7% of district population growth, growing by 310 persons to reach a population of 5,330 by 2028;
- a 76.2% share of district population growth (2,210 persons) occurring in the southern half of the district with rural Rehia-Oneriri growing by 900 people (31.0%) and the combined Mangawhai CAU's growing by 1,160 people to reach a population close to 5,000 (40%) taking the bulk of that growth;

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- relatively low shares of growth in the smaller urban CAU's of Ruawai (0.3%), Kaiwaka (2.8%) and Maungaturoto (2.1%) totalling just 150 persons although there will be considerable growth in the rural area around them; and
- continued low shares of district growth (14.5%) in the north and northwest, totalling 420 persons.

4.3.3 Population fluctuations

A significant proportion of unoccupied dwellings in the district become occupied during holiday periods. At the time of the 2013 Census an average 26% of dwellings (2,764 of 10,681) were unoccupied. Rates of unoccupied dwellings in Te Kopuru (10.6%), Maungaru (6.5%), Dargaville (7.2%), Maungaturoto (10.0%), Ruawai (11.4%), and Kaiwaka (13.3%) are lower and likely reflect normal rates of vacant dwellings at any given time of the year. By contrast, Kaipara Coastal (27.3%), Rehia-Oneriri (24.8%) and Mangawhai (52.7%) have significantly higher vacancy rates and are likely to see population fluctuations as vacant homes are occupied in holiday periods.

In an effort to estimate the scale of population fluctuation:

Assume occupancy of up to 100% of dwellings in Kaipara Coastal, Rehia-Oneriri and Mangawhai during holiday periods:

- for normally unoccupied dwellings in these areas, assume occupancy of 0.5 persons per dwelling above the 2013 average occupancy in Kaipara Coastal, Rehia-Oneriri and Mangawhai during holiday periods to take account of families with children and guests, which are likely to result in higher average occupancy than normally occupied dwellings; and
- assume no change in dwelling occupancy in Maungaru, Dargaville, Te Kopuru, Ruawai, Maungaturoto and Kaiwaka during holiday periods.

Using the 2013 base data, the usually resident district population of 20,600:

- could have risen during holiday peak times by over 7,000 persons (7,111) to 27,600, an increase of 35%; and
- just under half of that increase was in Mangawhai, gaining 3,400 persons at peak, an increase of 131%.

If the same percentage increases are applied to the 2018 and 2028 population assumptions:

- the resident district population of 23,100 persons in 2018 could increase by 8,013 persons during peak holiday periods to over 31,000;
- the resident district population of 26,000 persons in 2028 could increase by over 9,000 persons during peak holiday periods to over 35,000;
- as Mangawhai grows from a usual resident population of around 3,700 in 2018 to around 4,890 in 2028 its population could fluctuate up to 8,610 in 2018 (an increase of 5,000 at peak) and 11,287 in 2028 (an increase of 7,200 at peak).

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4.3.4 Dwelling growth

The 2015 assumption is that dwelling growth rates will be more or less consistent with rating unit growth projections. As well as using the rating data as a source and for comparison it is useful to take the SNZ generated population growth assumptions and assess:

- The number of dwellings required to accommodate the usual resident population; and
- Apply an additional unoccupied dwelling component for holiday homes and vacant dwelling stock using 2013 Census occupancy rates.

The assumption is for steady to strong dwelling growth in LTP decade 2018/2028 moderating in the 2028/2038 decade as population growth rates begin to slow with an aging population. Projections indicate:

- Nearly 2,000 (1,912) additional dwellings will be built in the district over the LTP 2018/2028 period; and
- Another 1,400 built between 2028 and 2038.

The largest amounts of dwelling growth will be in:

- Mangawhai CAUs with over 1,000 dwellings delivered in the LTP 2018/2028 period and another 900 dwellings by 2028;
- Rehia-Oneriri CAU, covering much of the southern part of the district, is expected to see ongoing strong growth (450 dwellings in LTP decade 2018/2028 and over 300 more dwellings out to 2028); and
- Dargaville is expected to gain 130 dwellings over the LTP period and 70 more homes built in the following decade to meet a modest growth in population.

4.3.5 Most likely scenario

The following table shows the projected scenario for population change across the larger Kaipara communities. These projections are from Statistics New Zealand using population data from the 2013 Census as a base. Statistics New Zealand provides low, medium and high series projections; KDC has chosen to use high level projections.

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Table 4-2: Annual rating unit growth forecasts 2017

Projected population of territorial authority areas														
2013(base)–2043 update														
Territorial authority area [1]	Projection [2]	Population at 30 June							Population change 2013–43	Population change 2018–28	Population change 2028–38	Percentage share of District growth 2013-43	Percentage share of District growth 2018-28	Percentage share of District growth 2028-38
		2013 [3]	2018	2023	2028	2033	2038	2043	Number 2013-43					
Kaipara district	High	20,500	23,100	24,600	26,000	27,100	28,000	28,800	8,300	2900	2000			
High growth projections by CAU														
504400 Te Kopuru		510	540	560	580	590	610	620	110	40	30	1.3%	1.4%	1.5%
504501 Kaipara Coastal		3190	3370	3470	3560	3610	3610	3570	380	190	50	4.6%	6.6%	2.5%
504502 Maungaru		1820	1950	2050	2140	2220	2280	2310	490	190	140	5.9%	6.6%	7.0%
504600 Dargaville		4610	5020	5180	5330	5440	5500	5530	920	310	170	11.1%	10.7%	8.5%
504700 Maungaturoto		810	920	950	980	1000	1010	1030	220	60	30	2.7%	2.1%	1.5%
504800 Ruawai		470	490	490	500	510	530	540	70	10	30	0.8%	0.3%	1.5%
504900 Kaiwaka		640	700	740	780	830	860	900	260	80	80	3.1%	2.8%	4.0%
505010 Rehia-Oneriri		5840	6510	6980	7410	7770	8060	8310	2,470	900	650	29.8%	31.0%	32.5%
505021 Mangawhai		1430	2060	2400	2710	2990	3240	3460	2,030	650	530	24.5%	22.4%	26.5%
505022 Mangawhai Heads		1170	1670	1930	2180	2400	2580	2750	1,580	510	400	19.0%	17.6%	20.0%
615302 Inlet-Mangawhai Harbour		0	0	0	0	0	0	0	0	0	0	0.0%	0.0%	0.0%
Mangawhai combined CAUs	2,415	2,600	3,730	4,330	4,890	5,390	5,820	6,210	3,610	1,160	930	43.5%	40.0%	46.5%

There are currently no identified growth driven capital projects for Land Drainage over the next three years. Where infrastructure is installed, this will likely be installed by landowners.

4.4 National Policy Statement on Urban Development Capacity 2016

This policy statement requires all councils to provide for growth to occur in their areas such that a lack of 'development infrastructure' (which includes water services) is not an impediment to that growth.

There are no communities in Kaipara larger than 30,000 population experiencing high rates of growth and so compliance only with requirements PA1-4 is required. Broadly these can be summarised:

- for expected growth in the period from now to three years, the land and development infrastructure has to be feasible, zoned and serviced (or able to be serviced if it is developer responsibility);
- for medium term growth (3-10 years) the land does not need to be serviced but plans to service must be included in the LTP; and
- for long term growth (10-30 years) the land does not need to be serviced but provision to do so needs to be included in the Infrastructure Strategy.

In practical terms, it is difficult for Council to predict when a land drainage district might wish to make changes to the way the scheme is configured, its performance or its coverage.

The approach adopted by Council is therefore to engage with the land drainage communities and seek a co-ordinated approach that will provide for the development on a 'just in time' basis and with confidence that any works required are financially feasible for both the developer and Council.

4.5 Increase in land drainage services

With the proposed changes to the climate and sea level there is already growing concern regarding the current levels of service of the NALD and how this will be affected. It has already been proposed that a catchment wide hydraulic assessment will need to be conducted for the Raupo land drainage district to identify the changes in rainfall and expected runoff, and how this will be affected by sea level rise and what the repercussions to the current land drainage district may be. This is not yet proposed for the northern area land drainage but it is a tool that may need to be utilised as and when applicable to identify possibly affected areas within the existing schemes and how this will be able to be managed. This will also raise the question as to whether it will be appropriate for Council to maintain the current protection levels or to 'retreat' to higher ground or to adopt a lower LOS.

Another potential driver of change is conversion of the current faming land use to a different form and/or intensification of the current use. This will primarily be driven by the overall economics of farming and the costs and benefits of changing the status quo. There is no discernible change occurring at this time and the potential impacts for the future cannot be determined. This remains a subject to be canvassed with the landowners from time to time.

4.6 Technological change

Historically the methodology for dealing with floodwaters was to collect it in large open drains and canals and discharge this through floodgates as soon as possible to remove this from the workable land. It is also noted that the current drainage districts are situated in such a way that the time of concentration allows for large volumes of floodwaters to be conveyed through the floodgates between tides before larger flows from the rear of the catchment make it to these points. This allows

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for the stakeholders' properties to remain mainly free of floodwaters whilst the floodwaters flow in a controlled manner into the receiving environment. Discharges are mainly made direct to the receiving environment with little capture of the potential contaminants that they may contain, or consideration of the effects they could have on the stability and functioning of the ecosystems.

Over the past two decades there has been a philosophical shift in this principle as new technologies have been developed to promote Low Impact Design in the management of floodwater. This typically involves implementing solutions that mimic the natural environment prior to development, and managing the impacts on the receiving environments.

Such advancements in floodwater management include the application of a treatment train approach (i.e. the use of two or more treatment methods in series to provide more effective contaminant removal) such as the use of ground soakage to maximise groundwater recharge and riparian planting around watercourses.

This shift in philosophy is supported by Council and guidance for its application is provided in the Engineering Standards and supporting documentation.

Technological advances in stormwater management are leading to more economically feasible devices entering the mainstream market and becoming more widely used. Stream restoration and riparian planting is replacing the standard lined channel, whilst the general treatment train approach to water quality is being applied to greatly improve discharge quality. Council also considers the use of wetlands and detention basins for stormwater management are integral parts to mimicking the natural flow regime in the receiving environment, whilst providing good levels of treatment.

Council is committed to working with NRC to implement new technology for stormwater management throughout the district. A constant awareness of technology changes is necessary to most effectively identify emerging trends and their impact on the utility infrastructure assets.

Although as stated above there have been advances in stormwater management, and how this can be implemented in either a limited capacity or on a larger scale, the terminology and engineering behind these practical solutions is also applicable to land drainage. While there will still be a greater reliance on large canals and waterways to remove the peak flows, riparian planting, detention ponds and other source treatment options will still remain options when trying to manage water quality.

This can be achieved through Council staff attending conferences, seminars and presentations along with seeking advice from professional advisors. Consultation with the public and affected stakeholders will help Council implement better systems and more practical solutions into the current land drainage networks to help provide a better service to the community and cleaner water to the receiving environment.

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4.7 Legislative change

Legislative change can significantly affect the Council's ability to meet minimum LOS, and may require improvements to infrastructure assets. Changes in environmental standards, and the RMA 1991, may affect stormwater discharge requirements.

In addition, changes in legislation can influence the ease with which new resource consents are obtained or existing consents are renewed. Experience has demonstrated that resource consent conditions are becoming more stringent with increased monitoring requirements being commonplace and the likelihood of additional treatment being necessary.

The Ministry to the Environment (MfE) is promoting a series of National Environmental Standards that can be enforced as regulations under the RMA. One of the sections under development relates to Ecological Flows and Water Levels in rivers, lakes, wetlands and groundwater resources. Although the receiving environment is already assessed in resource consent applications, the impact of this Standard is likely to require greater consideration of discharge quantities and quality of stormwater into the receiving environment.

The NRC is in the process of finalising the plans and policy surrounding proposed seal level rise and climate change. Once this has been formally adopted KDC will prepare and adopt any changes required to its standards and District Plan to meet the new requirements.

4.8 Environmental considerations

4.8.1 Focus on water quality

Environmental considerations are an ever-changing issue. As such, there is a requirement for Council to provide the best service it can with the most up-to-date information.

Public perception of the impact of stormwater on the natural environment has altered noticeably over the last decade and has turned towards treating stormwater at the source and maintaining the quality of the harbours and waterways. The quality of stormwater runoff therefore has a significant impact on the quality of the receiving environment, being streams and rivers.

Council, the NRC and communities are dedicated to protecting receiving environments, to protect it for future generations and to improve on the existing state. This is achieved through:

- management of silt runoff from new development earthwork areas (including silt pond requirements for developers);
- management of point source contamination risks (through the current Engineering Standards and community education); and
- monitoring the receiving environments.

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It is likely that as time progresses and more knowledge is gained from monitoring programmes about the effects of contaminants on the receiving environments that more stringent conditions will be applied on resource consents granted by NRC, including, but not limited to:

- targeted contaminant removal (for example reduction in zinc loads);
- increased overall treatment efficiency of land drainage management devices; and
- greater application of LID in the overall land drainage management on a catchment basis.

Figure 4-1: NRC commentary on recreational water standards

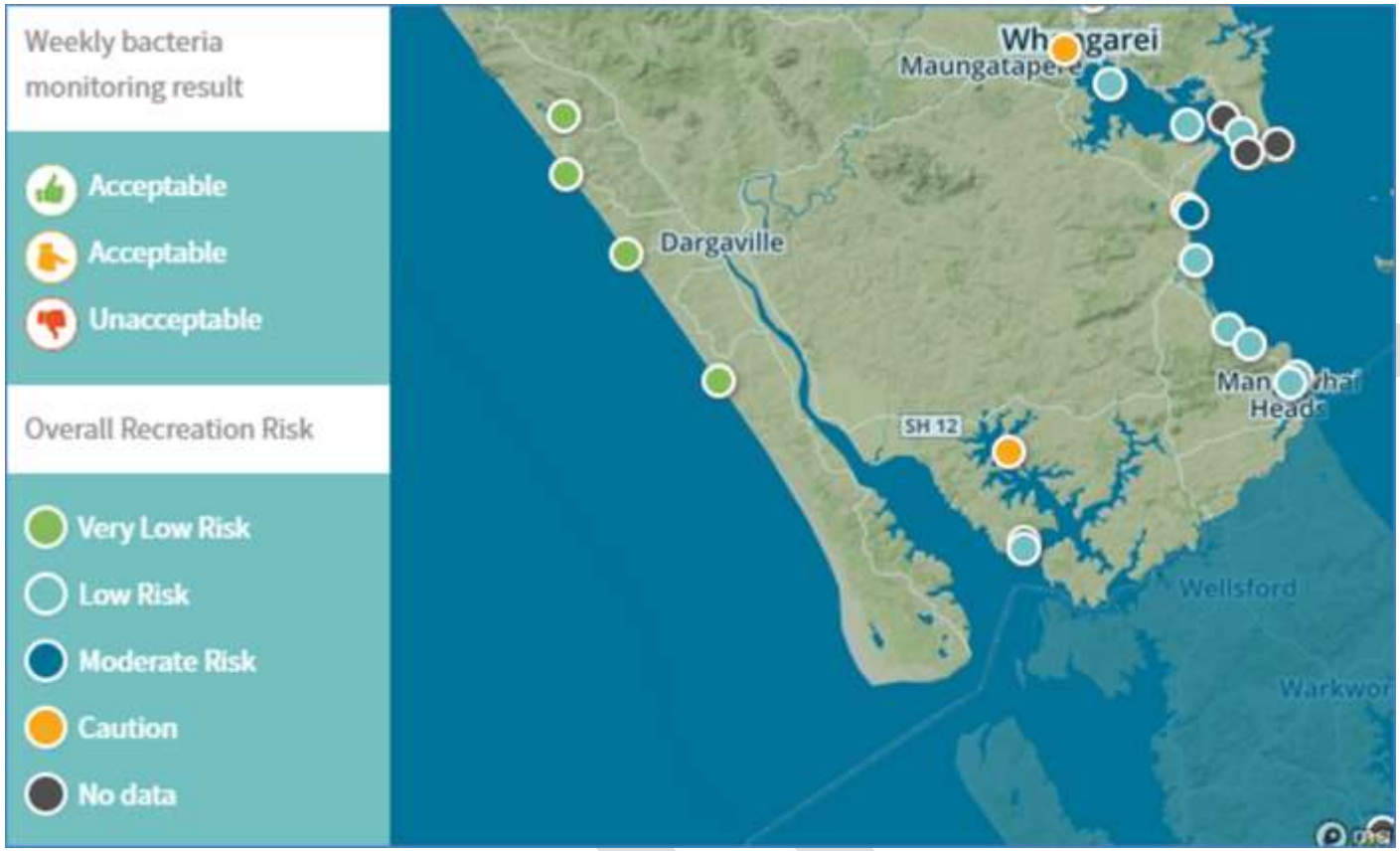
Okay to swim at most popular swim spots; NRC

The vast majority of Northland's most popular coastal swimming spots – and most of their freshwater equivalents – are suitable for swimming all or most of the time, regional council data shows.

Council Environmental Monitoring Manager Jean-Charles Perquin says hundreds of water samples were collected from 44 popular coastal and 13 freshwater summer swimming sites between late November last year and late February.

The annual water testing looks for bacteria used to gauge the risks of contracting gastrointestinal and other infections while using popular beaches, rivers and lakes for swimming, water sports and other forms of recreation.

Mr Perquin says 99.1 percent (606 out of 611) samples at coastal sites and 89.4% (161 out of 180) samples at freshwater sites over summer met national 'guideline values', meaning they were considered suitable for swimming.



4.8.2 Climate change

The MfE advises that climate scientists estimate Northland's temperature could increase 0.9°C by 2040, and 2.1°C by 2090[1]. This compares to a temperature increase in New Zealand during last century of about 0.7°C[2]. To put this in perspective, the 1997/1998 summer, which was particularly long, hot and dry, was only about 0.9°C above New Zealand's average for the 1990s. Northland is expected to also experience more frequent and intense heavy rainfall events which will increase the risk of flooding and could be four times as frequent by 2090.

[1] Ministry for the Environment, Climate Change Projections for the Northland Region. 2 August 2012: http://www.mfe.govt.nz/issues/climate/about/climate-change-affectregions/northland.html
[2] NIWA, Past Climate Variations over New Zealand: http://www.niwa.co.nz/our-science/climate/information-and-resources/clivar/pastclimate

Some of the potential impacts of climate change on stormwater and associated public infrastructure could include:

- increased flood frequency resulting from more intense rainfall;
- increased number of systems that do not have an appropriate LOS capacity, due to increased overall rainfall and raised groundwater tables;
- increased coastal flooding through higher tide and surge levels;
- increased flooding due to higher tides and rainfall breaching existing stopbanks;
- increased flooding due to higher low tide levels retaining stormwater and inundating an existing system by removing the ability for it to drain completely;
- potential overwhelming of existing treatment devices leading to increased contaminant loadings in the receiving environment; and
- increased coastal and fluvial erosion resulting from increased tide variations and discharges from the stormwater system.

NRC monitors rainfall at five sites throughout the district to understand the long term effects of climate change on rainfall patterns. In addition the National Institute of Water and Atmospheric Research (NIWA) maintains rainfall monitoring through an automatic station in Dargaville.

Although the definitive effects of climate change are not known at this time guidance is provided in a number of publications from a number of organisations. The Intergovernmental Panel on Climate Change (IPCC) releases guidance at regular intervals considering global impacts of climate change. The MfE distils the information from the IPCC publication into "*Climate change effects and impacts assessment: A guidance Manual for Local Government in New Zealand*" and the summary report "*Preparing for Climate Change: A Guide for Local Government*" which provides New Zealand specific Climate Change Data.

The following table is an extract from the MfE publication and highlights the potential effects of climate change on stormwater networks.

Table 4-3: Effects of climate change on land drainage

Resource	Key climate influences	Impacts of climate change
Rivers	Increased rainfall	River flows likely to, on average, increase in the west and decrease in the east of New Zealand. More intense precipitation events would increase flooding. By 2070 this could range from no change, up to a fourfold increase in the frequency of heavy rainfall events. Less water for irrigation in northern and eastern areas. Increased problems with water quality.
Drainage	Increased rainfall	Increased frequency of intense rainfall events could occur throughout New Zealand, which would lead to increased surface flooding and stormwater flows, and increased frequency of groundwater level changes.

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Resource	Key climate influences	Impacts of climate change
Coastal areas	Sea level rise Storm frequency and intensity Wave climate Sediment supply	Effects of sea level rise and other changes will vary regionally and locally, this will have an as yet unquantifiable effect on existing land drainage and flood protection systems. Coastal erosion is likely to be accelerated in areas where it is already occurring. Erosion may become a problem over time in coastal areas that are presently either stable or are advancing. Rise in sea level at low tide will directly impact the drainage networks capacity to drain floodwaters.

With climate change and predicted sea level rise KDC will need to alter its focus and the considerations around flood levels, stormwater discharge and consented discharge limits to match the requirements from NRC, the change in public expectations and the altering natural environment.

Council manages the impact of urban growth and development on the stormwater infrastructure and receiving environment through the application of Stormwater Catchment Management Plans (SWCMPs) and planning provisions set out in the District Plan. As such a similar approach can be taken with the land drainage schemes to accurately capture and identify the effects of climate change and sea level rise on the existing land drainage network and propose methods of remediation.

The functions of an SWCMP include:

- Assess stormwater management of the wider catchment and not just the development site;
- Integrate with District Plans and Growth Plans of the district to assess future performance of the stormwater network;
- Identify potential quality issues that could prevail as a result of future development;
- Identify catchment-wide stormwater management principles to reduce ad-hoc localised facilities;
- Act as a vehicle to communicate with Iwi, the community and other stakeholders;
- Identify potential risks (both flood and flow related) including the potential impacts of climate change; and
- Identify mitigation options for the stormwater network.

The outputs from the SWCMPs can be used to define capital works programmes and inform future planning to meet the changes in environmental considerations and help focus on the LOS that will be required.

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4.9 Summary of drivers of change

The following table provides a summary of how the above issues will impact on the management of NALD assets.

Table 4-4: Summary of issues impacting on LD

Issues	Impact on stormwater assets
Population growth	Increased urbanisation, and a greater tourist population, will mean that the land drainage protection will need to include these drivers in their future capability. This may require a focus is protecting the road assets and also providing for other amenities such as cycle trails.
Technical change	The changes in the technical approach to stormwater management, including regulatory and statutory requirements will impact on the future design of land drainage assets. It is unlikely that retrospective design will be required, however, the renewing or provision of any discharge consents are likely to be required to meet these standards.
Legislative changes	The proposed MfE National Environmental Standard related to flow and level is currently open for discussion. It is likely that this will come into operation and impact on the design of the land drainage network.
Customer expectations	Council's current Engineering Standards include the LOS for stormwater management and some of these requirements will become more applicable to land drainage. Customer expectations will necessarily be a blend of the expectations of the wider community and the specific expectations of the stakeholders involved in the various land drainage schemes.
Environmental considerations	It is likely that environmental considerations to protect the natural environment will become more important and regulated. This will also arise from technology changes and customer expectations. With increasing focus on water quality more wetlands and other water treatment options are being asked for as a design consideration.
Climate change	The potential impacts of climate change on the land drainage design to the year 2090, is provided for within the current Engineering Standards. The potential impacts of climate change are not static and Council will adopt the most up-to-date information published by the IPCC and New Zealand central government when this data is released.

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5 The Assets: extent and valuation data

5.1 Asset description

Council has been involved with land drainage from the day its predecessor was formed in 1876. Over the years there have been 37 drainage schemes formed so that subsidised works could be carried out to either maintain or construct drainage works. The subsidies were from Government departments at the time that controlled the river control subsidies works.

At one stage the drainage schemes were disbanded and the entire district was rated to cover the costs for the individual drainage schemes. Individual schemes were later re-established and form the system we have today where the drainage schemes are rated on the contributing catchment.

There are now 28 land drainage schemes lying outside the larger Raupo land drainage scheme with their own gates, stopbanks and maintenance requirements.

The land drainage schemes below are managed by KDC in conjunction with local stakeholders. There are also several drainage schemes without any hard infrastructure. For example, Tangowahine Valley and Manganui River are rivers that are maintained by KDC in conjunction with local stakeholders, spraying and cleaning of the banks as required,

The disbanded drainage schemes outlined below are the ones known to KDC that were not reinstated in the 1980s when the rest of the schemes were re-established, Tangaehae and Waimamaku were disbanded recently at the stakeholders' request but with remaining funds going towards a discharge consent around the areas where the existing privately managed drains and canals are located.

The oldest record found on drainage schemes is as follows:

"21 April 1897

7 Tatarariki Drains and Cleaning

Chairman proposed seconded by Councillor Bassett that in reply to letters written by Alex Andrew and John Thompsons asking to have Cobbald's outlet cleaned out they both be informed that the Council do not acknowledge any liability in the matter and suggest that they combine with other sectors interested in getting their drains cleaned out when the Council will be prepared to assist with a small subsidy and the Clerk write to the Manager of the Kauri Timber Coy at Te Kopuru pointing out that some assistance should be given to clean the Kopuru Creek owing to the company having logs and dam in the creek.

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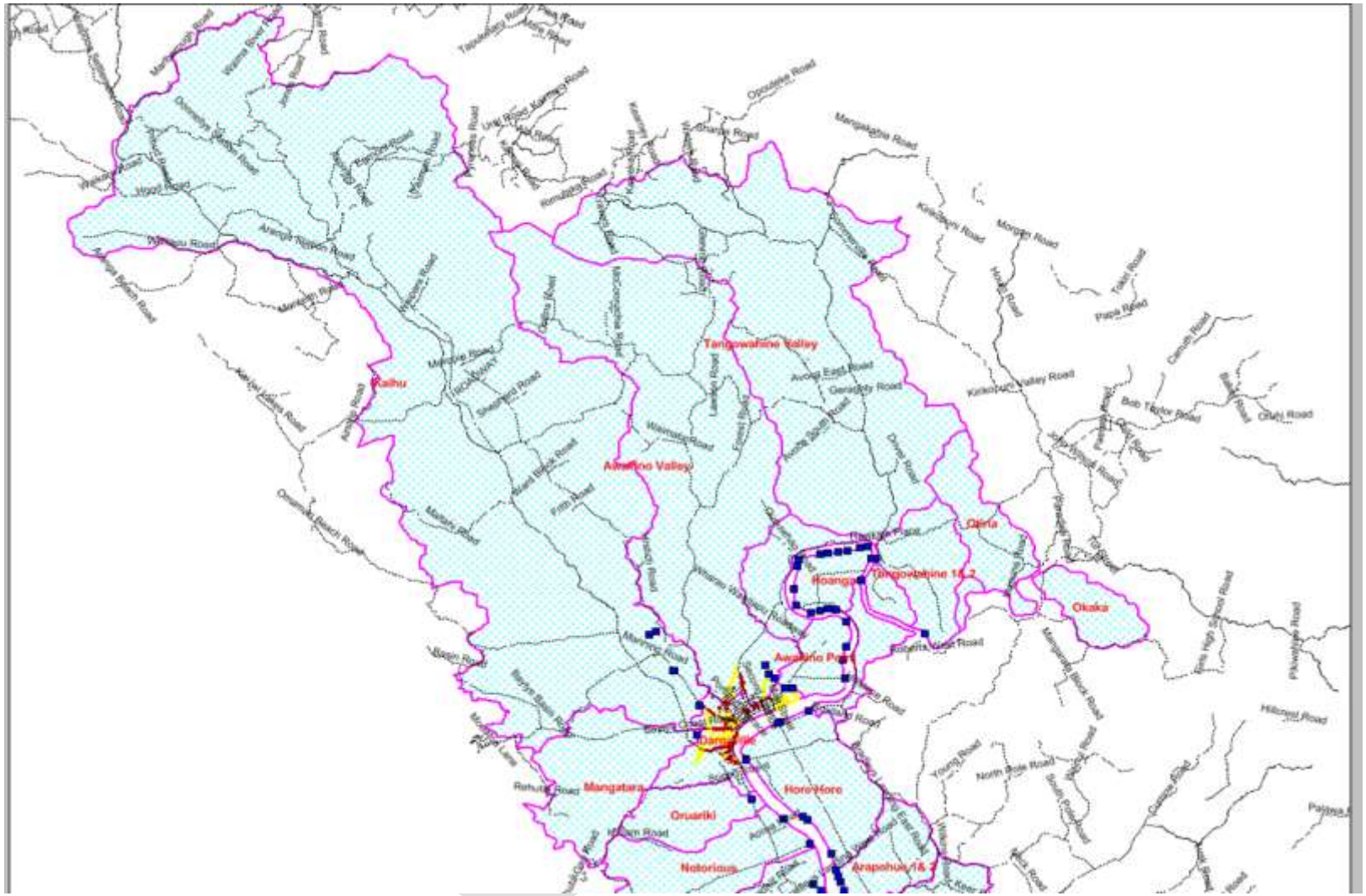
Figure 5-1: Location of land drainage schemes



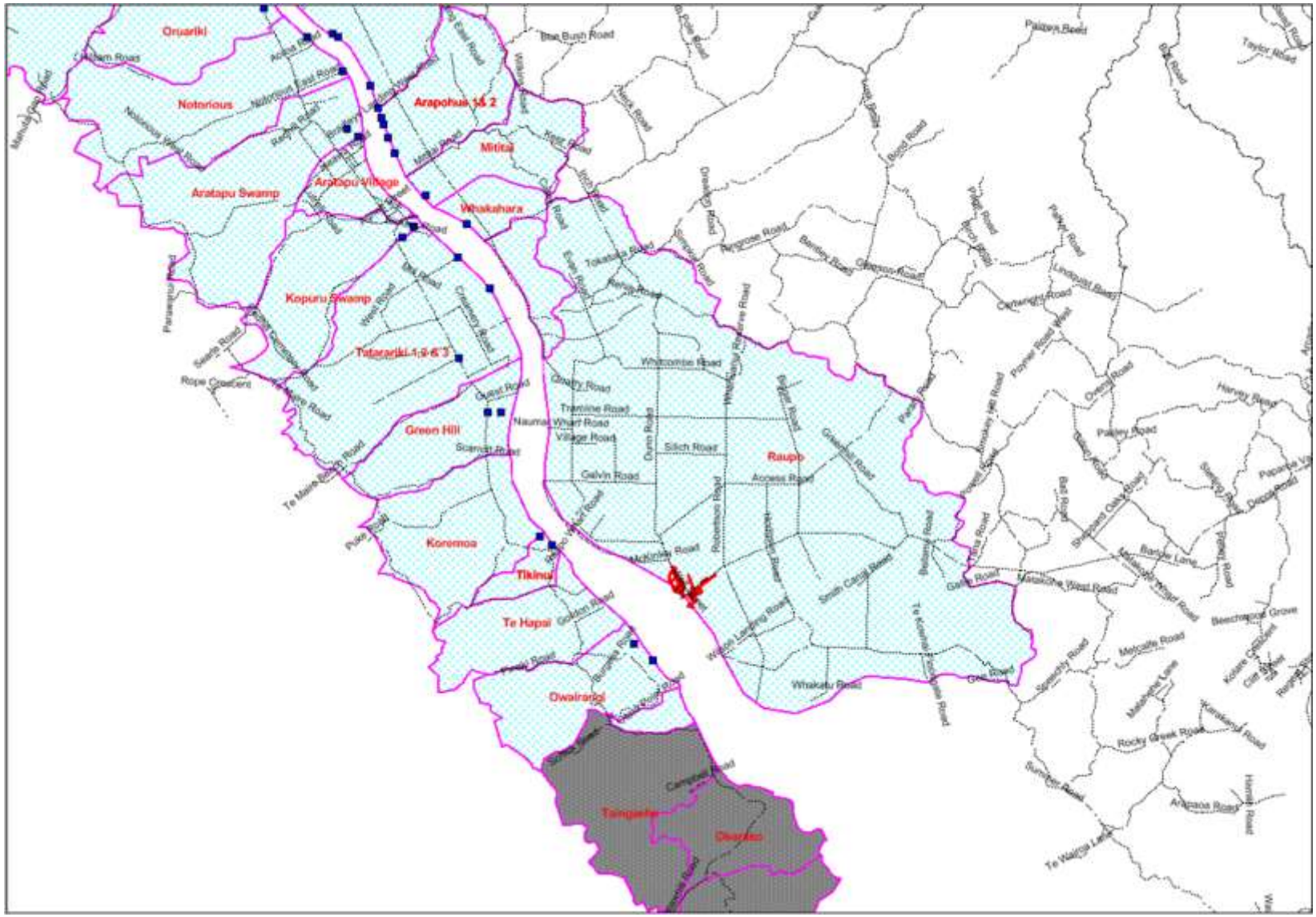

Oruariki
Notorious
Arapohue 1 & 2
Mititai
Aratapu Swamp
Aratapu Village
Whakahara
Kopuru Swamp
Tutarariki 1 & 3
Green Hill
Koremoa
Tikinui
Te Hapai
Owairaroa
Tangoake
Owaiteo
Raupo
Whitcombe Road
Tramline Road
Village Road
Silich Road
Galvin Road
Access Road
Robertson Road
Smith Camp Road
Whakatu Road
Melcolme Road
Rocky Creek Road
Beechwood Grove
Harvey Road
Pakiaka Road
Oruarii Road
Taylor Road
Bee Bush Road
Bond Road
Pakiaka Beach

Table 5-1: Current status of northern area LD districts

Drainage scheme	District number	Floodgates	Length of drains (m)
Active land drainage districts			
Aoroa	J10	2 (wooden ?x?)	2,032
Arapohue Nº.1	J11	1 (wooden 1.3 x 0.9)	2,050
Arapohue Nº.2	J12	2 (wooden 1.2 x 1.5)	1,731
Aratapu Swamp	J13	2 (wooden 1.5 x 1.2) 1 (concrete ?x?)	5,957
Aratapu Nº.2 (Village)	J14	3 (wooden ?x?)	4,469
Awakino Point	J16	5 (wooden ?x?) 1 (concrete ?x?)	6,466
Awakino	J15	2 (wooden ?x?) 1 (concrete ?x?)	9,895
Greenhill	J17	1 (wooden ?x?)	1,071
Hoanga	J18	12 (wooden ?x?) 5 (concrete ?x?)	11,634
Horehore	J19	9 (wooden ?x?)	18,464
Kaihu Valley	J21	3 (wooden ?x?) 1 (concrete ?x?)	10,135
Kopuru Swamp	J22	1 (wooden ?x?) 1 (concrete ?X?)	4,309
Mangatara	J25	1 (concrete ?x?)	2,490
Mititai	J26	1 (wooden 1.2 x 1.5)	522
Notorious	J27	1 (concrete ?x?)	6,330
Oruariki	J28	3 (wooden ?x?)	5,093
Owairangi	J32	1 (wooden ?x?)	1,608

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Drainage scheme	District number	Floodgates	Length of drains (m)
		1 (concrete ?x?)	
Tangowahine Nº.1 (Extn)	J36	1 (wooden ?x?) 1 (concrete ?x?)	2,905
Tangowahine Nº.2 (Extn	J37	1 (concrete ?x?)	4,000
Tatarariki	J39	2 (wooden ?x?)	5,463
Tatarariki 2	J40	1 (concrete 1.6 x 1.6)	840
Tatarariki 3	J41	1 (wooden ?x?)	2,642
Tikinui	J43	2 (wooden ?x?)	1,634
Whakahara	J46	1 (concrete 1.6 x 1.6)	2,731
District-wide Land Drainage			
Land drainage districts with nil assets			
Kaihu River	Nil	TBC	TBC
Koremoa	J23	Nil	3,602
Manganui River	Nil	Nil	Nil
Otiria		25.3.53	
Tangowahine Valley	Nil	Nil	Nil
Disbanded land drainage districts			
Tangaehae	N/A	N/A	N/A
Waimamaku	N/A	N/A	N/A
Okaka	N/A	N/A	N/A
Pukehuia	N/A	N/A	N/A
Okara	N/A	N/A	N/A
Upper Tangowahine Valley	N/A	N/A	N/A
Rahukuri	N/A	N/A	N/A
Kawakawa	N/A	N/A	N/A

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Drainage scheme	District number	Floodgates	Length of drains (m)
Te Hapai	N/A	N/A	N/A
Sunnynook	N/A	N/A	N/A
Tauraroa River	N/A	N/A	N/A
Kirikopuni	N/A	N/A	N/A

The northern area land drainage network assets are summarised below.

Table 5-2: Overview of assets

Asset	Quantity	Purpose
Stopbanks	Unknown	Prevent tidal flows from inundating private property during high tides and/or when the river is in flood.
Floodgates	17 concrete 54 wooden	Prevent tidal flows from entering during high tide and to enable the draining of canals and drains at low tide.
Canals	118.073 km	Canals are collector drains that collect water from a number of smaller drains. These are identified as being 2.5m-10m in width at the top of the drain.
Drains		Drains collect water from individual or multiple properties less than 2.5m in width at the top.

5.2 Stopbanks

The original stopbanks were typically formed by mounding excavated tidal mud to form continuous banks from headland to headland.

Most stopbanks are topped up by regular drain cleaning. As a result the heights of the banks are variable and are likely to be higher than currently required for flood protection. Over time many of the stopbanks have been built up to a height of 2.6 to 2.7m above mean sea level.

However, there is currently little documentation available to confirm their current make up or their alignment with any expected standard height.

The previous AMP suggests that the design standard for foreshore banks should be a crest level of 3.5m above mean seal level, which would include a freeboard of 0.5m above extreme tide levels. With predicted sea level rise and climate change this value may need to change and when a decision is made on this a programme of works will need to be developed and projects identified.

Stopbanks are not considered to require renewal at any particular time and are not depreciated. They do however require suitable maintenance to retain their form and functionality.

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5.3 Floodgates

The NALD network includes 54 wooden floodgates and 17 concrete floodgates of varying description, size and configurations.

This AMP considers a floodgate to incorporate the inlet and outlet wingwalls, the pipes or barrels of the floodgate, the actual gate itself, and any chains, winch and gantry associated with the lifting of the gate. In the case of several of the larger floodgates, riprap material in the floodgate outlet is also considered to be a part of the floodgate.

Floodgates range from small diameter concrete pipes with small concrete wing walls and wooden gate, to large diameter, multi barrel steel channels, with extensive wooden wing walls and multiple steel gates. The most recent upgrades to the floodgate network within Raupo is seeing large pre-cast and poured in-situ concrete structures with large wingwalls and well protected channels. This also uses wooden piles and timber to form greater wingwalls areas if required (see Figure 5.2 for examples of difference in floodgate types).

The age of each individual floodgate is not known and to date a formal structural condition assessment has not been undertaken. However the condition of floodgates is regularly physically inspected.

Due to their construction and the materials used, it is generally accepted that most, if not all, gates will leak during high tide. The resulting inflow of water is not significant, even at larger gates, and has not warranted remedial works. The use of rubber seals is been investigated together with alternative design and construction methods that may facilitate better seals between gates and barrels.

For renewal purposes, a floodgate is considered as having two components, the structure and the gate and these might be replaced individually.

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Figure 5-2: Various floodgate types

Table 5-3: Floodgate locations, type and valuation

Land Drainage District	Asset Type	Installation Year	Quantity	Comments from 2016 Valuation	Useful Life	Remaining Useful Life @ 2016	2016 Unit Rate	Replacement Value	Annual Depreciation
Aratapu Swamp	Floodgates concrete	2007	1	50% share of total $50k cost	80	71	$ 33,595	$ 33,595	$ 420
Awakino Valley	Floodgates concrete	2011	1	Nichols floodgate	80	75	$ 15,852	$ 15,852	$ 198
Awakino Point	Floodgates concrete	2009	1	Phillips floodgate Number1	80	73	$ 31,412	$ 31,412	$ 393
Hoanga	Floodgates concrete	2008	1	Fagan / Wistrand #1	80	72	$ 15,453	$ 15,453	$ 193
Hoanga	Floodgates concrete	2008	1	Fagan / Wistrand #2	80	72	$ 15,453	$ 15,453	$ 193
Hoanga	Floodgates concrete	2009	1	Wistrand	80	73	$ 12,307	$ 12,307	$ 154
Hoanga	Floodgates concrete	2010	1	Gillabrand (Lowest Value)	80	74	$ 12,092	$ 12,092	$ 151
Hoanga	Floodgates concrete	2012	1	Main outlet no1	80	76	$ 13,755	$ 13,755	$ 172
Kaihu Valley	Floodgates concrete	2010	1	Replace fg 6 Byant	80	74	$ 17,812	$ 17,812	$ 223
Kopuru Swamp	Floodgates concrete	2009	1	Install new fg1 Bickers Rd	80	73	$ 75,383	$ 75,383	$ 942
Mangatara	Floodgates concrete	1999	1	New fg 1	80	63	$ 58,813	$ 58,813	$ 735
Notorious	Floodgates concrete	2006	1	FG 1 wing wall repair cost (Highest Value)	80	70	$ 64,812	$ 64,812	$ 810
Owairangi	Floodgates concrete	2010	1	Replace fg1 concrete box culvert	80	74	$ 31,906	$ 31,906	$ 399
Tangowahine 1	Floodgates concrete	2005	1	Replace fg 1	80	69	$ 50,271	$ 50,271	$ 628
Tangowahine 2	Floodgates concrete	2006	1	Replace fg 1	80	70	$ 47,623	$ 47,623	$ 595
Tatarariki 2	Floodgates concrete	2006	1	Replace, assume ave cost	80	70	$ 26,914	$ 26,914	$ 336
Whakahara	Floodgates concrete	2006	1	Replace, assume ave cost	80	70	$ 26,914	$ 26,914	$ 336
						Average	**$ 32,375**	**$ 550,368**	**Total**

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Land Drainage District	Asset Type	Installation Year	Quantity	Comments	Useful Life	Remaining Useful Life @2016	2016 Unit Rate	Replacement Value	Annual Depreciation
Aoroa	Floodgates wooden	1975	2		50	9	$23,097	$46,195	$924
Arapohue 1	Floodgates wooden	1975	1		50	9	$23,097	$23,097	$462
Arapohue 2	Floodgates wooden	1975	2		50	9	$23,097	$46,195	$924
Aratapu Swamp	Floodgates wooden	1975	2		50	9	$23,097	$46,195	$924
Aratapu Village	Floodgates wooden	1975	3		50	9	$23,097	$69,292	$1,386
Awakino Valley	Floodgates wooden	1975	2		50	9	$23,097	$46,195	$924
Awakino Point	Floodgates wooden	1975	5		50	9	$23,097	$115,486	$2,310
Green Hill	Floodgates wooden	1975	1		50	9	$23,097	$23,097	$462
Hoanga	Floodgates wooden	1975	12		50	9	$23,097	$277,167	$5,543
HoreHore	Floodgates wooden	1975	9		50	9	$23,097	$207,876	$4,158
Kaihu Valley	Floodgates wooden	1975	3		50	9	$23,097	$69,292	$1,386
Kopuru Swamp	Floodgates wooden	1975	1		50	9	$23,097	$23,097	$462
Mititai	Floodgates wooden	1975	1		50	9	$23,097	$23,097	$462
Oruariki	Floodgates wooden	1975	3		50	9	$23,097	$69,292	$1,386
Owairangi	Floodgates wooden	1975	1		50	9	$23,097	$23,097	$462
Tangowahine 1	Floodgates wooden	1975	1		50	9	$23,097	$23,097	$462
Tatarariki 1	Floodgates wooden	1975	2		50	9	$23,097	$46,195	$924
Tatarariki 3	Floodgates wooden	1975	1		50	9	$23,097	$23,097	$462
Tikinui	Floodgates wooden	1975	2		50	9	$23,097	$46,195	$924
								$1,247,253	**Total**

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Comparison of the unit rates used for valuation of the NALD schemes floodgates versus the Raupo land drainage scheme reveals a significant difference as indicated in the following table.

Table 5-4: Comparison of NALD schemes and Raupo asset valuations

Northern Districts 2016 Valuation			
Area	Count of assets	Sum of Replacement Value	Calculated unit rate
Drains	118,073	$4,319,879	$37
Floodgates concrete	17	$550,368	$32,375
Floodgates wooden	54	$1,247,253	$23,097
	Total	$6,117,500	

Raupo District 2016 Valuation			
Area	Count of assets	Sum of Replacement Value	Calculated average unit rate
Building	4	$281,326	$70,331
Drains	130,000	$4,346,256	$33
Earth stop bank	1	$2,697,952	$2,697,952
Floodgates concrete	4	$462,980	$115,745
Floodgates wooden	49	$5,590,802	$114,098
Pumping structure	1	$175,209	$175,209
Pumps	1	$174,120	$174,120
Rip rap	12,000	$523,715	$44
	Total	$14,252,361	

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The Raupo rates for both concrete and wooden floodgates are more than three times the rates for the NALD scheme gates. A detailed comparison has not been done of the gates in the two schemes or the source of the valuation data. These rates flow directly through into the scheme valuations, depreciation calculation and renewal forecasts and there needs to be confidence in these numbers. This will be addressed as an AMIP project over the next three years (aligned with next valuation).

5.4 Drains and canals

The original drainage network dates back to the late 1800s when early settlers undertook to drain the land fronting the river. Eventually the drains were extended back to the hills, this was also supported by grants from central government under the Land Drainage Act 1908.

Initially drains were constructed to specific dimensions however, due to ongoing erosion and periodic drain maintenance, a gradual increase in drain width has occurred over time and their dimensions vary along their length. To categorise them by dimensions would require frequent and time-consuming measurement that would generate little benefit. Drain clearing is a balance between maintaining an effective flow cross-section with the loss of usable land, and volume of excavated material, that result from widening the drain.

Instead all drains and canals will be categorised by their criticality in relation to the area drained or volume of runoff carried. Therefore, canals and major drains with a larger number of drains feeding into them are considered to be more critical than those draining several paddocks. This is an improvement item that will need to have focus brought to it in the next LTP period.

Figure 5-3: Drain types

Table 5-5: NALD scheme, extent and valuation

Northern Drains	Length	Replacement Cost @ $37/m	Depreciated Replacement Cost
Aoroa	2,032	$74,344	$74,344
Arapohue 1	2,050	$75,002	$75,002
Arapohue 2	1,731	$63,331	$63,331
Aratapu Swamp	5,957	$217,946	$217,946
Aratapu Village	4,469	$163,505	$163,505
Awakino Valley	9,895	$362,024	$362,024
Awakino Point	6,466	$236,568	$236,568
Green Hill	1,071	$39,184	$39,184
Hoanga	11,634	$425,647	$425,647
HoreHore	18,464	$675,533	$675,533
Kaihu Valley	10,135	$370,804	$370,804
Kopuru Swamp	4,309	$157,651	$157,651
Koremoa	3,602	$131,785	$131,785
Mangatara	2,490	$91,100	$91,100
Mititai	522	$19,098	$19,098
Notorious	6,330	$231,593	$231,593
Oruariki	5,093	$186,335	$186,335
Owairangi	1,608	$58,831	$58,831
Tangowahine 1	2,905	$106,284	$106,284
Tangowahine 2	4,000	$146,346	$146,346
Tatarariki 1	5,463	$199,872	$199,872
Tatarariki 2	840	$30,733	$30,733
Tatarariki 3	2,642	$96,662	$96,662
Tikinui	1,634	$59,782	$59,782
Whakahara	2,731	$99,918	$99,918
TOTAL	**118,073**	**$4,319,879**	**$4,319,879**

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5.5 Total asset valuations for each northern area land drainage scheme

The following table provides the combined valuation of floodgates and drains for the various active schemes. The following table sorted by Replacement Value provides an indication of the hierarchy of the schemes. The largest scheme (HoreHore at $883,000) has over 20 times the replacement value of the smallest (Mititai at $42,000).

Northern Totals	Replacement Cost	Depreciated Replacement Cost	Total Depreciation to Date	Annual Depreciation
Aoroa (J10)	$120,538	$82,659	$37,880	$924
Arapohue 1 (J11)	$98,100	$79,160	$18,940	$462
Arapohue 2 (J12)	$109,526	$71,646	$37,880	$924
Aratapu Swamp (J13)	$297,736	$256,077	$41,659	$1,344
Aratapu Village (J14)	$232,797	$175,978	$56,819	$1,386
Awakino Valley (J15)	$424,070	$385,200	$38,870	$1,122
Awakino Point (J16)	$383,467	$286,020	$97,447	$2,702
Green Hill (J17)	$62,281	$43,342	$18,940	$462
Hoanga (J18)	$771,874	$538,834	$233,039	$6,407
HoreHore (J19)	$883,409	$712,951	$170,458	$4,158
Kaihu Valley (J21)	$457,908	$399,753	$58,155	$1,608
Kopuru Swamp (J22)	$256,132	$230,596	$25,536	$1,404
Koremoa (J23)	$131,785	$131,785	$0	$0
Mangatara (J25)	$149,913	$137,416	$12,498	$735
Mititai (J26)	$42,195	$23,256	$18,940	$462
Notorious (J27)	$296,405	$288,304	$8,102	$810
Oruariki (J28)	$255,627	$198,808	$56,819	$1,386
Owairangi (J32)	$113,835	$92,502	$21,333	$861
Tangowahine 1 (J36)	$179,652	$153,800	$25,852	$1,090
Tangowahine 2 (J37)	$193,969	$188,016	$5,953	$595
Tatarariki 1 (J39)	$246,067	$208,187	$37,880	$924
Tatarariki 2 (J40)	$57,647	$54,282	$3,364	$336
Tatarariki 3 (J41)	$119,759	$100,819	$18,940	$462
Tikinui (J43)	$105,977	$68,097	$37,880	$924
Whakahara (J46)	$126,832	$123,467	$3,364	$336
TOTAL	**$6,117,500**	**$5,030,954**	**$1,086,546**	**$31,825**

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Table 5-6: Total scheme valuations

Northern LD Schemes Sorted by Total Replacement Cost

Northern Totals	Replacement Cost	Depreciated Replacement Cost	Total Depreciation to Date	Annual Depreciation
HoreHore (J19)	$883,409	$712,951	$170,458	$4,158
Hoanga (J18)	$771,874	$538,834	$233,039	$6,407
Kaihu Valley (J21)	$457,908	$399,753	$58,155	$1,608
Awakino Valley (J15)	$424,070	$385,200	$38,870	$1,122
Awakino Point (J16)	$383,467	$286,020	$97,447	$2,702
Aratapu Swamp (J13)	$297,736	$256,077	$41,659	$1,344
Notorious (J27)	$296,405	$288,304	$8,102	$810
Kopuru Swamp (J22)	$256,132	$230,596	$25,536	$1,404
Oruariki (J28)	$255,627	$198,808	$56,819	$1,386
Tatarariki 1 (J39)	$246,067	$208,187	$37,880	$924
Aratapu Village (J14)	$232,797	$175,978	$56,819	$1,386
Tangowahine 2 (J37)	$193,969	$188,016	$5,953	$595
Tangowahine 1 (J36)	$179,652	$153,800	$25,852	$1,090
Mangatara (J25)	$149,913	$137,416	$12,498	$735
Koremoa (J23)	$131,785	$131,785	$0	$0
Whakahara (J46)	$126,832	$123,467	$3,364	$336
Aoroa (J10)	$120,538	$82,659	$37,880	$924
Tatarariki 3 (J41)	$119,759	$100,819	$18,940	$462
Owairangi (J32)	$113,835	$92,502	$21,333	$861
Arapohue 2 (J12)	$109,526	$71,646	$37,880	$924
Tikinui (J43)	$105,977	$68,097	$37,880	$924
Arapohue 1 (J11)	$98,100	$79,160	$18,940	$462
Green Hill (J17)	$62,281	$43,342	$18,940	$462
Tatarariki 2 (J40)	$57,647	$54,282	$3,364	$336
Mititai (J26)	$42,195	$23,256	$18,940	$462
TOTAL	**$6,117,500**	**$5,030,954**	**$1,086,546**	**$31,825**

5.6 Culverts

Culverts are installed to facilitate access to private property (i.e. under driveways) and to enable access for maintenance and also part of the drainage network. Council currently has no records as the quantity, size and age of these assets and they are not included in the valuation.

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5.7 Critical assets

Critical assets have been defined as being assets with a high consequence of failure. They are often found as part of a network, in which, for example, their failure would compromise the performance of the entire network.

A formal criticality assessment has been undertaken over the last three year period and an initial assessment of the saltwater floodgates in the Raupo land drainage has been undertaken by Opus, based on the recorded age of existing assets. This has not yet been extended to the northern area.

The criticality framework, and the resulting risk rankings (Criticality combined with Likelihood of Failure) will need to be applied to all land drainage assets in the next LTP period.

Historical evidence and local knowledge has identified the land drainage related assets in the following table which could be considered to be "critical", in that failure of these assets could compromise the land drainage network.

The land drainage assets in the northern area schemes are considered to have a relatively low criticality compared to the assets protecting Dargaville and Ruawai. This is based on the understanding that failure of the stopbanks or floodgates could allow flooding of the protected land but this would not generate significant or widespread impacts. Houses are relatively few and far between and generally on elevated foundations. Stock can be moved and while crops would adversely affected this is not a long term issue. It is also relevant that the storm event is likely to be relatively short and most of the affected area would drain during the next low tide. This would also allow access for repair equipment. While there are losses and inconvenience associated with this scenario the cost of designing and implementing measures that would avoid these outcomes is considered to be prohibitive and outside the expectation of the stakeholders involved.

Further understanding and definition of mitigation measures is required.

Table 5-7: Criticality of LD assets

Asset group	Assessment of Criticality	Criticality
Culverts under roads	Under State Highways are responsibility of NZTA. Under local roads are responsibility of KDC Transportation. Within urban areas generally have alternative routes and low likelihood of entire road being compromised.	N/A
Open drains	There are many open drains throughout the various communities and the Risk Register in the Stormwater AMP lists consequences of failure between Minor and Severe. Failure would typically take	Low - Open drains in private property

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Asset group	Assessment of Criticality	Criticality
	the form of blockage by silt/foliage and/or erosion of banks threatening buildings. Generally regarded as low criticality and owners will advise Council if drains through private property require maintenance. Inspection regime in place to identify maintenance requirements but more for aesthetics than concern about capacity.	
Stopbanks on Northern Wairoa River (Dargaville and Ruawai) – **not** NALD schemes	Stopbanks (earth embankment, timber and concrete) are the primary protection to prevent Dargaville and Ruawai from flooding under extreme river events. There are no flood pumps on the inland side if a breach or back-up of runoff occurs. The river can be up to 1m above Dargaville CBD and Ruawai street levels.	High (Extreme)
Floodgates	Floodgates are required to prevent flow from river in high river level events. Impact likely to be less catastrophic than failure of stopbank however if combined with heavy rain could generate localised flooding of lower Dargaville and Ruawai. Gates are gates or floating ball type and have been known to fail. Failure is unlikely to be one or two at a time and location would be relatively obvious. However, there is risk that gate cannot be accessed or repaired before significant damage arises. These are already subject to regular inspections and High Criticality would justify this.	High (Major)
Land drainage schemes	Other land drainage schemes (28) are mostly under control of local Management Committees who are quite hands-on in relation to willingness to commit expenditure versus level of protection required. Funding is by targeted rates collected and administered by KDC. Much of stopbank maintenance is undertaken by the landowner concerned. Generally the land protected is farmland only. Risk exposure would be economic losses to crops and stock with presumably limited potential for flooding of isolated low-lying farmhouses, farming equipment/milking sheds and buildings. It is presumed that stock could be moved to higher ground or that extent of flooding (depth and flow rate) would not generate significant stock losses. The schemes generally do not affect State Highways.	Low

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Asset group	Assessment of Criticality	Criticality
	Note that Ruawai stopbanks are part of stopbank section.	
Access to assets	Access to stormwater and land drainage assets can be impacted by localised flooding associated with high intensity rainfall and by wider spread flooding associated with high river levels and/or slow run-off from land drainage schemes. Depending on the circumstances this can conceivably last for several days. Access to particular assets is not considered to be an issue relative to inability to access the area because of road flooding. Impacts are difficult to predict but this is not considered to be a pressing concern for this activity.	Low

5.8 Asset values

5.8.1 Overview

The purpose of valuations is for reporting asset values in Council's financial statements. The Local Government Act 1974 and subsequent amendments contain a general requirement for local authorities to comply with Generally Accepted Accounting Practices (GAAP). The Financial Reporting Act 1993 sets out a process by which GAAP is established for all reporting entities and groups, including all local authorities. Compliance with the New Zealand Equivalent to International Accounting Standard 16; Property, Plant and Equipment (NZ IAS 16) and IAS 36; Impairment of Assets, is one of the current requirements for meeting GAAP.

The most recent Council asset valuation exercise was undertaken in 2016. The valuation process is summarised in the report *Water Supply, Stormwater and Land Drainage Asset Revaluation 30 June 2016*.

Asset valuations, annual depreciation and useful working life assumptions are included in the asset information detailed above.

5.8.2 Depreciation

Depreciation of assets must be charged over their useful life.

- *Depreciated Replacement Cost* is the current replacement cost less allowance for physical deterioration and optimisation for obsolescence and relevant surplus capacity. The *Depreciated Replacement Cost* has been calculated as:

$$\frac{\text{Remaining useful life}}{\text{Total useful life}} \times \text{replacement cost}$$

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- *Depreciation* is a measure of the consumption of the economic benefits embodied in an asset. It distributes the cost or value of an asset over its estimated useful life. Straight-line depreciation is used in this valuation;
- *Total Depreciation to Date* is the total amount of the asset's economic benefits consumed since the asset was constructed or installed;
- The *Annual Depreciation* is the amount the asset depreciates in a year. It is defined as the replacement cost minus the residual value divided by the estimated total useful life for the asset;
- The *Minimum Remaining Useful Life* is applied to assets which are older than their useful life. It recognises that although an asset is older than its useful life it may still be in service and therefore have some value. Where an asset is older than its standard useful life, the minimum remaining useful life is added to the standard useful life and used in the calculation of the depreciated replacement value.

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6 Lifecycle strategy and management

6.1 Introduction

This section identifies Council's strategy and programme for managing, maintaining and renewing assets within the northern area land drainage district. The programmes described within this section have been developed to achieve the LOS identified in section 3 of this AMP.

This section presents the Lifecycle Management Plan for land drainage assets and includes:

- Operations and maintenance strategies;
- Renewal and development strategies; and
- Work programmes and associated financial forecasts.

6.2 Design parameters

Design parameters for all new land drainage assets are not well-defined. Documentation on the history of land drainage in the NALD schemes identifies design capacities for drains and canals, however does not specify standards of construction for any assets.

As a result, the installation of new culverts has varied, with undersized and oversized culverts being installed.

KDC needs to review what knowledge it has regarding design standards and document a definitive standard for the design and construction of land drainage assets and communicate this to the respective drainage schemes for review and consultation.

Future standards could either be included in Council's existing engineering design standards or separately in a specific land drainage standard for design and construction.

6.3 Work categories

The lifecycle management strategies are divided into the following five work categories:

6.3.1 Asset operations

The active process of utilising an asset which will consume resources such as manpower, energy, chemicals and materials.

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6.3.2 Asset maintenance

The ongoing day-to-day work activity required to keep assets serviceable and prevent premature deterioration or failure. Two categories of maintenance are carried out:

- **Unplanned Maintenance:** Work carried out in response to reported problems or defects (e.g. repair burst water main).
- **Preventative maintenance:** Work additional to schedules inspections and maintenance identified during inspections as essential to continued operation.
- **Planned Maintenance:** Work carried out to a predetermined schedule (e.g. pump station inspection, mains scouring) or programmed as a result of identified needs.

6.3.3 Asset renewal

Major work that restores an asset to its original capacity or the required condition. This includes both planned and reactive renewals.

6.3.4 Asset development

Covers tactics for the creation of new assets or works which upgrade or improve an existing asset beyond its existing capacity or performance in response to changes in supply needs or customer expectations.

6.3.5 Asset disposal

Disposal is any of the activities associated with the disposal of a decommissioned asset. Assets may become surplus to requirements for any of the following reasons:

- Under-utilisation;
- Obsolescence;
- Provision exceeds required LOS;
- Uneconomic to upgrade or operate;
- Policy change;
- Service provided by other means (e.g. private sector involvement); and
- Potential risk of ownership (financial, environmental, legal, social, vandalism).

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Currently the budget for the drainage schemes only identifies all asset renewal expenditure as part of the operational cost structure but separately identified as WIP (Work In Progress). This is split out in the following discussions.

The NALD schemes are unique within KDC as they are rated as per an agreement with the local stakeholders and capital investment is planned as and when required. If the funds to complete the work are not available at the time the landowners can agree to fund the works. With agreement by both parties this is sometimes loan funded through KDC and the repayments are then paid back by the landowners through a set rate.

6.4 General standards and specifications used

6.4.1 (a) Operations, maintenance, renewals and development standards

Council contractors are required to comply with the following standards and legislation when maintaining, operating, renewing and developing the water supply network:

- Local Government Act 2002;
- This AMP;
- Resource consents and Resource Management Act 1991;
- Processes and procedures not defined in this document;
- Health and Safety in Employment Act 1992;
- Building Act 1991;
- Pesticides Act 1979 and regulations 1983;
- Poisons Act 1969 and Regulations;
- Health Act 1993;
- Approved safety plan; and
- Good engineering practice.

6.4.2 (b) Disposal standards

In all cases asset disposal processes must comply with Council's legal obligations under the Local Government Act 2002, which covers:

- Public notification procedures required prior to sale;
- Restrictions on the minimum value recovered; and
- Use of revenue received from asset disposal.

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6.5 Lifecycle management strategies – operations and maintenance

6.5.1 Land Drainage Maintenance Plan

The following table shows Council maintenance strategies to ensure that the defined LOS are provided. The table shows the key service criteria affected and mode and impact of failure if the action is not carried out.

Table 6-1: Maintenance activities

Asset / failure mode	Action	Key service criteria	Impact
General maintenance			
All Assets –	Maintain assets in a manner that minimises the long term overall total cost while ensuring efficient day-to-day management.	Cost/Affordability	Low/Medium – increased costs and risk of failure.
Unplanned maintenance			
All Assets – Disaster i.e. cyclone and/or major flooding, stopbank collapse, floodgate collapse.	Maintain a suitable level of preparedness for prompt and effective response to flooding, stopbank or floodgate collapse or pump failure by ensuring the availability of suitably trained and equipped staff and service delivery contractors. Specifically: local engineers and property owners.	Flood Prevention	Medium – flooding of private property.
Planned inspections			
All Assets –	Undertake scheduled inspections as justified by the consequences of failure on LOS, costs or safety.	All	Low – Slow to react to minor flooding caused by premature asset failure.
Planned – preventative maintenance			
As with planned inspections.	Undertake programme of planned asset maintenance to minimise the risk of critical asset failure (e.g. pump overhaul) or where justified economically (e.g. race track re-levelling).	All	As with planned inspections.

Council-approved contractors are utilised for all functions of land drainage maintenance. These contractors are usually approved by the affected stakeholders. The activities include, but are not limited to: weed spraying and machine cleaning of drains. A certified engineering company provides maintenance services for the floodgates and a suitable contractor undertakes drain and channel maintenance for KDC.

Planned maintenance work includes an inspection of all structures and stopbanks. This is usually carried out by the stakeholders who forward any issues through to the KDC representative who will then meet them onsite and assessed the issue. A remediation methodology is agreed on by the parties and this is then put into a forward works plan.

A major issue associated with the maintenance of floodgates is the impact of the current NRC's Water and Soils Plan (NRC Regional Policy 2017 is currently in draft format) on the ability to perform maintenance activities on certain floodgate outlets within marine zone 1 without the need for resource consent. This will impact on the administrative cost of maintaining the network especially if consents are required for individual floodgates (as opposed to a blanket consent).

A number of drains have experienced slumping of the banks which result in the gradual widening of the drains, the loss of pasture and occasionally the loss of a fence line. This has resulted in the widening of the larger drains over time and is of ongoing concern to landowners. Options to halt this process include the timber lining of drains (full depth or partial depth), however the impact on lifecycle costs have not yet been assessed.

When flooding occurs a number of ponding areas develop, the size of which are dependent upon the rainfall intensity and duration. To date Council has not formally recognised these areas. The mapping of these flood areas should be undertaken in the near future.

The current maintenance and inspection strategies are highlighted in the following tables.

The nature and frequency of the work is consistent with the maintenance strategies above and the age, condition, performance and criticality profiles of the assets.

Table 6-2: Planned inspections

Planned inspections	Frequency
Drains	
Summer spraying	Monthly – October to May
Machine weed racking	Monthly
Winter inspections	Weekly
Floodgates	
Inspect and clear gravel, silt and vegetation accumulation	Weekly

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Planned inspections	Frequency
Grates	
Grate cleaning and removal of debris	Monthly
Stopbanks	
Inspect for erosion/slumping and seepage	Monthly in summer Fortnightly in winter

Maintenance work on the various schemes varies in accordance with local experience and the wishes of the local stakeholders. Some schemes have a regular programme and associated budget. Other schemes have an ongoing maintenance programme supplemented by periodic more significant works. The following table illustrates the differences and the impact this has on the maintenance budgets.

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Table 6-3: Baseline and periodic cleaning

Annual and Periodic Expenditure on Repairs and Maintenance (Main Operating Budget)		Base Annual	Periodic	Period (Yrs)
2432048 - R&M Grounds Drains:LD Aoroa	*Usual cleaning $1,400/annum large clean $1,600 every 6 years*	*$ 1,400*	*$ 1,600*	*6*
1562048 - R&M Grounds Drains:LD Arapo 1	Usual maintenance is $1066 to allow for OD repayments, machine clean in year 6 when OD paid off and reserves gathered again.	$ 1,066		
2232048 - R&M Grounds Drains:LD Arapo 2	*Usual cleaning $1,500/annum large clean $4,500 every 4 years*	*$ 1,500*	*$ 4,500*	*4*
2162048 - R&M Grounds Drains:LD Arata S	*Usual cleaning $12,000/annum large clean $20,000 every 5 years*	*$ 12,000*	*$ 20,000*	*5*
1682048 - R&M Grounds Drains:LD Aratapu	Usual maintenance is roughly $1500/annum, building reserves to enable the replacement of the floodgates	$ 1,500		
1872048 - R&M Grounds Drains:LD Awakino		$ 25,000		
2122048 - R&M Grounds Drains:LD Awaki P	$6200, every first year for machine cleaning, $3,000 every second year for drain spraying, building reserves for eventual replacement of floodgate 15.	Alternating $6,200 and $3,000		
1092048 - R&M Grounds Drains:LD Distr		$ 7,462		
2012048 - R&M Grounds Drains:LD Greenhi	$1,199 each year for drain spraying within the district and allowance for $3,700 for a machine clean once every 5 years.	$ 1,999		
1282048 - R&M Grounds Drains:LD Hoang 1	*Usual cleaning $10,661/annum large clean $16,000 every 3 years*	$ 10,661	$ 16,000	3
1242048 - R&M Grounds Drains:LD Horehor	*Usual cleaning $14,000/annum large clean $20,000 every 3 years*	*$ 14,000*	*$ 20,000*	*3*
1912048 - R&M Grounds Drains:LD Kaihu R		$ 5,748		
1952048 - R&M Grounds Drains:LD Kaihu V		$ 20,255		
2582048 - R&M Grounds Drains:LD Kopuru		$ 1,000		
1332048 - R&M Grounds Drains:LD Koremoa	*Usual cleaning $1,000/annum large clean $4,200 every 5 years*	*$ 1,000*	*$ 4,200*	*5*

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Annual and Periodic Expenditure on Repairs and Maintenance (Main Operating Budget)		Base Annual	Periodic	Period (Yrs)
1082048 - R&M Grounds Drains:LD Manganu		$ 7,255		
1702048 - R&M Grounds Drains:LD Mangata		$ 10,661		
1372048 - R&M Grounds Drains:LD Mititai	*Usual cleaning $2,665/annum large clean $6,000 every 5 years*	*$ 2,665*	*$ 6,000*	*5*
1892048 - R&M Grounds Drains:LD Notorio	Usual cleaning $8,500/annum large clean $16,500 every 6 years	$ 8,528	$ 16,500	6
1442048 - R&M Grounds Drains:LD Oruarik		$ 12,000		
1492048 - R&M Grounds Drains:LD Otiria		$ 2,600		
2172048 - R&M Grounds Drains:LD Owairan	*Usual cleaning $1,500/annum large clean $4,000 every 5 years*	*$ 1,500*	*$ 4,000*	*5*
2102048 - R&M Grounds Drains:LD Tangaih	This drainage district is currently closed, Resource Consent fees being paid until current funds are exhausted	$ -		
1182048 - R&M Grounds Drains:LD Tangw 1	*Usual cleaning $2,700/annum large clean $7,000 every 5 years*	*$ 2,700*	*$ 7,000*	*5*
1672048 - R&M Grounds Drains:LD Tangw 2	*Usual cleaning $2,500/annum large clean $5,000 every 5 years*	*$ 2,500*	*$ 5,000*	*5*
1932048 - R&M Grounds Drains:LD Tangw V	*Usual cleaning initially is zero but then increasing to $3,000/annum*	*$ -*	*$ 3,000*	
2182048 - R&M Grounds Drains:LD Tatar 1	*Usual cleaning $2,132/annum large clean $6,500 every 5 years*	*$ 2,132*	*$ 6,500*	*5*
1212048 - R&M Grounds Drains:LD Tatar 2	*Usual cleaning $2,132/annum large clean $6,500 every 5 years*	*$ 1,066*	*$ 6,500*	*10*
2612048 - R&M Grounds Drains:LD Tatar 3	*Usual cleaning $3,500/annum large clean $9,500 every 10 years*	*$ 3,500*	*$ 9,500*	*10*
1292048 - R&M Grounds Drains:LD Tikinui	*Usual cleaning $800/annum large clean $1,300 every 5 years*	*$ 800*	*$ 1,300*	*5*
1692048 - R&M Grounds Drains:LD Waimama	Drainage district no longer exists	$ -		
1822048 - R&M Grounds Drains:LD Whakaha	Drain cleaning in Feb, large machine clean every 5 years.	$ 1,400	$ 3,400	5

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6.5.2 Land Drainage Operation Plan

The general operational plan is to maintain the current capacity of the drainage network through regular inspection of the network and minimisation of interference in hydraulic capacity (weed clearing, spraying etcetera).

The following table shows the operational strategies carried out to ensure that the defined LOS are met and the key service criteria that are affected if the action is not carried out.

Table 6-4: Operating activities

Asset/failure mode	action	Key service criteria	Impact
Drains and Channels			
Drains	Weeds will be controlled to minimise loss of hydraulic capacity. Frequent inspections to ensure hydraulic capacity is maintained.	System Capacity and Efficiency	Med/High – flooding
Unable to reach assets to maintain.	Access roads to the floodgates, stopbanks, drains and culverts will be maintained to provide a level of vehicular access appropriate to each area.	Responsiveness	Low – delay in completing maintenance activity
Floodgates			
Debris build-up keeps gate open/shut against water flow	Floodgates regularly inspected and cleared if necessary to ensure correct operation.	System Capacity and Efficiency	Low – minor flooding in low- lying areas near river
Stopbanks			
Stopbanks – Slumping of banks results in increased risk of overtopping	Stopbanks inspected frequently to ensure bank stability is preserved, and weak or low areas can be identified and adequately addressed.	System Capacity/Reliability	High – overtopping results in stopbank damage and flooding

6.5.3 Land drainage operations and maintenance budgets

The following table illustrates the activity codes utilised for operational budgets and their relative magnitudes. Note that the WIP Increase code is essentially the Capital Works provision and is utilised in the following section on renewals.

The following table lists the budget for each scheme and highlights those that have a WIP Increase budget.

The following graph shows the pattern of operational expenditure over the next 10 years without the WIP Increase item. The variations each year are generated by the periodic maintenance provisions for some of the schemes as discussed above. Otherwise the profile is relatively stable.

Table 6-5: Scheme operational budget by type

	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28
WIP Increase	30,000	30,000	30,000	30,000	30,000	30,000	30,000	112,000	30,000	133,500
Internal Activ Tran	-4,264	-4,264	-4,264	-4,264	-4,264	-4,264	-4,264	-4,264	-4,264	-4,264
Sundry Income	-	-	-	-	-	-	-	-	-	-
Corporate Costs	19,599	19,600	19,600	19,600	19,600	19,600	19,600	19,600	19,600	19,600
Department Costs	21,217	21,217	21,783	21,535	21,217	21,783	21,535	21,535	21,535	21,535
Health and Safety	-	-	-	-	-	-	-	-	-	-
Internal Activ Cost	-	-	-	-	-	-	-	-	-	-
Land Rates KDC	-	-	-	-	-	-	-	-	-	-
R&M Plant Equipment	-	-	-	-	-	-	-	-	-	-
Depreciat Amortisation	29,196	29,196	29,196	29,196	29,196	29,196	29,196	29,196	29,196	29,196
R&M Grounds Drains	179,745	175,767	187,435	187,828	201,136	170,428	182,628	192,035	189,800	207,797
Leachate Removal	-	-	-	-	-	-	-	-	-	-
Rates Remissions	-	-	-	-	-	-	-	-	-	-
Write Offs	-	-	-	-	-	-	-	-	-	-
TOTAL INCL WIP	**275,493**	**271,516**	**283,750**	**283,895**	**296,885**	**266,743**	**278,695**	**370,102**	**285,867**	**407,364**
TOTAL EXCL WIP	**245,493**	**241,516**	**253,750**	**253,895**	**266,885**	**236,743**	**248,695**	**258,102**	**255,867**	**273,864**

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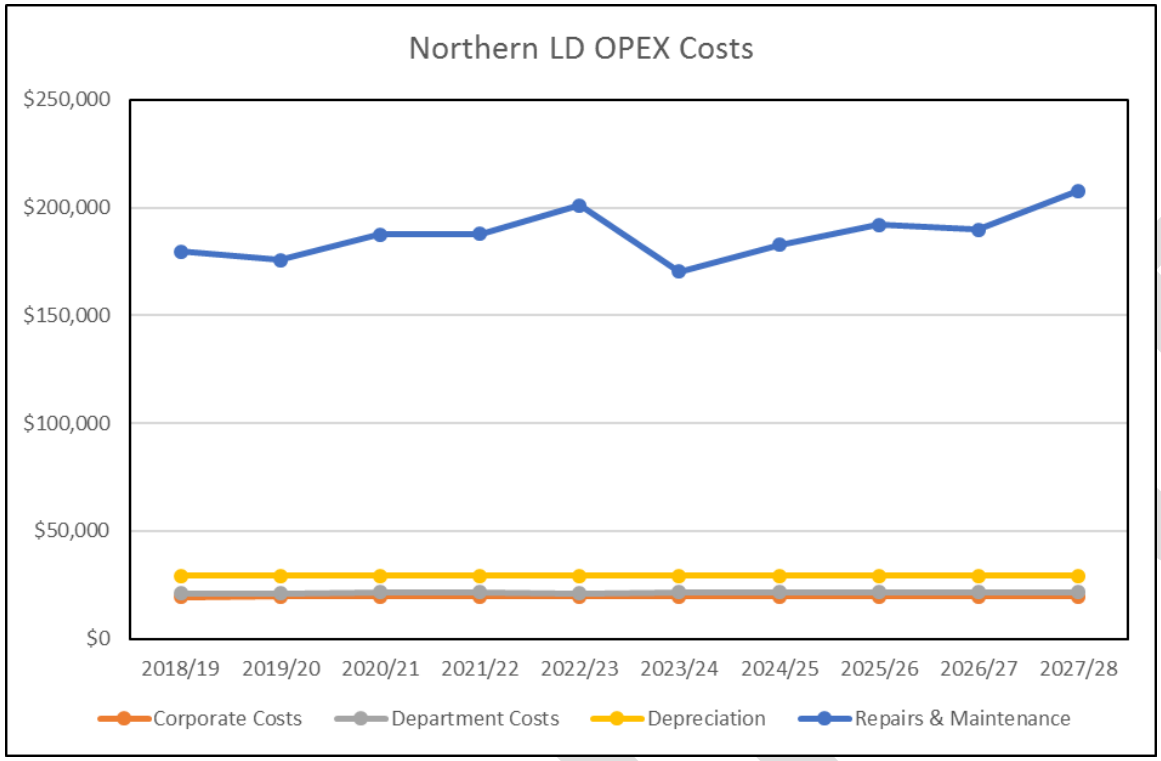
Table 6-6: Operational budget by scheme

	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28
243 - Aoroa Land Drainage Scheme	3,155	3,155	3,155	3,355	3,155	3,155	3,155	3,155	3,155	3,355
156 - Arapohue No 1 Land Drainage Scheme	2,569	2,569	2,569	2,569	2,569	2,569	2,569	2,569	2,569	2,569
223 - Arapohue No 2 Land Drainage Scheme	3,481	3,481	3,481	6,481	3,481	3,481	3,481	6,481	3,481	3,481
216 - Aratapu Swamp Land Drainage Scheme	15,339	15,339	15,339	15,339	23,339	15,339	15,339	15,339	15,339	23,339
168 - Aratapu Village Land Drainage Scheme	3,345	3,345	3,345	3,345	3,345	3,345	3,345	3,345	3,345	3,345
187 - Awakino Valley Land Drainage Scheme	25,903	25,903	25,903	25,903	25,903	25,903	25,903	25,903	25,903	25,903
212 - Awakino Point Land Drainage Scheme	10,199	6,999	10,199	6,999	10,199	6,999	10,199	6,999	10,199	6,999
109 - Land Drainage - District Wide	38,952	38,952	38,952	38,952	38,952	38,952	38,952	38,952	38,952	38,952
Work in Progress = CAPEX	*30,000*	*30,000*	*30,000*	*30,000*	*30,000*	*30,000*	*30,000*	*30,000*	*30,000*	*30,000*
201 - Greenhill Land Drainage Scheme	2,533	2,533	2,533	2,533	5,034	2,533	2,533	2,533	2,533	5,034
128 - Hoanga No 1 Land Drainage Scheme	18,981	24,320	19,547	18,981	24,320	19,547	18,981	24,320	18,981	18,981
124 - Horehore Land Drainage Scheme	27,180	21,180	21,180	27,180	21,180	21,180	27,180	21,180	21,180	130,680
Work in Progress = CAPEX	-	-	-	-	-	-	-	-	-	*103,500*
191 - Kaihu River	5,748	5,748	5,748	5,748	5,748	5,748	5,748	5,748	5,748	5,748
195 - Kaihu Valley Land Drainage Scheme	24,734	24,734	24,734	24,734	24,734	24,734	24,734	24,734	24,734	24,734
258 - Kopuru Swamp Land Drainage Scheme	7,482	7,482	7,482	7,482	7,482	7,482	7,482	7,482	7,482	7,482
133 - Koremoa Land Drainage Scheme	1,806	1,806	1,806	5,006	1,806	1,806	1,806	1,806	5,006	1,806
108 - Manganui River Land Drainage Scheme	8,519	8,519	8,519	8,519	8,519	8,519	8,519	8,519	8,519	8,519
170 - Mangatara Land Drainage Scheme	13,234	13,234	13,234	13,234	13,234	13,234	13,234	13,234	13,234	13,234
137 - Mititai Land Drainage Scheme	4,112	4,112	7,447	4,112	4,112	4,112	4,112	89,447	4,112	4,112
Work in Progress = CAPEX	-	-	-	-	-	-	-	*82,000*	-	-
189 - Notorious Land Drainage Scheme	10,954	10,954	18,926	10,954	10,954	10,954	10,954	10,954	18,926	10,954
144 - Oruariki Land Drainage Scheme	15,123	15,123	15,123	15,123	15,123	15,123	15,123	15,123	15,123	15,123
149 - Otiria Land Drainage Scheme	3,638	3,638	3,638	3,638	3,638	3,638	3,638	3,638	3,638	3,638
217 - Owairangi Land Drainage Scheme	3,287	3,287	5,787	3,287	3,287	3,287	3,287	5,787	3,287	3,287
210 - Tangaihi Land Drainage Scheme	-	-	-	-	-	-	-	-	-	-
118 - Tangowahine No 1 Land Drainage Scheme	4,840	4,840	4,840	4,840	9,140	4,840	4,840	4,840	4,840	9,140
167 - Tangowahine No 2 Land Drainage Scheme	4,036	4,036	4,036	4,036	6,536	4,036	4,036	4,036	4,036	6,536
193 - Tangowahine Valley Land Drainage Scheme	-	-	-	3,318	-	-	3,318	3,318	3,318	3,318
218 - Tatarariki No 1 Land Drainage Scheme	4,000	4,000	4,000	4,000	8,368	4,000	4,000	4,000	4,000	8,368
121 - Tatarariki No 2 Land Drainage Scheme	2,224	2,224	2,224	2,224	2,224	2,224	2,224	6,657	2,224	2,224
261 - Tatarariki No 3 Land Drainage Scheme	4,890	4,890	4,890	4,890	4,890	4,890	4,890	4,890	4,890	10,890
129 - Tikinui Land Drainage Scheme	2,555	2,555	2,555	2,555	3,055	2,555	2,555	2,555	2,555	3,055
169 - Waimamaku Land Drainage Scheme	-	-	-	-	-	-	-	-	-	-
182 - Whakahara Land Drainage Scheme	2,675	2,558	2,558	4,558	2,558	2,558	2,558	2,558	4,558	2,558
TOTAL INCLUDING WIP	***275,493***	***271,516***	***283,750***	***283,895***	***296,885***	***266,743***	***278,695***	***370,102***	***285,867***	***407,364***
TOTAL EXCLUDING WIP = OPEX	**245,493**	**241,516**	**253,750**	**253,895**	**266,885**	**236,743**	**248,695**	**258,102**	**255,867**	**273,864**

Figure 6-1: Operational budget forecast



6.6 Lifecycle Management Strategy – renewals

6.6.1 Land drainage renewal drivers and prioritisation

The general renewal strategy is to rehabilitate or replace floodgate structures, gates or culverts when justified by:

- **Asset Performance:** Renewal of an asset when it fails to meet the required LOS. The monitoring of asset reliability, capacity and efficiency during planned maintenance inspections identifies non-performing assets. Indicators of non-performing assets include:
  - Excessive inflow of river water during high tide;
  - River water is migrating between the floodgate and the stopbank; and
  - The floodgate does not have sufficient capacity to drain floodwaters within two days.

- **Economics:** It is no longer economic to continue repairing the asset (i.e. the annual cost of repairs exceeds the annualised cost of renewal). An economic consideration is the co-ordination of renewal works with other planned works such as road reconstruction.

Planned and reactive replacement works are prioritised in accordance with the following table and then programmed or in urgent cases undertaken immediately. It is important to note that any response to the reduction of LOS is agreed through consultation with the stakeholders and work is planned in accordance to what is agreed at the time. KDC retains the responsibility to the wider community and will utilise the relevant clauses in the Drainage Act 1908 as and where required.

Table 6-7: Renewal prioritisation

Priority	Renewal criteria
1 (High)	Failure has occurred and renewal is the most efficient lifecycle cost alternative. Asset failure of key system component is imminent. Regular maintenance required: **more than three visits annually**. Road upgrading scheduled for the current financial year.
2	Maintenance requiring **more than three visits per two month period** in past 12 months. Difficult to repair, due to fragile nature of material or obsolescence.
3	Pipe or structure maintenance involving two to three visits annually.
4	Existing assets have a low level of flexibility and efficiency of replacement alternative.
5 (Low)	Existing asset materials or types are such that known problems will develop in time.

The renewal strategy will be reviewed at least annually.

If work is deferred for any reason, this work will be re-prioritised against the next year's renewal projects and a revised programme established.

Renewal works identified by way of the above renewal strategies may be deferred if the cost is beyond the district's ability to fund it. This situation may arise if higher priority works are required on other infrastructure assets; short term peaks occur in expenditure or if an inadequate rating base exists.

When renewal works are deferred, the impact of the deferral on economic efficiencies and the scheme's ability to achieve the defined service standards will be informally assessed. Although the deferral of some renewal works may not impact significantly on the short term operation of assets, repeated deferral will create a liability in the longer term.

A register of all deferred works will be maintained.

Note: Stopbanks, drains and canals are not considered for renewal. Their functionality is preserved through regular maintenance.

To date there have been no significant renewals undertaken on land drainage assets. The cost of any renewal work undertaken to date has not been captured as renewal expenditure and as a result it is very difficult to determine historical renewal expenditure.

The installation of new culverts or replacement of old culverts for access to land over drains is a roading network function. However recently there has been a large degree of inconsistency in the sizing of these culverts which may affect both the capacity of the drain and the cost of achieving access. A method for calculating culvert size needs to be developed or culverts sizes should be calculated by Council, and published by Council to eliminate future inconsistencies and potential adverse effects on drain capacity.

6.6.2 Theoretical renewal profile

The process described above for identifying and prioritising capital works renewal tends to focus on needs as they arise and is not readily applied to the longer term planning of renewal requirements. Typically, the types of faults that drive renewals cannot be identified more than a few years ahead at the most.

To obtain some indication of the likely profile of renewal works into the future the default approach is to predict the renewal date from the installation date and the expected lifetime i.e. a floodgate installed in 1970 with an expected 75 year life would be expected to need renewal in 2045. While this approach is highly inaccurate when applied to a specific asset it does have some validity when applied to large groups of assets where the variations that inevitably occur tend to smooth out somewhat.

The lifecycle expectations for land drainage assets are:

Table 6-8: Asset life expectancies

Land drainage asset	expected life
Drains	Indefinite
Channels	Indefinite
Stopbanks	Indefinite
Detention basins	Indefinite
Floodgate structures • concrete • wooden	 80 years 50 years

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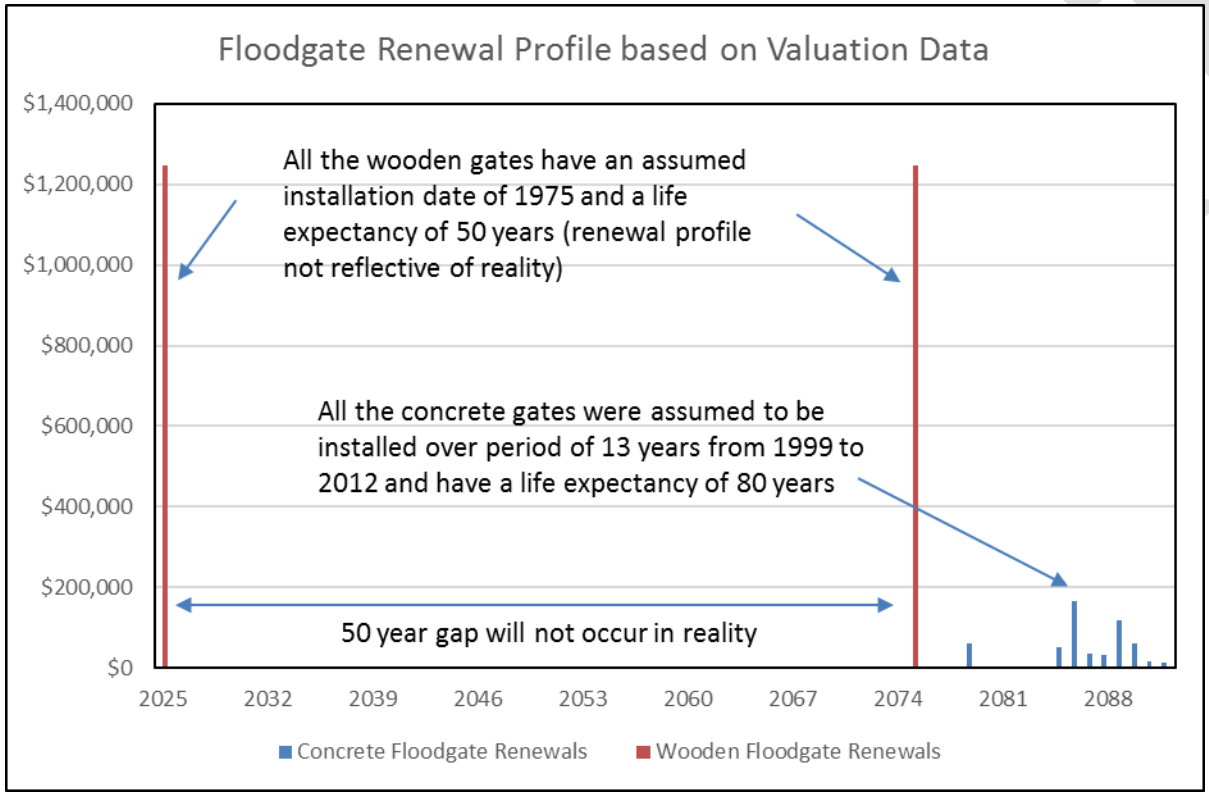
The data that the land drainage asset valuation is based on assumes that:

- All wooden floodgates were installed in 1975 with a life expectancy of 50 years; and
- All concrete floodgates were installed in over a 13 year period between 1999 and 2012 with an 80 year life expectancy.

When this information is combined into a renewal prediction the profile in the following chart is generated. It should be noted that the predicted value of renewal works is based on unit rates used in the valuations. The significant differences between the NALD rates and the Raupo rates for nominally similar assets has already been discussed above.

Figure 6-2: Theoretical floodgate renewal profile



The literal interpretation of this profile is that there is a significant 'bow-wave' of wooden gate renewals occurring in seven years time and then again in another 50 years after that. Renewal of concrete floodgates is not required until after 2080. While technically correct based on the input data this profile is clearly not reflecting reality. Much of this inaccuracy comes from the assumed installation dates and the expected lives.

However, the process still has validity as a financial planning tool but needs to be updated to reflect:

- More accurate information on installation dates (if known);
- Revised life expectancies to reflect observed performance and possibly reflecting localised conditions; and
- Robust condition assessment to confirm alignment between life expectancy and actual condition.

While the data used for valuation purposes has significant issues in relation to its relevance for renewal predictions it is still valid in relation to the overall magnitude of the renewals required (assuming the unit rates can be confirmed) and the depreciation expense that should be charged (assuming the expected life is realistic). The current depreciated value of the assets is of no practical consequence from a renewal planning perspective.

6.6.3 Improving the asset renewal planning

As yet the performance and criticality of the current assets in the NALD schemes are an unknown, as such an accurate renewals programme cannot be constructed for future planning,

This is an AMIP item and must be rectified to enable better knowledge and planning of the land drainage districts, their assets and the renewals of the assets for the protection of the drainage networks and the greater communities.

6.6.4 Currently proposed renewal provisions

The proposed renewal programme for LD assets is illustrated below. It currently comprises an unallocated allowance of $30,000 per annum across all of the NALD schemes with specific provisions for two floodgate renewals in later years.

The actual allocation of this funding is determined on a 'most urgent need' basis as determined by discussion between the affected landowners and Council. This will also be influenced by the willingness of the landowners to fund the works, in whole or in part, rather than wait and the amount of funding deemed to be held as 'reserves' for a particular scheme.

Notwithstanding the issues raised above the annual provision of $30,000 would seem to be of the right magnitude if the overall renewal requirement for the floodgates is considered per the following table.

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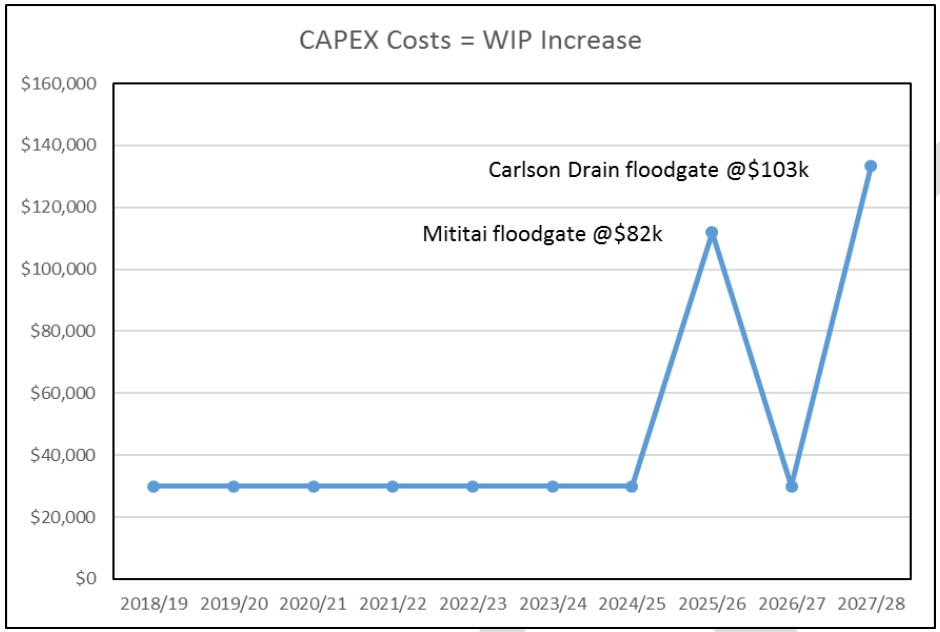
Table 6-9: Weighted average renewal expenditure required

Type	Value	Life	Avge/Yr
Wooden	$1,247,253	50	$24,945
Concrete	$ 550,368	80	$6,880
	$1,797,622		**$31,825**

Figure 6-3: Capital works forecast



6.6.5 Lifecycle Management Strategy - Development

Currently, Council and the drainage committees have no intention of developing the network further.

While it is envisaged that stopbanks may need to be raised at some point in the future, this issue requires investigation and a budget has not been set aside for this to date.

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6.6.6 Lifecycle Management Strategy - Disposal

Due to the nature of this activity, it is unlikely that any drainage assets will need to be considered for disposal. Where the obligations and liabilities for maintaining and renewing the assets are borne by one stakeholder it has occurred that the stakeholder has removed the scheme from the list of KDC managed drainage districts as shown in the table within this document. This is on a case-by-case basis and the effects of this action on the wider community are always taken into consideration.

There are currently no planned land drainage network disposals.

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7 Financial summary

The financial forecasts for the 10 year period are included above as this provides a more comprehensive overview of the particular aspect being discussed.

A comparison between the provision for capital works and scheme depreciation indicates that in most years they are virtually in balance. Where two specific expenditure spikes occur this is above the depreciation provision but would depend on consultation with the relevant stakeholders in relation to whether the works actually proceed, the timing of the works and how they should be funded.

Table 7-1: Capital expenditure vs depreciation

	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28
WIP Increase	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 112,000	$ 30,000	133,500
Depreciation	$ 29,196	$ 29,196	$ 29,196	$ 29,196	$ 29,196	$ 29,196	$ 29,196	$ 29,196	$ 29,196	29,196
Ratio	103%	103%	103%	103%	103%	103%	103%	384%	103%	457%

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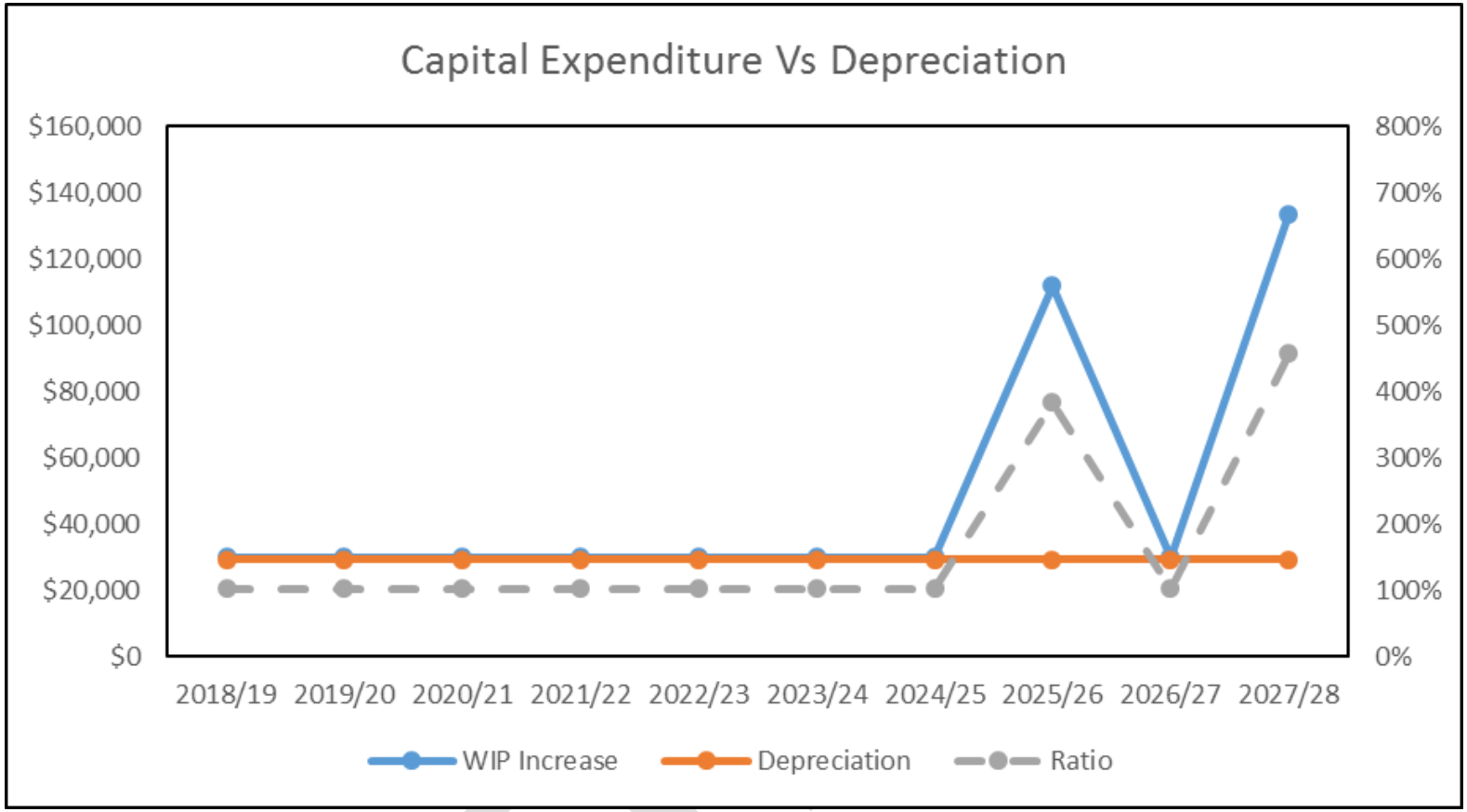
Figure 7-1: Capital expenditure vs depreciation

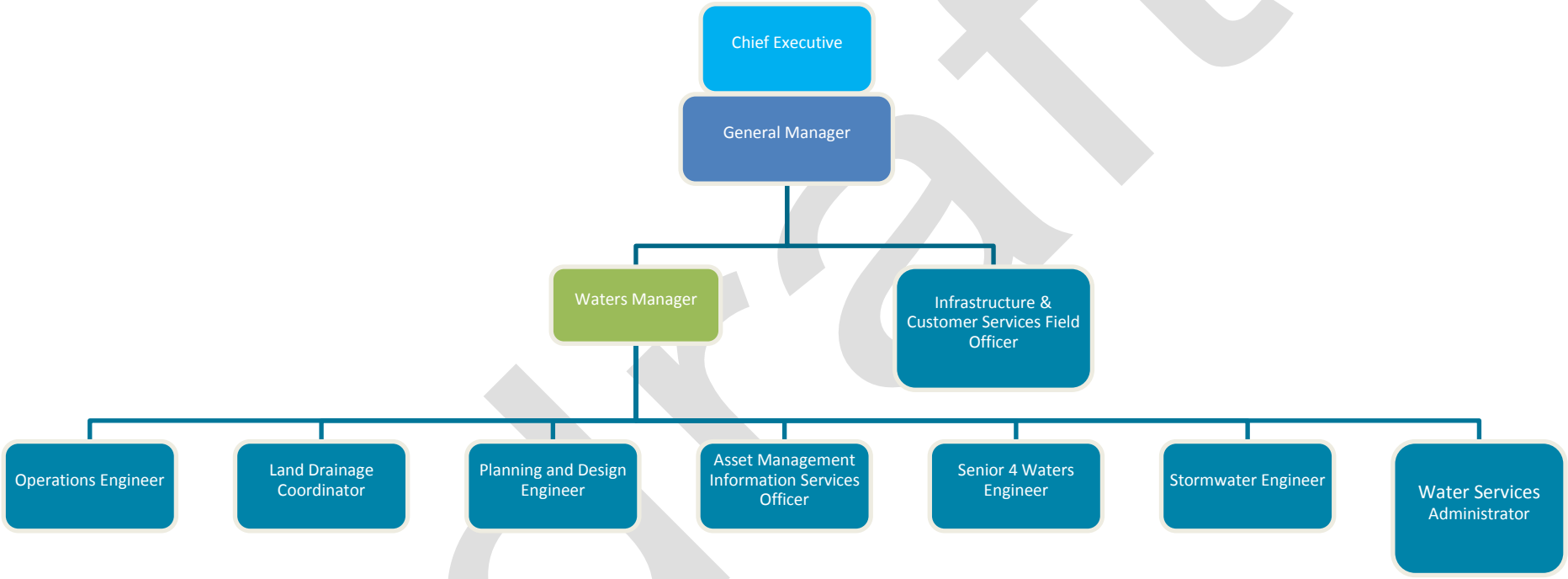


8 Service management

8.1 Organisation

The following figure illustrates Council's organisational structure.

Figure 8-1: Organisational structure



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8.2 Asset management systems and processes

8.2.1 Asset management systems

Effective information systems are essential for AM. Ease of information storage and analysis enables good AM decisions. Council uses the support tools listed in Table 8.1 to manage the stormwater business:

Table 8-1: Management systems

System name	System purpose	Purpose
MapInfo (GIS)	Asset location	The location of assets are stored within tables and represented spatially via a series of points, lines or regions.
AssetFinda	Asset Register	Details on the asset's size, material, date of installation and other related information for water supply, wastewater and stormwater assets are recorded within AssetFinda.
NCS (Napier Computer System)	Accounting	Council accounting and financial systems are based on MAGIQ(NCS) software and GAAP Guidelines.
MAGIQ (Maintenance and General Inquiry)	Customer enquiry and service request tracking	To record customer interactions and track all service requests for follow up investigation and resolution within appropriate timeframes. MAGIQ is the standardised form of record inquiry, record maintenance and reporting used for all NCS applications. Integrates with Intramaps, an inquiry tool in GIS to enable easy viewing of asset information.
Aquavision	Telemetry	The performance of the wastewater pumping stations is monitored via the Aquavision telemetry system.
Advanced Information	Telemetry	The performance of the treatment plants and water supply pumping stations is monitored via the advanced information telemetry system.

8.2.2 IntraMaps

The IntraMaps system is the core system used to house the spatial data related to Council's stormwater, wastewater and water supply assets.

The MapInfo system provides the information supporting the IntraMaps, which is widely used within Council as a user-friendly interface to the GIS asset data, enabling quick access to asset location and asset attribute information.

A screenshot of the IntraMaps system is shown below:

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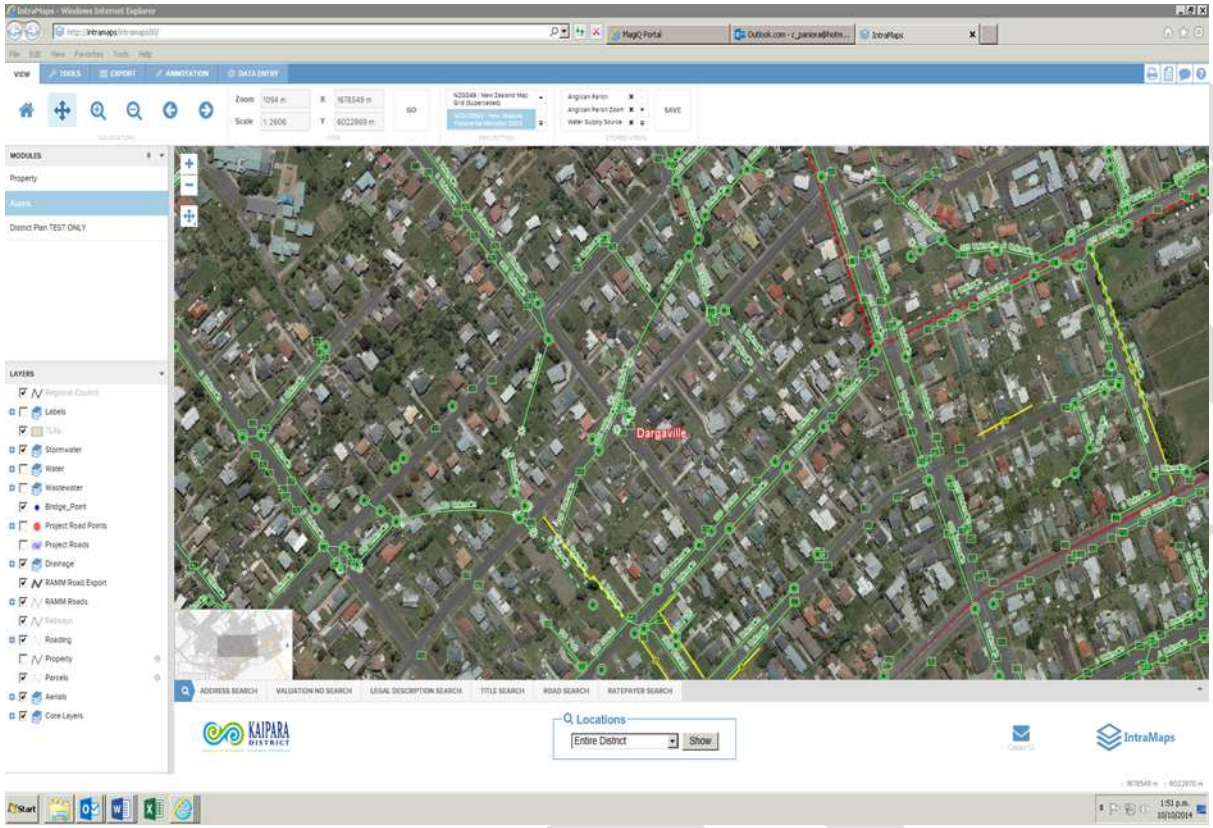
Figure 8-2: IntraMaps Screenshot



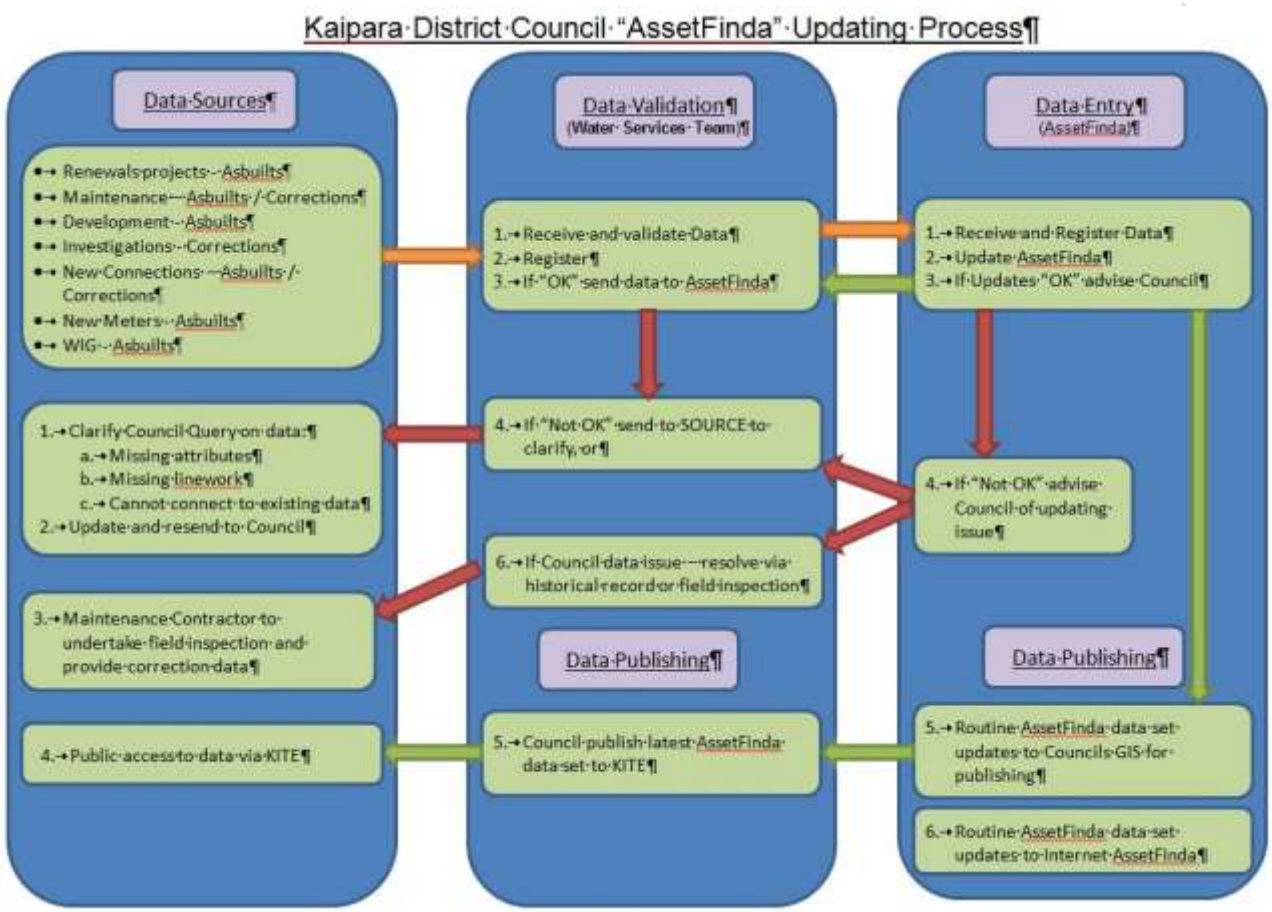
The representation of the assets within this system is believed to be reasonably comprehensive, although gaps and inaccuracies in the data are known to exist. A data improvement task has been identified and included in the AMIP to fix the known anomalies.

Ongoing data improvement and identification and resolution of data anomalies will be resolved primarily through the maintenance contract and projects, as works are completed on the network.

The IntraMaps system is externally hosted and is updated as as-built information is received, and passed on via the data maintenance process. As-built data is sourced from new development, capital works projects and from the Maintenance Contractor.

The data maintenance process is represented below.

Figure 8-3: Data maintenance process



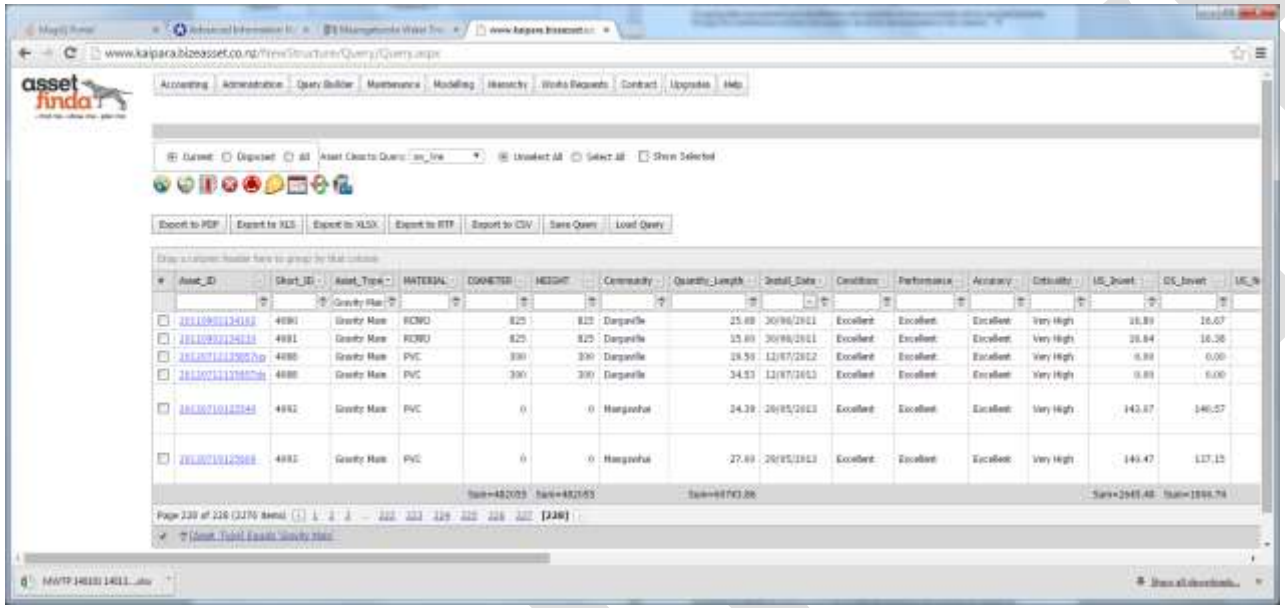
8.2.3 AssetFinda

The AssetFinda system is a MapInfo based tool used to record asset related information. This currently includes basic asset descriptors including; asset name, size, material, install date, invert levels, condition, and performance. The completeness of the data within these fields is highly variable and the accuracy cannot be currently qualified.

The system was recently upgraded from a table-based system to web-enabled. The system is externally hosted and maintained.

A screenshot of the AssetFinda system is included in Figure 8-4:

Figure 8-4: AssetFinda screenshot



The system has the ability to:

- Undertake asset valuations and depreciation calculations for the stormwater, wastewater and water supply assets, however, this functionality has yet to be implemented on Council's data; and
- Record various maintenance activities against the asset; however this capability has yet to be fully defined and implemented.

There is a need for this system to be further enabled and the supporting processes implemented to ensure appropriate maintenance activity data and condition and performance data collected from the field, can be uploaded in the system and used for monitoring the decline in asset serviceability and determination of timing for asset renewal.

An AMIP item has been identified to enable the AssetFinda system to be modified for the recording of this information.

8.3 Health and safety

Council has a Health and Safety (2007) policy aimed at providing and maintaining a safe and healthy working environment to Council employees, contractors and members of the public. With respect to asset management activities it is particularly important to protect staff, contractors and the public from hazards associated with stormwater assets.

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9 Risk management

9.1 Overview

Council's Risk Management Policy and Framework has been updated and the latest version is dated December 2012.

Risk management is undertaken to identify specific business risks associated with the ownership and management of land drainage and stormwater assets and to determine the direct and indirect costs associated with these risks.

Council is familiar with the risks associated with each stormwater scheme, however it has not previously formalised a Risk Management Strategy. The Risk Management Strategy should hold a pivotal role in the prioritisation of asset funding.

A Council-wide approach to risk management would be valuable to allow comparison of risk across different asset types. This would allow risks that impact on the stormwater network to be compared against those impacting Water Supply, and Roads and Footpaths assets for example. It would then be possible to balance all of Council's risks in a way that optimises expenditure and minimises Council's total risk exposure.

Council uses risk registers and action plans to monitor and control specific key risks.

9.2 Risk Management Policy

The land drainage schemes are exposed to a range of hazards that affect its ability to deliver services to its community in an economically, socially and environmentally sustainable manner. These hazards can originate from external events (e.g. earthquakes), from the water (e.g. high rainfall event combined with spring tide) or from the infrastructure itself (e.g. asset deterioration leading to failure).

A risk analysis of the drainage network must consider not only the impact of hazards affecting individual assets but the combined consequences of widespread failure in a major hazard event, and in particular a large flood.

In today's environment it is important that Council and the local stakeholders undertake all that could be reasonably expected to reduce the impact of a major hazard event on the community.

The risk posed by these hazards is a product of their consequences for service delivery and the frequency of occurrence. This section shows how Council intends to manage the variety of risk associated with hazards at all levels of its water management, in an approach consistent with that to be employed by the rest of the Council organisation.

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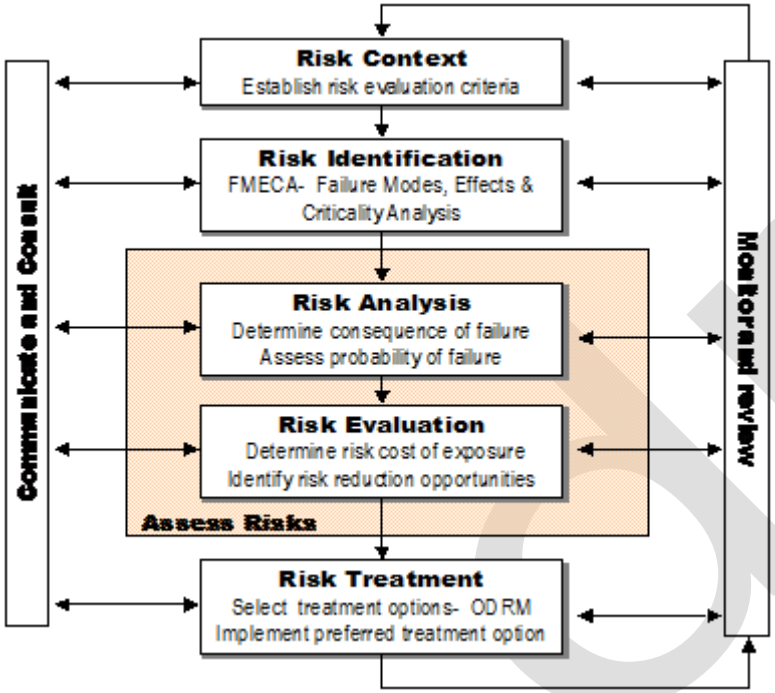
This is accomplished by:

- Identifying all hazards;
- Identification, analysis, evaluation and treatment of the risks and consequences associated with such hazards where:
  - appropriate action is identified to manage the risks and consequences;
  - priority is assigned to the highest risks to be addressed in the short to medium term; and
  - responsibility is allocated to specific staff for managing risks.

This is conducted in accordance with the process outlined in AS/NZS 4360:2004 and illustrated below.

Figure 9-1: Risk management process



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The scope of this section includes the completion of Step 1 (establishing the context for risk management in Kaipara district) and Step 2 where the land drainage network has been reviewed for potential hazards. Step 3 analyses identified risks, their potential impacts and current controls. Risks are evaluated and treatments scheduled within forward Capital and Operational programmes (Steps 4 and 5). The outcome is presented in the Risk Register that is appended to this document. A useful summary table of the highest priority risks to be addressed in the short to medium term concludes this section.

9.3 Risk identification

9.3.1 Event hazards

As part of the process for raising their awareness of risks associated with the asset in their care, Council will be sourcing and collecting up to date records of the latest information on event-based hazards in the Northland area, and will review the likely implications for risks to its infrastructure assets. In particular, information may be obtained from NRC who should have a comprehensive record of hazards and flood events in this area.

Earthquake

Although no specific studies on earthquake hazards have been undertaken for the Kaipara district, similar studies for other districts of similar geology and geography provide an insight into the effects that can be expected from an earthquake. There is likely to be significant and widespread damage to both stopbanks and floodgates in a major earthquake.

In the drainage network, possible damage includes:

- Bore casings damaged by ground displacement;
- Pump buildings are at risk of collapse;
- Joint failure in pipes, especially in liquefaction-prone sands;
- Displacement of floodgates interrupts the nature flow of water; and
- Damage to dams/weirs resulting in a sudden release of water.

King tides during heavy rainfall events

The occurrence of a heavy rainfall event at a time of king tides may result in continued and repetitive overtopping of the stopbanks and inundation of private property with saltwater.

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9.3.2 Product hazards

Product hazards could include the inability to obtain resource consent to maintain outfalls in the coastal marine area.

9.3.3 Infrastructure hazards

Infrastructure hazards are defined as the hazards to public health, Council finances, service delivery, the environment, other assets in the vicinity etcetera that arise from failure of key infrastructure such as pumps, pipes and other components of the water supply networks. Once the critical assets are identified, the risks are analysed and mitigation methods are designed and fed through to the operational, maintenance or capital works programmes.

To date there has been no formal identification and analysis of infrastructure hazards. In particular, therefore little is known of the nature and extent of environmental damage risk.

This AMP acts to formalise hazard identification for these assets and identifies an action plan that once implemented will ensure that risk assessment is fully ingrained into the business.

9.4 Risk analysis and evaluation

9.4.1 Key analysis criteria

The key risk management criteria for Kaipara District Council management are:

- impacts on public health and safety;
- environmental risks;
- legal and regulatory compliance;
- financial Impact: direct costs (repair, lost revenue, third party damage, legal costs);
- image, reputation and public support; and
- Service delivery impact on customers and community.

The matrix used to assess the consequences of failure is shown in Table 9.2. Careful consideration has been given to the weightings of consequences and the resulting risk rating. The table infers, for example, that a direct repair cost of $1,000 - $3,000 is equivalent to receiving negative local media coverage. A risk of this level, if it had a probability of occurring once a year, would be identified as being a ‘high’ risk requiring a review of the risk controls and some improvement in those controls to reduce risk to ‘moderate’.

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Risk exposure for each key service objective and each risk event is calculated as:

RISK EXPOSURE	=	PROBABILITY OF OCCURRENCE	x	IMPACT OF OCCURRENCE

The probability of occurrence used to determine the risk rating is defined as:

Table 9-1: Likelihood of failure

	Likelihood	Current probability
A	Rare	Could occur only in exceptional circumstances (unlikely next 50 years)
B	Unlikely	Could occur at some time in the next 50 years
C	Possible	Could occur at some time in the next 10 years
D	Likely	Could occur once a year
E	Almost certain	Is expected to occur several times a year
F	Certain	Occurs on a daily basis

Table 9-2: Consequence of failure

IMPACT (RISK)					
CONSEQUENCE	1	2	3	4	5
Description	Insignificant	Minor	Major	Severe	Catastrophic
Corporate Image	Event only of interest to individuals (<$1,000). Nil effect or community concern.	Minor community interest ($1,000-$3,000) Local media report.	Public community discussion ($3,000-$25,000) Broad adverse media coverage.	Loss of community confidence in Council ($25,000-$0.1M) National publicity. Public agitation for action.	Public investigation (>$0.1M) International coverage. Management changes demanded.
Environmental	Negligible impact (<$1,000) Reversible within 1 week.	Material damage of local importance. ($1,000-3,000) Prosecution possible. Impact fully reversible within 3 months.	Serious damage of local importance ($3,000-$15,000) Prosecution probable. Impact fully reversible within 1 year.	Serious damage of national importance ($0.15M-$0.3M) Prosecution expected. Impact reversible within 10 years.	Serious damage of national importance (>$0.3M) Prosecution. Long term study. Impact not fully reversible.

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IMPACT (RISK)					
CONSEQUENCE	**1**	**2**	**3**	**4**	**5**
Description	**Insignificant**	**Minor**	**Major**	**Severe**	**Catastrophic**
Safety and Health	Negligible injury (<$500)	Minor injury ($500-$2,500) Medical attention required.	Serious Injury ($2,500-$0.1M) Hospitalisation required.	Loss of life ($0.1M-$0.25M).	Multiple loss of life or district-wide epidemic (>$0.25M).
Third Party Property Damage and Losses	Minimal liability for consequential loss (<$500).	Liability for consequential loss ($500-$5,000).	Liability for consequential loss ($5,000-50,000).	Liability for consequential loss ($50,000-$200,000).	Liability for consequential loss (>$200,000).
Loss of Service - Extent/ duration	Small number of customers experiencing minor service disruption (<$500).	Significant service disruption affecting small number of customers ($500-$2,000).	Significant localised disruption over extended period ($2,000-$20,000).	Major localised disruption over extended period ($20,000-$100,000).	Major long term district wide service disruption (>$100,000).
Kaipara Business Costs (Total recovery)	Total direct revenue loss and cost to restore service (<$500).	Total direct revenue loss and cost to restore service ($500-$5,000).	Total direct revenue loss and cost to restore service ($5,000-$50,000).	Total direct revenue loss and cost to restore service ($50,000-$100,000).	Total direct revenue loss and cost to restore service (>$100,000).

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9.4.2 Risk evaluation

The matrix of likelihood and consequence of failure ratings shown in Table 9.3 is used to assess the level of risk, ranking events as low, moderate, significant or high risk.

Table 9-3: Risk matrix

Likelihood	Consequences				
	1	2	3	4	5
A	L	L	L	M	H
B	L	L	M	H	E
C	L	M	H	E	E
D	M	M	H	E	E
E	M	H	E	E	E
F	H	E	E	E	E

This allows all asset and corporate risks to be compared and ranked. The risk policy specifies the following broad treatment strategy for the levels of risk:

L = Low Risk: Manage by routine procedures.

M = Moderate Risk: Management responsibility must be specified.

H = High Risk: Risk and management strategy identified in AMP. Failure management plans available.

E = Extreme Risk: Risk and management strategy identified in AMP. Failure management plan specifically addressing event in place.

9.4.3 Communication, monitoring, review and reporting

KDC is in the process of establishing a risk register in the following structure to communicate report and monitor the implementation of the Risk Management Policy.

- Key Elements. Each key activity that Council carries out to provide a service;
- Description of the risk:
  - What can happen? The things that can go wrong if each of the activities is not carried out properly;
  - How can it happen? The specific actions might cause that risk event to occur; and

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- Consequences. A description of the potential impacts arising from that risk event e.g. costs to Council, damage to public image, public health effects; and

- Current Practices (Controls). The practices that are currently carried out to manage those risks;
- Future Appropriate Practice. The practices that should ideally be carried out to manage risks to an acceptable level;
- Improvement Actions. The improvements required to close the gap between current and appropriate practice;
- Responsibility. Nominated person responsible for ensuring the risks are managed and improvements carried out in accordance with the programme; and
- Audit trail. Date of entries and revisions, target date for actions to be taken, and actual tasks completion dates.

9.5 Application to land drainage

The following table identifies Council's high and extreme risks that are relevant to land drainage, together with potential impact, current controls and an action plan to mitigate, minimise or manage the risk.

Table 9-4: Summary of extreme/high risk for Council

LOS Failure Indicator	Asset group	Asset sub-group	Caused by	Risk Severity	Controls	
					Existing	To develop
Flooding, slips, accidents and injuries	Open Drain Network	Public open drains	Liability from third party accident in open drains.	H	The piping of open drains is considered on a case-by-case basis.	
Unavailability of urban roads, flooding	Piped Network	Inlets and outlets	Vandalism.	H	Routine and reactive inspections.	
	Flood Alleviation Infrastructure	Stopbanks	Extensive damage (earthquake or other natural hazard).	H	Response planning.	
		Flood detention systems	Extensive damage (earthquake or other natural hazard).	H	Response planning.	

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LOS Failure Indicator	Asset group	Asset sub-group	Caused by	Risk Severity	Controls	
					Existing	To develop
	Managerial and governance risks	Corporate risk	Inadequate Corporate Risk Policy.	H	Council Corporate Risk Policy developed 2012.	
Inefficient management of assets, significant asset or service failure occurs with no management plan	Asset design and construction risks	Asset records	Asset records not up to date.	H	Asset records from physical works projects and maintenance activities are updated into AssetFinda.	To include all asset changes in asset register.

9.6 Risk treatment

Options for risk treatment are yet to be considered. Risk reduction treatments available include:

- Reduce probability of failure by capital works (renew, provide redundancy, upgrade), maintenance expenditure, operational documentation, training etcetera;
- Reduce the impact of a failure by actions such as preparing emergency response plans;
- Accept some risk and carry the consequential costs;
- Change the LOS;
- Insure against the consequential costs; and
- A combination of the above.

Table 9.5 identifies all high and medium risks associated with land drainage, together with potential impact, current controls and an action plan to mitigate, minimise or manage the risk.

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Table 9-5: Specific risk responses

Asset group	Risk	Potential impact	Risk exposure	Controls/Action Plan
Infrastructure				
Stopbanks	Sea level risk as a result of global warming.	Sea level rise causes stopbanks to be overtopped in spring tides and/or when river in flood.	High	Programme needs to be implemented to investigate stopbank heights and start raising stopbank levels.
Floodgates, drains and canals	Sea level risk as a result of global warming.	Sea level rise results in floodgates, drains and canals behind below low tide mark and therefore unable to drain.	High	Land Drainage Co-ordinator to investigate difference in level between floodgate and low tide and available fall to determine whether sea level rise is a threat.
Regulation changes	Change in regulations inhibit the ability to manage and control undesirable vegetation.	Build-up of vegetation in outlets/drains/canals resulting in loss of hydraulics and inability to efficiently drain the network.	High	Resource consent obtained that allows for the clearing of nuisance vegetation in coastal marine area.
Stopbanks - spall material	Cheap spall material not available results in significant increase in maintenance costs.	Increase in rates to ensure current level of service maintained in relation to stopbank protection.	Medium	Alternatives for spall materials are frequently re-assessed
Drains - local spraying contractors	Loss of local spraying contractors results in significant increase in maintenance costs.	Increase in rates to ensure current LOS maintained in relation to spraying and network capacity.	Medium	Contracts for other districts are grouped to increase workload to contractor. Alternative contractors are available.
Floodgates - local engineer	Loss of local engineer to repair/replace floodgates.	Increased costs to maintain/replace floodgates.	Medium	
Events				
Earthquake	Earthquake causes widespread soil displacement	Damage to stopbanks results in prolonged flood damage to low-lying	Medium	Develop emergency response plan

Asset group	Risk	Potential impact	Risk exposure	Controls/Action Plan
	and lateral movement.	areas.		
Cyclone/Spring Tide	Cyclone at time of spring tides causes overtopping of stopbanks and network capacity exceeded.	Extensive and prolonged flooding in drainage district.	Medium	
Flooding	Excessive flooding on land side of stopbanks unable to be drained in two tides.	Prolonged inundation of private property by floodwaters (possibly saltwater) resulting in extensive damage to pastures/crops.	Medium	Access available to other pumps, portable pumps available and action plans agreed with local stakeholders.
Floodgate Failure	Failure of one or more floodgates over prolonged period allowing entry of seawater.	Canals fill up with incoming tide.	Medium	Drain floodgates are shut to prevent saltwater entering drainage network.
Product				
Biological Resistance	Weeds in drainage network become resistant to Roundup.	Drain cleaning methods need to be changed to more expensive methods to maintain hydraulics.	Medium	
		Drains no longer able to be kept weed-free and capacity of network is adversely affected.	Medium	

9.7 Health and Safety:

Council has a Health and Safety (2016) Policy aimed at providing and maintaining a safe and healthy working environment to Council employees, contractors and members of the public. With respect to asset management activities it is particularly important to protect staff, contractors and the public from hazards associated with

Council assets. *"At the Kaipara District Council (Council) we will all keep everyone safe and healthy at work, and get better at being safe every year, by doing these things".*

10 Continuous improvement

Council recognises the need to improve on its current AM practices and has committed to lifting its current level of AM. The development of this AMP is an indication of this commitment.

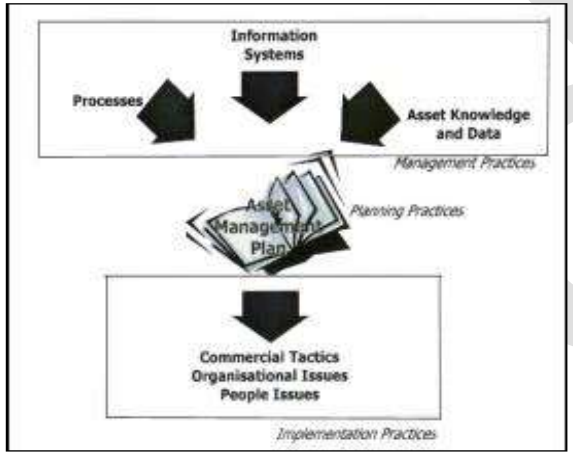
With regards to land drainage assets, there will always be a balance between the level of sophistication and investment in AM planning versus the willingness of drainage district landowners to pay for planning tasks. Given the nature and extent of the land drainage assets the level of planning established by this AMP is deemed to be of a suitable level by Council and the Drainage District Committee members.

Ensuring that the fundamental requirements for AM are in place gives Council a solid foundation on which to progress future improvements.

Sound AM planning requires the following key AM inputs:

- **Processes:** The necessary processes, analysis and evaluation techniques needed for lifecycle asset management;
- **Information Systems**: The information support systems, which support the above processes and which store and manipulate asset data; and
- **Data**: Data available for manipulation by information systems to support AM decision-making.

Figure 10-1: Key AM inputs



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Council recognises the importance of these key inputs and this is reflected in the AMIP detailed in this section.

10.1 Asset Management Improvement Plan (AMIP)

Council has developed an AMIP to address the risks and issues described above. Timing for completion of the activities may vary depending on Council priorities. This may result in re-prioritisation of activities from year to year, while maintaining bottom-line budgets.

Table 10-1: Improvement Programme 2018/2028

Improvement Programme 2018/2028	
Year 1 **Planned improvement / change 2018/2019**	• Populate a central database and geospatial framework for the recording of asset attributes and condition assessment information; • Provide a central management system for consents, compliance and monitoring; • Commence an hydraulic assessment of the Northern Area Land Drainage (NALD) schemes to be able to better prepare these schemes for climate change and sea level rise; and • Commence condition assessments of floodgates.
Year 2 **Planned improvement / change 2019/2020**	• Continue assessments of NALD schemes assets; • Update creation dates for floodgates in valuation system and review expected lives of these assets; • Review valuation of floodgates and drains compared to Raupo land drainage scheme in preparation for 2021 AMP; • Continue assessments of existing drainage system to prepare for climate change and sea level rise' • Refine application of Criticality Framework to land drainage and review resulting risk assessment' • Commence consultation process with stakeholders to better define the expected land drainage LOS, clarify ownership of assets and maintenance/renewal responsibilities and clarify how long term funding of the schemes should be managed. This process will include assessment of current level of satisfaction with current arrangements; and • Assess existing drainage districts and identify where, if possible, any can be reduced or amalgamated.
Year 3 **Planned improvement / change 2020/2021**	• Continue assessments of existing drainage system to prepare for climate change and sea level rise; • Commence assessment of the potential impacts of increasing the focus on water quality issues as this is impacted by land drainage activities; • Generate indicative renewal programme from the system including updated condition assessments, asset valuations,

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	projected remaining lives and allocation of responsibility for renewals; • Commence consultation process to progress amalgamations or boundary changes of schemes where this has been identified as potentially beneficial; and • Generate updated AMP for 2021
Years 4-10 **Planned improvement / change 2021/2028**	• The proposed programme in years 1-3 will yield a lot of information on asset condition, reviewed land drainage district boundaries, reviewed LOS and insight into how climate change will impact on the system; • The nature and extent of these changes are difficult to predict at this time but could conceivably require a significant rethink about how land drainage is managed in these districts; and • The programme from years 4-10 will largely reflect the changes that are identified in years 1-3 and their progressive implementation.

10.2 Monitoring and review

The AMP is a living document that is relevant and integral to daily AM activities. To ensure the AMP remains useful and relevant the following ongoing AMP monitoring and review tasks will be undertaken.

- **AMP Revision –** The AMP will be revised and updated on a three-yearly basis to coincide with the LTP process, and will incorporate the outcome of service level reviews and any new knowledge resulting from the AMIP.
- **Quality Assurance Audit –** Audits will be undertaken to ensure that the integrity and cost effectiveness of data collected for use in the AMP is maintained.
- **External Audit –** An external audit of each review of the AMP is to be undertaken prior to presentation to Council, to provide Council with the confidence that the AMP has been prepared and is being managed competently.
- **Annual Plan –** The Annual Plan and Annual Report will be monitored for consistency with this AMP.
- **Capital Expenditure Review –** Annual review of the capital expenditure programmes will continue to be undertaken to ensure that the programmes developed reflect the best needs of the asset.

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Appendix A: Resource Consent Register

KAIWAKA STORMWATER					
Asset condition 2 good condition					
Reticulation Pipe line length 320m		320	Severe	Possible	Significant
Manholes Total 9	9		Severe	Possible	Significant
Open Drains Total length 262m		262	Minor	Possible	Significant
Inlets/Outlets Total 5		5	Minor	Possible	Significant
MANGAWHAI STORMWATER					
Asset condition 2 good condition					
Reticulation pipeline		27,781m	Minor	Possible	Significant
Open drains		1,400m	Minor	Possible	Significant
Manholes	357		Minor	Possible	Significant
Inlets/Outlets Coastal Outlet	31		Minor	Possible	Significant
Detention ponds	4		Minor	Possible	Significant
Soak pits	72		Minor	Possible	Significant
RUAWAI STORMWATER					
Open Drain Freyberg Road drain to Marina F/gate			Major	Moderate	High

Kaipara District Council Resource Consent Register – Stormwater

Consent number	Type code	Details	Expiry Date
784301	CST	Council: Rock groynes, Mangawhai Harbour	28/02/2023
906301	LUC	Council: Flood protection works	30/04/2035
935401	CST	Council: Works in the CMA	30/06/2034

Consent number	Type code	Details	Expiry Date
952601	CTD	Council: Discharge of Stormwater, Wintle Road, Mangawhai Heads	30/09/2036
986001	LUC	Council: Stopbank construction - Stage 3 - Kaihu River	30/04/2035
1332901	CST	Council: Use and occupy space in Crown owned CMA	30/06/2035
1853901	CST	Council: Floodgate and floodway maintenance in Kaipara district	31/05/2027
2036201	LUC	Council: Relocate floodgate	30/06/2013
2122001	DIL	Council: Stormwater works	30/09/2043
2284101	LUC	Council: Floodgated culvert installation	30/06/2013
2436801	LUC	Council: Stormwater discharge structure	30/09/2012
19960211101		Council: Stormwater diversion and discharge – Mangawhai	
19960464301		Council: Stormwater diversion and discharge – Mangawhai	

CST – Coastal Permit
CTD – Coastal Discharge
LUC – Land Use
DIL – Discharge to Land

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Appendix B: List of acronyms and abbreviations

List of Acronyms

The following key acronyms and abbreviations are used in this document:

Term	Definition
AC	Asbestos concrete (pipe type)
AEP	Annual Exceedance Probability (e.g. 10% is once in 10 years)
AM	Asset Management
AMIP	Asset Management Improvement Plan
AMP	Asset Management Plan
AMS	Asset Management Systems
CAPEX	Capital expenditure
CCTV	Closed Circuit Television
CDEM	Civil Defence Emergency Management
CMA	Costal Marine Area
CON	Concrete (pipe type)
CORST	Corrugated steel (pipe type)
Council/KDC	Kaipara District Council
CPP	Competitive Pricing Procedures
DP	District Plan
EW	Earthenware (pipe type)
Fibro	Fibrolite (pipe type)
Galv	Galvanised (pipe type)
GEW	Glazed earthenware (pipe type)
GIS	Geographical Information System
IPCC	Intergovernmental Panel on Climate Change
IIMM	International Infrastructure Management Manual
KDC/Council	Kaipara District Council
KITE	Kaipara Information Technology Environment

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Term	Definition
LGA	Local Government Act 2002
LID	Low Impact Design
LIM	Land Information Memoranda
LOS	Level of Service
LTP	Long Term Plan
NALD	Northern Area Land Drainage
NCS	Napier Computer System
NOVAF	Novaflex (trade name for a pipe type)
NRC	Northland Regional Council
OPEX	Operational expenditure
PIM	Project Information Memoranda
PVC	Polyvinylchloride (pipe type)
RCRRJ	Reinforced concrete rubber ring joint (pipe type)
RMA	Resource Management Act 1991
SWCMP	Stormwater Catchment Management Plans
UPVC	Un-plasticised polyvinylchloride (pipe type)
URP	Usual Resident Population
WSSA	Water and Sanitary Services Assessment

draft