Stormwater
And
Flood Protection
Asset Management Plan
2015 - 2025

Nelson City Council
te kaunihera o whakatū

A824368

STORMWATER AND FLOOD PROTECTION
Asset Management Plan

2015-2025

Quality Assurance Statement

Version No.	Date	Description	Prepared by	Reviewed by	Approved by
1	10/12/13	Draft for Council workshop	P Ruffell	Councillors	A Louverdis
2	1/5/14	Draft approved by Council to inform LTP 2015-25	P Ruffell	SLT	A Louverdis
3	10/9/15	Approved by Council W&I Committee to match LTP	Various	Councillors	Council
4 Final	15/10/15	Approved by Council	Various	Councillors	Council

Cover Photos:
Orchard Creek and Orphanage Creek

Nelson City Council
te kaunihera o whakatū

TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF TABLES

LIST OF FIGURES

EXECUTIVE SUMMARY Stormwater and Flood Protection Asset Management Plan 2015-25

INTRODUCTION

This Asset Management Plan produced for the public stormwater and flood protection assets owned and managed by the Nelson City Council provides a 12 year outlook commencing July 2015. The Asset Management Plan demonstrates how the Nelson City's goal of delivering the agreed levels of service will be achieved through effective and sustainable management of the stormwater and flood protection assets.

Central Government has signalled a likely requirement for Councils to develop an infrastructure strategy covering the foreseeable issues associated with key infrastructure for a 30 year future timeframe.

In order to contribute to this strategy financial tables for the 30 year period have been prepared for this asset management plan.

ASSETS INCLUDED IN THIS PLAN

Council's stormwater and flood protection system includes rivers and streams and the stormwater reticulation system.

The Nelson City Council system can be categorized into two parts – a natural component and a constructed stormwater system. The natural part consists of rivers and streams that play an important role in the support of aquatic ecosystems, areas for recreation and public use and the channelling of stormwater flows in rainfall events. During high rainfall events the rivers and streams transport large volumes of water and sediment, that are capable of causing significant damage to property adjoining these areas and within the flood path, should the flow escape the channel.

The constructed stormwater network provides water channels to drain stormwater and flows from roads and properties in the built up areas. The network includes pipes, channels, and overland flow paths that convey stormwater to receiving water courses or the sea. The stormwater system also incorporates pump stations and some stormwater detention/ponding areas that hold stormwater for slow release to the downstream network of streams. In a large part of the city a fully reticulated system is not yet available and individual properties discharge stormwater to onsite soakage or to the road channel.

The replacement value (2014) of the stormwater infrastructural assets is $168.9M and Flood protection assets $13.6M.

Goal of the Stormwater and Flood Protection Activity

Council provides a stormwater and flood protection system to reduce harm to people and property, contribute to community wellbeing and protect the environment from uncontrolled stormwater discharges.

Council is aware that reducing the flood risk to residents and businesses to the same standard in all stormwater catchments may not be affordable or appropriate. A design level for example of a 1 in 100 year event for high commercial areas may not be the right response for a rural area. Council has to balance priorities between different activities, as well as balancing competing priorities within the stormwater activity. There will always be a tension between design, risk factors and cost.

Rationale for Council's Involvement

Health and Safety / Property Protection

Large parts of Nelson City occupy a narrow band of land wedged between the sea and low foothills, with the majority of development taking place in areas close to or influenced by rivers and streams. The provision of a robust stormwater and flood protection system allows people to carry out their day to day lives with minimal disruption or adverse health effects from rainfall events or ponding water.

Protection of Environment and Community Well-being

The natural stormwater system comprises vegetation and ground soakage with overflow to rivers and streams in high rainfall events. For the majority of time, rivers and streams sustain aquatic ecosystems and are increasingly linked to private properties and recreation activities, particularly for the larger rivers, by the residents of the City. This system is also where the bulk of materials washed from roads and private properties in the City first contact the aquatic ecosystem.

As development in the city encroaches onto historical flood plains (those parts of the city where flood waters would have traditionally spread when the flow in the channel exceeds its capacity) the multiple demands on the remaining available river and stream channel areas of flood flow capacity and recreational use needs to be balanced to ensure the long term best possible outcome for the city.

Legislative Requirements

The Nelson City Council is a local authority established under the Local Government Act 2002 (the Act) with purpose and responsibilities set out in the Act. In particular the purpose as it relates to infrastructure is as follows:

10 Purpose of local government

(1) The purpose of local government is—

(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.

and the Act further defines core services to the community as:

11A Core services to be considered in performing role

In performing its role, a local authority must have particular regard to the contribution that the following core services make to its communities:

(a) network infrastructure:

(b) public transport services:

(c) solid waste collection and disposal:

(d) the avoidance or mitigation of natural hazards:

(e) libraries, museums, reserves, recreational facilities, and other community infrastructure.

The stormwater network is a network infrastructure (sec 197(2)) and a water service (sec 124).

Council has specific obligations under section 130 of the Act to continue to provide existing stormwater services as well as a general authority to construct public drains and undertake land drainage. These also recognise the requirement to take a sustainable development approach, set out in section 14 of the Act, which takes into account:

- the social, economic and cultural interests of people and communities; and
- the need to maintain and enhance the quality to the environment; and
- the reasonably foreseeable needs of future generations

Specific powers and responsibilities are contained in the Land Drainage Act 1908, Part 29 of the Local Government Act 1974 and the Soil Conservation and Rivers Control Act 1941 for flood protection.

Reliable provision: Human health, tourism and industry, in particular, rely on the reliable provision of this service - The Local Government Act 1974 provides the authority for the Council to own and operate the water supply service.

STORMWATER PRIORITIES FOR THE PERIOD 2015 TO 2025

Council's priorities between 2015 and 2025 for the stormwater and flood protection activity will focus on the following areas:

- Maitai River flood capacity and protection of the central business district from the Maitai river, Brook stream and York stream flood flows;
- Stormwater channels (small open ditches and drains) on private properties that carry some stormwater from public spaces such as roads, parks and reserves need to be inspected and maintained. Secondary flow paths when rivers, streams and pipes are full need to be identified and landowners made aware of the need to keep clear (City wide);
- Te Tau Ihu Settlement Legislation;
- Climate change and the capacity of urban rivers and streams.

  Move to Q_{100} (1% probability of occurrence in any year) plus 500mm freeboard for Orphanage Stream/SaxtonCreek/Saxton Field bunding, York Stream, Little-Go Stream;
- Natural Hazard Security of the network in light of the recent Canterbury Earthquakes and storm events, including wider network hazards- Earthquake fault line and liquefaction;
- Capital Works. Prioritisation of new stormwater works to areas without reticulation. Slip areas/ Tahuna slope risk overlay /flood areas/with other projects. Issues with Low Impact Design (Poor performance in some soils/poor test results from percolation testing/horizontal flow issues across boundaries) and slips on hillsides from Dec 2011 event;
- Complete recovery works following extreme rainfall event April 2013 (Intake structures/ gravel removal/rock protection);
- Freshwater Quality improvement.(National Environment Standards / Central Government freshwater reforms);
- Sustainable development. Nelson 2060;
- Rural rivers (Operations &Maintenance/protection works/rating);
- SCADA (Supervisory Control And Data Acquisition). Review and upgrade of radio telemetry;
- 30 year Infrastructure Strategy signalled in the Local Government Act 2002 Amendment Act 2014.

Maitai River, Brook Stream, York Stream Flood Capacity and Protection of the Central Business District

The Maitai River, Brook Stream and York Stream are the major watercourses that impact on the central business district. Flooding from these channels can impact on most areas of central Nelson. In order to develop long term plans for flood protection, computer models of these water courses are being developed. These models can then be used to investigate flooding patterns for any rain event and look at the effectiveness of upgrade options.

Maitai River

The Maitai River has undergone limited upgrading of the river in the lower reaches only to allow for extreme flood events. Council has recognised the need to further develop a

range of solutions in the upper residential reaches where development and recreational uses increase the complexity of flooding design. An updated flooding model has now been completed for the full length of the Maitai River. This model is being used to investigate the areas where flood waters escape the current river channel and model the possible impacts of future climate change and sea level rise.

A range of flood control options are available to the community, including detaining flood flows in the upper catchment, upgrading constrictions to flow such as bridges, widening the channel and increasing the height of the banks.

The primary issue being considered is whether or not it is possible to contain flood flows within the "banks" of a modified river cross section and if this is possible, at what cost to the current walkways and reserves that have been developed in these areas.

Inevitably there will have to be some trade off made between protecting properties from flooding and maintaining the natural and recreational values of the river. The first step is discussions with the community about the aspects of the Maitai River that are considered to be critical to retain.

Sections of the Maitai river adjacent Clouston's Bridge and Riverside Drive are expected to be the focus for initial detailed investigation.

Brook Stream

The Brook Stream is a mix of natural and concrete lined channels, in an increasingly urbanised environment, from the intersection point with the Maitai River to the headwaters above the Brook Motor Camp. There is very limited flow information available for the stream, which has an impact for the Maitai flood protection investigation, as well as initiatives for the Brook stream itself, such as the improvement of the concrete channel section for fish passage. In 2013 Council, through its hydrology contract with Tasman District Council, installed flow monitoring equipment within the concrete channel section. The next step is to begin developing a computer model of the concrete section of the channel to look at options for creating a more natural channel environment and evaluating flood capacity into the future.

York Stream

York Stream is also a mix of natural and modified channels. Upper reaches are controlled by three detention dams in the Bishopdale area, with culverted and open channel sections to a major culvert intake structure at Victory School. Council has begun construction of a large diameter pipeline from the York Stream intake at the Bishopdale reserve to the open channel section in Tipahi Street. This pipeline has been designed to cope with a Q_{100} (1% probability of occurrence in any year) flow event.

The area from Victory School to the sea is fully enclosed in a box culvert. Flows in excess of the various open channel/culvert capacities must flow overland through the lower Bishopdale/Vanguard Street/St Vincent Street areas to Saltwater Creek.

Currently Council is reviewing the capacity of the main culvert networks in Vanguard Street and St Vincent Street prior to starting work on a computer model that will enable a more accurate assessment of overland flow issues in the area.

Stormwater Channels on Private Property

In the recent past little or no maintenance was carried out on these by Council as they have been considered to be the property owners' responsibility. In 2013 Council adopted a revised drainage ownership policy that recognised the likelihood that the Courts' would consider a number of these channels to be public drains.

This issue is closely linked to the need to complete the work of identifying secondary flow paths for stormwater overflows from watercourses, channels or the piped network. These flows run along roads or private property until such time as they can return to a waterway.

A process to identify and establish responsibilities for the maintenance and upgrading of these is required.

Te Tau Ihu Settlement Acts 2014

The Ngāti Kōata, Ngāti Rārua, Ngāti Tama ki Te Tau Ihu, and Te Ātiawa o Te Waka-a-Māui Claims Settlement Act 2014, Ngāti Apa ki te Rā Tō, Ngāti Kuia, and Rangitāne o Wairau Claims Settlement Act 2014 and the Ngati Toa Rangatira Claims Settlement Act 2014 (The Acts) provides statutory obligations for Council in respect to general decision making processes. The Acts are the culmination of Central Government's resolution of claims lodged by the eight iwi for redress of past wrong's and provides for Cultural, Relationship and Financial redress.

Statutory acknowledgments may impact works programmes within the Asset Management Plan and the eight iwi will potentially be considered as affected parties under section 95E of the Resource Management Act, which the settlement legislation provides for. The proposal to establish a Freshwater Advisory Committee under the settlement legislation would be a potentially effective tool for achieving a forum to involve the iwi of Te Tau Ihu in the development of future asset management planning, infrastructure strategies and Long Term Plans.

Ngati Kuia have also developed a management plan for their toanga tutura (treasure of Ngati Kuia) the Pakohe stone (argillite) and protocols and processes will be put in place to respect that, alongside any other iwi management plans received into Council.

Climate Change and the Capacity of Rivers and Streams

Significant development has occurred on historical flood plains as the City has grown. Areas that would once have contributed to the passage of flood waters are now occupied by buildings and structures. The need to provide for stormwater flows, aquatic ecosystems and community recreation in constrained channels is a current reality facing the City. The flood flow that Nelson would experience from a Q_{50} event (2% probability of occurrence in any year) is the current standard that has been adopted for design and construction works of the major stream and river channel upgrades in the city. Recent extreme events in excess of Q_{50} have lead to the need to review the minimum design standard and consider whether this should be increased to Q_{100} (1% probability of occurrence in any year). The LTP 2015/25 signalled that Council will review the risk profile of streams and rivers on a case by case basis before deciding on the appropriate response to flooding.

Options for addressing the flooding risk to urban properties are being considered for three broad timebands: Current day to 2040, 2040-2070 and 2070-2100. These timebands follow preliminary assessments of the impacts of climate change on rainfall intensities carried out by the National Institute of Water and Atmospheric Research Ltd (NIWA). Detailed design for upgrading works would ideally set a framework for protecting against current flood patterns while ensuring future generations can carry out the works required for flood flows at the time.

The broad strategy for flood protection through the city is currently based on:

- Upgrading the urban stretches of rivers and streams and ensuring secondary flow paths are identified and maintained from rivers, streams and detention dams- Protecting the Central Business District- Stoke area-Atawhai area to the top of the Gentle Annie Saddle;
- Extending the piped stormwater network through the city;
- Upgrading existing open channel drains;
- Identify, maintain and upgrade secondary flow paths.

While most of the urban streams maintained by Council have had substantial stretches upgraded to meet pre-climate change Q_{50} flows, increased development in upper reaches has highlighted some weak areas. Serious flooding in the Orphanage Stream and Saxton Creek areas during April 2013 has lead to the need for urgent works to be carried out on both streams. Nelson City Council and Tasman District Council are jointly developing plans for Saxton Creek to upgrade culverts in Champion Road and the stream channel from Champion Road to Main Road Stoke. Nelson City Council will need to continue with upgrading works downstream of Main Road Stoke in future years.

Given the expectation that climate change will result in altered rainfall intensities and frequency of extreme events an inventory of all of the urban and rural rivers and streams is shown in the future budgets.

NATURAL HAZARDS

Recent work by Council has focussed on natural hazards that might impact on the city, in particular:

- Direct damage from Earthquake shaking
- Damage from liquefaction in susceptible areas
- Damage from Tsunami
- Damage from Flooding and major storm events
- Impact of potential climate change and sea level rise

Security of the network in light of the recent Canterbury Earthquakes and Nelson storm events, including wider network hazards- Earthquake fault line, liquefaction and climate change will influence network upgrades into the future.

Future work will focus on near fault proximity of the network, possible impacts of liquefaction on existing and future infrastructure, impacts of flooding and the long term planning required as a result of climate change.

The Christchurch Earthquakes of 2010 /2011 lead to significant damage to that city's infrastructure, including streams and rivers, pump stations and the underground pipe network, from direct shaking and liquefaction. Recognising this and the results of other natural hazard investigation post the Nelson storm events of December 2011 and April 2013, Nelson City Council is reassessing the risk to the network from earthquakes (including liquefaction, tsunami and direct shaking), flooding, storms and sea level rise.

In particular a series of reports have been compiled, as part of the city's wider hazard planning, as follows:

- *TSUNAMI MODELLING AND EVACUATION ZONE MODELLING FOR TASMAN AND GOLDEN BAY- GNS FEBRUARY 2012 (A261963)*
- *REVIEW OF TSUNAMI HAZARD IN NEW ZEALAND (2013 UPDATE)- GNS AUGUST 2013(A371109)*
- *ASSESSMENT OF THE LOCATION AND PALEOEARTHQUAKE HISTORY OF THE WAIMEA-FLAXMORE FAULT SYSTEM IN THE NELSON-RICHMOND AREA WITH RECOMMENDATIONS TO MITIGATE THE HAZARD ARISING FROM FAULT RUPTURE OF THE GROUND SURFACE- M. R. JOHNSTON A. NICOL GEOLOGICAL CONSULTANT GNS SCIENCE 395 TRAFALGAR STREET PO BOX 30368 NELSON LOWER HUTT GNS SCIENCE CONSULTANCY REPORT 2013/186 AUGUST 2013(A673742)*
- *REVISED PRELIMINARY ASSESSMENT OF THE LIQUEFACTION HAZARD IN TASMAN AND NELSON FEBRUARY 2013 (A597463)*
- *TAHUNANUI AREA LIQUEFACTION ASSESSMENT- TONKIN AND TAYLOR LTD NOVEMBER 2013(A1117884)*
- *MAITAI RIVER FLOOD HAZARD MAPPING MODELLING REPORT TONKIN AND TAYLOR LTD AUGUST 2013(A677152)*

A further report is expected in 2015, to update the 2009 report by the National Institute of Water and Atmospheric studies (NIWA) looking at the latest state of knowledge of the impact of climate change on sea level rise.

The stormwater and flood protection network activity is likely to be impacted by sea level rise in line with other utilities because the outlet to the network is in many instances the sea or tidal margins and the reticulation is essentially gravity based, with

pipes of varying depth, age and integrity. Pump stations are mostly positioned on lower level ground with potential for direct tidal impact.

Liquefaction was seen in Christchurch to be an extreme risk to the network through floating manholes and sand and silt infiltration into pipelines and manholes.

Climate change is expected to bring with it more extreme weather in the form of higher intensity and duration rain events (with associated flood damage) and drought periods. The issue will be monitored and future asset management plans will be adjusted to address impacts as they become better understood.

Capital Works

There are still large parts of Nelson that do not have access to a reticulated stormwater system. Where these areas are developed on a good gravel base, on-site soakage has not caused any particular problems over the years. Where these areas discharge stormwater onto clay based sites with very limited soakage, overland flow into open ditches quickly results. Land stability issues, neighbour to neighbour relationships, public health issues arising from water ponding and insect breeding, together with the aesthetic and economic cost of maintaining open ditches have led previous Councils to support a programme of providing a reticulated stormwater network in the City. Priority has been given to those areas with poor soakage, inundation and land stability issues.

Over the next three years a review of the stormwater provisions within the Tahunanui Slope Risk Area will be undertaken.

Improvements in the stormwater and flood protection networks requiring separate capital expenditure currently follow a priority order:

- Reactive emergency works;
- Wider areas impacted by significant flooding or land slippage;
- Streams and rivers capacity upgrade;
- Streets without stormwater reticulation.

Various components of the stormwater goal are considered when developing the final detailed design:

- Economics of various options;
- Efficiency of meeting the network need;
- Cultural values relating to storm water disposal to freshwater and marine environments;
- Ecological values of freshwater and marine eco-systems;
- Recreational values of shared rivers and streams;
- Enhancing natural structures of streams and rivers where possible.

Recovery works following extreme rainfall events in December 2011, April 2013 and June 2014

Council has a duty to respond to flood events throughout the city. As with buildings and fittings, Council insures items of infrastructure for damage in these events. Infrastructure is insured through the LAPP (Local Authority Protection Programme Disaster Fund) scheme. This is a mutual pool created by local authorities in 1993 to cater for the replacement of infrastructure following catastrophic damage by natural disaster. The recent earthquakes in Christchurch coupled with the flooding events throughout the country have reduced the funds ability to support Councils' with their recovery works after disasters.

December 2011

An extreme rainfall event occurred throughout Nelson and Tasman in December 2011. The event was notable for the total volume of rain that fell over a 48 hour period, being the greatest for at least the past 260 years anywhere in the urbanised areas of New Zealand. The long duration of relatively low intensity rainfall led to hillsides becoming saturated and multiple slips occurred throughout the city.

The stormwater network itself generally coped very well with this event as flows were even and at levels the pipework could cope with. The greatest impact was on intake structures that struggled to cope with slip debris that was washed into the pipe inlets. There are also residual risks to many intakes from loose material that remains in slip areas. Recovery investigations are looking at intake design, with future works to improve these in critical locations likely over the next three years.

The various streams and rivers in the city also held up well. While some damage to banks and berms was experienced in Marsden Valley (Poorman Valley Stream), the Brook Valley (Brook Stream) and Todds Valley, the greatest impact has been in the deposition of gravel and slip debris in the base of most of the streams. Little Go Stream was impacted significantly from gravel deposition and flooding of properties in Rutherford Street occurred. Saxton Creek had gravel deposited along its length, with large volumes remaining in the bed and banks in the upper catchment within Tasman District.

Initial gravel extraction from this event has been completed, however the amount of gravel that is now deposited in various locations means that on-going work will be required as annual flood flows move the gravel through the network.

April 2013

The extreme rainfall event in April 2013 was characterized by very high intensity rain for a short time over a narrow section of Stoke South and Richmond. Of the order of 100mm fell in one hour over a very small catchment area involving Orphanage Stream and Saxton Creek. This level of rainfall is expected on average once in 500 years.

The impact of this event was significant on businesses in the Whakatu Industrial Estate, homes and properties in secondary flow paths, and Saxton stadium.

Saxton Creek is the last of the urban stream sections to be upgraded in the city and as such no channel works had been carried out prior to the event

A major project has begun, with Tasman District Council, to upgrade Saxton Creek over the next three years.

The channel of Orphanage Stream has previously been upgraded to cope with a Q50 storm event. An allowance for freeboard on top of the likely flow level is made in all channel designs. This allowance greatly enhances to capacity of the channel. The channel performed very well in the event that was many times larger than designed for. A review of the channel and culverts is currently underway to see if they can be upgraded economically to provide a greater level of protection to property. Included in this project is a review of the bunding in place on Saxton Field and the practicality of connecting these to form an emergency detention pond within the complex.

June 2014

On 25 June 2014 an intense rainfall of 42mm in one hour (32mm in 30mins) over the Bishopdale, Victory and Tahuna Hills areas lead to significant surface flooding in Waimea Road, Emano Street and Murphy Street.

Freshwater Quality Improvement

Previous State of the Environment Reports confirm that the quality of the freshwater streams and rivers in Nelson continues to be of serious concern.

Central Government has also identified reform of the freshwater regulatory environment as an important cornerstone of its policy framework. Changes to the Resource Management Act in the next year or so are expected to require local communities to put in place measures that would lead to an improvement in fresh water quality over time.

The National Policy Statement- Freshwater Management 2011 (NPSFM) came into effect

on 1 July 2011. In 2013 Central Government proposed amendments to the NPSFM. An analysis of the proposed amendments by Local Government NZ concludes that the amendments now broadly require that:

- Water quality must be maintained or improved in a region although the proposal provides no additional direction as to when or how trade-offs might be made;
- There is an avoidance of any further over-allocation of water and a phase out of existing over-allocation (water quantity);
- National bottom lines are set for ecosystem health and human health;
- By 2030, regional councils are to have within their plans freshwater objectives that reflect national and local values (there are proposed mandatory national values and attributes). The framework recognises that improving water quality in some places will take some time. While there is a requirement to set objectives there is no timeframe set for their achievement

The policy will need to be given effect to by regional rules in the Nelson Resource Management Plan (NRMP). It is expected that the greatest impact will come in the form of water quality controls and limits on water extraction.

Improving water quality will require an integrated response from all areas of Council and property owners with an increasing emphasis on preventing contaminants entering fresh water rather than a focus on cleaning the water itself.

Extensive community discussion occurred in 2014 on projects and policy direction for the Maitai River that could respond to fish passage, levels of sediment entering the river and habitat improvement.

Sustainability

Overview of Sustainability

The Local Government Act 2002 requires that local authorities take a sustainable development approach to everything they do. The publication, Nelson 2060 (June 2013) was developed by Council through an inclusive process called “Framing our Future” and sets out Nelson’s sustainability strategy.

The framework and checklist outlined in this document will be used to guide the management of the city’s infrastructure.

Community infrastructure is installed and maintained on the understanding that the assets are provided in perpetuity for the benefit of future generations. Longevity of an asset is a prime consideration when design and planning is undertaken for new or replacement components in the network.

Actions for Future Improvement

Further action in promoting the sustainability of this activity centres on the following areas:

- Ongoing construction of a stormwater and flood control network to protect people and property;
- Ensure the design of watercourses allows for flood flows, enhanced natural characteristics and the wider community recreational use of the area;
- Ongoing monitoring of the condition and operation of the asset to ensure proper performance and minimise repair and replacement costs;
- The development of catchment management plans for all catchments on a priority based methodology over the next ten years.

Rural Rivers

Currently, Council does not take stormwater rates from any property to the East of the Gentle Annie Saddle, nor from properties that are greater than 15 Hectares in area. Consequently the only day to day maintenance or capital upgrades carried out in the majority of these areas are where utilities and structural facilities such as bridges and

buildings, owned by Council are threatened. The general exception is gravel extraction which is carried out in the Maitai River.

Council does receive occasional requests for assistance from landowners in rural areas. These requests typically follow heavy rain events and can range from assistance with the removal of tree debris and gravel build-up, to the protection of river banks from erosion. In June 2013 Council recognized the need to respond to these requests, while noting that there is currently no funding stream for any work, and agreed to the following policy of cost sharing with property owners for works that have a private benefit.

"Council will investigate bank protection and river control works to private property in the areas where stormwater rates are not applied, on a cost sharing basis with adjacent property owners"

It will be necessary to further refine the response to rural rivers as increased residential development takes place and residents' expectations about flood protection develop.

Supervisory Control And Data Acquisition (SCADA) Review and Upgrade

All of the Nelson City Council's strategic utility components are monitored remotely, at Civic House or by duty staff using laptop computers at home, utilising a telecommunication system called SCADA.

SCADA has given Council the ability to ascertain faults and instigate repairs without affecting the service to the consumer and has significantly increased efficiency and reliability of the utility schemes. This function has become critical to the operation of the network and has been supported by Council's in house Information Management team up to now. There is a need to upgrade this package and at the same time consider how the technical requirements can be accommodated with the essentially office based computer network used by the majority of Council staff.

30 YEAR INFRASTRUCTURE STRATEGY

The requirement for an infrastructure strategy arose from advice provided by Better Local Government programme advisory groups. The strategy is intended to improve local authorities' delivery of core infrastructure and management of physical assets. It should identify strategic issues facing the council and the future implications and is intended to add transparency for residents and ratepayers about these issues and their consequences.

The strategy is included in the LGA 2002 Amendment Act (2014).

This Asset Management Plan contains the information that would form the basis of the stormwater and flood protection utility section of an integrated strategy, in particular the following are addressed in the sub sections of the plan either directly or as areas that will require future work:

- what level of infrastructure investment, if any, is necessary to provide for growth in the community;
- how to manage the timing of investment for growth, to avoid constraints on growth from limited infrastructure capacity while minimising the costs to the community of underutilised infrastructure capacity;
- what level of investment is needed to maintain, renew and replace existing assets;
- how to balance service level expectations with affordability in the context of demographic changes such as depopulation and aging; and
- what level of investment, if any, is needed to improve the level of service provided by those assets;
- planning for maintenance, growth and possible increases or decreases in levels of service provided;
- managing or improving public health and environmental outcomes, or mitigating adverse effects on them;

- managing the risks to, and resilience of, infrastructure assets from natural disasters; and
- managing the financial provision for risks to infrastructure assets from natural disasters
- indicative estimates of the projected capital and operating expenditure requirements for each year;
- assumptions about service levels and asset lives on which the projections are based; and
- where assumptions involve significant uncertainty, the nature of that uncertainty and its potential impacts.

LEVELS OF SERVICE

The Levels of Service (LOS) provision for the stormwater activity and the performance measures by which these levels will be assessed are defined with the aim of achieving community outcomes and meeting the stormwater goal.

Background

Councils Annual Plan and Long Term Plan consultation processes over the past four years have gathered information on preferred levels of service or the extent of infrastructure that Council has or will be required to install. This consultation has given the community the opportunity to be involved in the process of indicating the level of service required in a number of areas within the Council's stormwater activity.

The Nelson City Council Long Term Plan/Long Term Plan community outcomes (associated with the stormwater activity) encompass the community's vision of the sort of place where they would like to live in the future. These outcomes guide the future development of the district and illustrate how the Council's stormwater activity contributes to the high level goals. The table below details the linkages between the customer values, levels of service, and the community outcome that the level of service supports.

	What Council will provide	Performance Measures	Targets			Targets in Years 4-10
			Year 1	Year 2	Year 3	
Stormwater	**Environmental Protection** **For the built and natural environment from stormwater discharges**	Level of compliance with resource consent conditions	100% compliance	Maintain	Maintain	Maintain
		Stormwater network extended throughout the city	Complete 80% of capital expenditure programme	Maintain	Maintain	Maintain
	Reliability **An operational stormwater network**	Number of blockages per 100 km of pipes on an annual basis Number of flooding events	Less than 25 blockages per 100km of pipes on an annual basis No damage from flood events up to Q2 level to more than 10 per 1000 properties per year	Maintain	Maintain	Maintain
	Contractor response **Provide a prompt, reliable and timely response to service requests and system failures**	Time that contractors take to respond to events	Contractor to meet maximum response times under the contract	Maintain	Maintain	Maintain
	Response to complaints	Number of complaints per 1000 connections per year	No more than 25 complaints per 1000 connections per year	Maintain	Maintain	Maintain
Flood Protection	**Protection for the urban built and natural environment from floods through upgrading, maintaining, repairing and renewing assets to standards in the Flood Protection Asset Management Plan**	Damage to urban property from stream flooding is minimised	Urban sections of streams are inspected and maintained annually	Maintain	Maintain	Maintain
		Damage to urban property from Maitai River flooding is minimised	Urban section of Maitai River is inspected and maintained annually	Maintain	Maintain	Maintain
	Integration of ecological and flood protection requirements in urban sections of streams and	Fish passage in streams is maximised and ecological impact of structures is minimised	Complete review of fish passage to Brook Street concrete	Undertake design of preferred option to improve fish passage to the	Begin review of fish passage to remainder Brook Street channel	Fish passage in streams is maximised and ecological impact of structures is

	rivers		channel	Brook Street channel		minimised
		Channel Maintenance works carried out in accordance with resource consents	100% compliance with resource consents	Maintain	Maintain	Maintain

STORMWATER SYSTEM OVERVIEW

Background

The Nelson City Council has been responsible for stormwater disposal in the city since the first piped disposal system was installed in approximately 1907. The Nelson City Council stormwater and flood protection system can be categorized into two parts:

- A natural component consisting of 27km of rivers and streams.
- Constructed stormwater system consisting of 181km of mains, two pump stations and 420 outfalls to rivers, streams or to salt water.

The replacement costs of the stormwater assets are $168.9M and Flood Protection $13.6M(as shown in the 2014 valuations) detailed below.

Table 1-2: Summary of Stormwater Services Assets (June 2014)

Asset Category	Quantity	Unit	Replacement Value $
Stormwater			
Mains Up To 600mm	159.4	km	75,557,050
Mains > 600mm	40.5	km	47,371,923
Channels	1.2	km	251,352
Culverts	5.8	km	16,554,691
Rocks Road Culvert	0.3	km	3,039,409
Tide Gates	24	No	175,509
Intakes	93	No	526,970
Manholes	4,404	No	20,324,201
Outfalls (with wing walls)	77	No	394,041
Sumps	593	No	1,384,972
Pump Stations	2	No	3,343,711
TOTAL			168,923,829
Flood Protection			
Bank Protection	59,222	m^2	11,978,760
Detention Dams	9	No	1,645,220
TOTAL			13,623,980

Reticulation

The primary purpose of the reticulation system is to minimise flooding damage by collecting and discharging stormwater from rainfall into streams and other watercourses. An increasingly important component is the reduction of stormwater inflow and infiltration into the wastewater network which increases loads on the sewer system potentially causing overflow and increasing pumping costs. As the discharge of wastewater into the environment during rain events becomes less acceptable the need for stormwater reticulation increases.

The reticulation system is designed for a 1 in 15 year flood event, with suitable secondary flowpaths generally being established in roadways. Most main channels of rivers and streams upgraded in the city are currently designed to cater for a Q_{50}

(1 in 50) year flood event with an additional 400mm clearance from the top of the water to the top of the adjacent banks (freeboard). The increased risk of extreme events has lead to further consider adopting Q_{100} plus 500mm freeboard as the more appropriate channel design for the future.

The current design standard of Q_{15} for reticulation, with larger flows utilising secondary flow paths, is still considered to be appropriate. Council's experience in medium level rain intensity events has consistently been the difficulty of keeping intakes clear and functioning rather than specific issues with reticulation pipe capacity.

The distribution of pipe length versus installation date can be seen in Figure 5.2. The pipe install date distribution increases at a steady rate for the pipes installed from the 1950s to the present date. Appendix C details the abbreviations for the pipe materials.

Pump Stations

The Nelson City Council operates two stormwater pump stations: Centennial Road installed in 1999 and the Wood installed in 2003. These pump stations (Centennial $890k and the Wood $2.05M) were installed due to excessive flooding in Tahuna and the Wood areas, especially during storm events that coincided with a high tide. Centennial Road pump station is operated regularly for maintenance, and for storm purposes on average twice per year. The Wood Pump Station storm pumps have operated on average once per year. Operational changes are being instigated that would allow the storm pumps to be operated more frequently in lieu of the smaller emptying pumps. This is expected to be beneficial for the larger pumps and reduce the regular replacement of the smaller pumps.

FINANCIAL SUMMARY

Council funds the various components of the stormwater activity from a range of sources. The growth component of capital expenditure projects are currently funded from development contributions and long-term loans. Network renewals are funded through loans and all operational costs, including depreciation are funded directly from rates.

The mix of funding sources ensures that primary infrastructure required for the growth of the city can be provided in a timely fashion with those parties requiring the infrastructure providing a significant proportion of the funding.

The projected operating and maintenance costs, renewals and capital expenditure for the stormwater system over the next twelve years are shown in the table below.

The first ten years have been updated to reflect the LTP 2015/25.

Table ES1: Stormwater 12 Year Operations and Maintenance Projections ($,000)

Year		1	2	3	4	5	6	7	8	9	10	11	12
Long Term Plan		2015/25 LTP			2018/28 LTP			2021/31 LTP			2024/34 LTP		
O&M Expense	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27
Administration	1,972	858	865	857	865	857	865	857	865	857	865	865	865
Depreciation	1,883	2,005	2,027	2,044	2,076	2,109	2,160	2,238	2,302	2,349	2,397	2,397	2,397
Electricity	10	11	11	11	11	11	11	11	11	11	11	11	11
Mtce: Physical Works - Programmed Reticulation	16	20	20	20	20	20	20	20	20	20	20	20	20
Mtce: Physical Works - Reactive Reticulation	206	250	250	250	250	250	250	250	250	250	250	250	250
Mtce: St Vincent culvert		2	2										
Mtce: Monitor Streams Cawthron	21	20	20	20	20	20	20	20	20	20	20	20	20
Building Act: Dams		120	20	20	20	20	20	20	20	20	20	20	20
Mtce: Wakapuaka Land Drainage	6	6	6	6	6	6	6	6	6	6	0	0	0
Freshwater Bylaw Compliance	5												
Update NIWA rainfall/ Natural Hazards Risk Assessment		70		50									
Network Capacity for Growth		50	50										
Port Hills S/W Strategy					150								
Stoke S/W Strategy							150						
Tahuna S/W Strategy									150				
Stream Maintenance Code of Practice		75											

Prelim Capex Investigations		10	10	10	10	10	10	10	10	10	10		
Total [a] ($,000s)		3,497	3,281	3,288	3,428	3,303	3,512	3,432	3,654	3,543	3,593	3,583	3,583

Table ES2: 30 Year Stormwater Renewal Plan ($,000). The first ten years have been updated to reflect the LTP 2015/25.

Year		1	2	3	4	5	6	7	8	9	10	11	12
Long Term Plan		**2015/25 LTP**			**2018/28 LTP**			**2021/31 LTP**			**2024/34 LTP**		
Renewals Project Area	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27
Pipe Renewals		96	50	50	50	50	50	50	50	50	50	50	50
Pump Station Renewals		20	0	40	0	200		0	460	80	130		
Tide Gate Renewals			25					15					
Total ($,000s)		116	75	90	50	250	50	65	510	130	180	50	50

Table ES3: Stormwater Capital Years 1-12 of the 2015/25 Long Term Plan Financial Summary

Year		1	2	3	4	5	6	7	8	9	10	11	12
Long Term Plan		2015/25 LTP			2018/28 LTP			2021/31 LTP			2024/34 LTP		
Capital Projects	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27
Airlie St			50	50	300								
Anglia/Scotia									50	150			
Arapiki Rd					100	50	200	300					
Ariesdale/Thompson Tce				40	165								
Beach Road							35	20	150				
Beatson Road									50	50	300		
Bisley Avenue		20	70										
Black						10	10	100					
Brooklands							35	10		135			
Brougham Street								30	300				
Buxton Carpark N-W Cnr		10	60										
Catchment Management Plans													
Catchment/Freshwater Improvements							100	250					
Cawthron Crescent						30	20	150					
Chamberlain Street (16 - 22)													
Cherry/Baigent/Ridgeway									75	30	500		
Coleridge Pl Secondary flow path			20	20	50								
Collingwood Street									80	50	20	550	600
Dodson Valley							45	20	100				
Examiner						50	20	250					
Fifeshire		100	250										
Fountain Place													

Year		1	2	3	4	5	6	7	8	9	10	11	12
Long Term Plan		2015/25 LTP			2018/28 LTP			2021/31 LTP			2024/34 LTP		
Capital Projects	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27
Golf/ Parkers					35	15		400					
Halifax (Maitai-Milton-Halifax St East)		50	25	850									
Hampden/ Wigzell / Alfred / Tipahi / Eckington					250		600		300				
Hardy (Tasman-Alton)										45	20	500	
Harford Court Secondary Flow Path									20	20	80		
Hill Street North					50		500						
Isel Place							50	20	150				
Jellicoe/Bledisloe/Kaka/Kea/Freyberg/Maple					50			500					
Karaka				50	20	250							
Kauri Street			10	50									
Matai/Titoki/Ranui				50	20	150							
Kipling											45	20	200
Kowhai						30	10	100					
Mahoe/Orsman/Matipo					50	100		35	50		400		
Main Road Stoke (Hays cnr - Louisson)							25		350				
Main Road Stoke (Louisson - Marsden)							25		650				
Manson Ave						50		250					
Manuka											45	20	500
Marlowe Street													
Marsden Valley Cemetery diversion						20	10	175					
Martin								50	20	250			
Marybank / Tresillian Ave						100	50	500					
Milton (Cambria - Grove)					25		200						
Montcalm St/Arrow St/Washington Valley Rd/Hastings		180	150		1,000	1,000	700						

Year		1	2	3	4	5	6	7	8	9	10	11	12
Long Term Plan		2015/25 LTP			2018/28 LTP			2021/31 LTP			2024/34 LTP		
Capital Projects	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27
Morrison/Hope/Alma/Buxton/Bridge													90
Mount/Konini				50			500			500			
Nayland Road / Galway		50	70										
Neale/Kea/Kaka/Railway Reserve													
Newmans Link					10				10	100			
Ngaio/Maitland						65	20	200					
Nile Street East / Clouston Terrace		50	500										
North Esk/Beccles		2											
Orakei/Tamaki/Rangiora intersection							30						
Paru Paru											10	10	100
Pateke							10	10	100				
Poynters Crs & Albert Road								15	20	150			
Public/Private Drains & Open Chanel Upgrade Programme							500	500	500	500	500	500	500
Railway Reserve - Saxton Rd West - Dryden Street		80	750			270							
Railway Reserve/Newall/Bledisloe/Louisson/Main Rd Stoke (West)							500						
Rangiora Tce					100								
Renwick / Wellington Street/Waimea Rd				50	50		100	100	100				
Riverside							30	10	100				
Rotoiti						30		100					
Russell Street Reserve					25	25	100						
Rutherford - Stage 1 - Girls College		80	50	250									
Rutherford - Stage 2 - Review of box culvert					150			250	100		1,000	1,000	
Sadlier/Hobhouse/Mules/Suter													50
Salt Water Creek/Haven Rd Culvert		5											

Year		1	2	3	4	5	6	7	8	9	10	11	12
Long Term Plan		2015/25 LTP			2018/28 LTP			2021/31 LTP			2024/34 LTP		
Capital Projects	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27
Seaton/Allisdair								50	200				
Shelbourne St (Bronte - #42)							50	150					
St Vincent St/Hastings St culvert		100	150	1,500	1,500								
Stafford Ave						30	20	150					
Stanley/Beachville		263											
Stansell (Pvte/Public)		138											
Suburban Club		34											
Tahuna Slope Risk Area		100	100	100	500	500	500						
Tasman (Bronte-Nile-Manuka)													
Tasman (Cambria - Grove)													
Tasman (Halifax-grove)													
Tidal Gates													
Totara/Hutcheson						10	10	100					
Trafalgar Square (Betts Carpark & up to 353 T/Sq)						70	100	750					
Tui Glen							35			135			
Vanguard Street Stormwater		50	50	300					50	250			
Viewmount/Ridgeway									25		150		
Wastney Terrace - South		881											
York Terrace									30		300		
Natural Hazards Risk Remediation						100	100	100					
Network Capacity Confirmation for Growth Areas									100	100	100	1,250	
Network Upgrades Nelson North													
Network Upgrades Nelson Central												800	800

Year		1	2	3	4	5	6	7	8	9	10	11	12
Long Term Plan		2015/25 LTP			2018/28 LTP			2021/31 LTP			2024/34 LTP		
Capital Projects	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27
Network Upgrades Nelson South													
Piping Ditches		50	50	50	50	50	50	50	50	50	50	50	50
Public/Private Drains		100	100	100	100	100	100	100	100	100	100	100	100
Private Drains / Subdvn (50% share)			50		50	50	50	50	50	50	50	50	50
Total ($,000s)		2,346	2,505	3,510	4,650	3,155	5,440	5,845	3,880	2,665	3,670	4,850	3,040

Table ES4: Flood Protection Operations and Maintenance.

Year		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Long Term Plan		**2015/25 LTP**			**2018/28 LTP**			**2021/31 LTP**			**2024/34 LTP**		
O&M Expense	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27
Administration		264	264	264	264	264	264	264	264	264	264	264	264
Mtce: Open Channel Programmed		2	2	2	2	2	2	2	2	2	2	2	2
Mtce: Open Channel Reactive		200	200	200	200	200	200	200	200	200	200	200	200
Depreciation		139	171	245	309	326	327	328	329	367	419	419	419
Total ($,000s)		605	637	711	775	792	793	794	795	833	885	885	885

Table ES5: Flood Protection Capital Expenditure Projection

Year		1	2	3	4	5	6	7	8	9	10	11	12
Long Term Plan		**2015/25 LTP**			**2018/28 LTP**			**2021/31 LTP**			**2024/34 LTP**		
Capital Projects	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27
Inventory of Rural Streams												100	150
Inventory of Urban Streams		600											
Secondary Flow Paths												50	50
Maitai River		100	100	100	2,000	2,000	1,000	1,000					
York Catchment Evaluation													
York Stream (below Waimea)		750	750	500	500								
York Stream - Lower												100	100
Fish Passage upper Brook St channel		50	50	250									
Brook Stream Outlet Low flow		50	50	250									
The Brook		85					100	100	500	500	500		
Hampden St East - Little Go Stream - Stage 1													
Hampden St East - Little Go Stream - Stage 2		4,000	700										
Flood mitigation		748	150	150	100	100	100	100	100	100	100		
Saxton Creek Upgrade		2,873	2,000	1,500									
Saxton Creek Culvert Upgrade		100	80						3,000	3,500			
Minor Flood Improvement Programme													
Main Rd Stoke/Poormans Stream/Culvert opp. Fire Station												50	250
Whakatu Drive (Storage World)		50	50	500									
Emano St channel (8may2014)									150	50	50	1,000	
Murphy Street(27June2014)												150	50
Global RC		50											

GROWTH AND DEMAND

Population Forecasts

The population of Nelson City in 2006 was 42,888 and 46,437 in the 2013 census. This is projected to increase to approximately 56,000 by 2045, using the projections from Statistics New Zealand completed in 2015.

The future demand drivers for the stormwater activity in Nelson City are expected to be:

- Population increase and the associated residential expansion into greenfield areas;
- Sustainability strategies outlined in Section 3.1;
- Ongoing requirements to maintain and enhance aquatic ecosystems and provide for recreational use of rivers and margins.

Council has a programme to review and enhance urban rivers and streams for a Q_{50} design capacity, which is the peak flow arising from a rainfall event with a likelihood of happening once in 50 years. Due to the proximity of existing properties, structures and land of high natural and recreational value, upgrading the margins of these rivers and streams, particularly the Maitai River, will not be straightforward. It is expected that a multi-disciplinary approach will be adopted for any proposed works.

One challenge for central Nelson's stormwater system is low-lying areas of reclaimed land in the central city. In some parts of town, particularly around Vanguard Street, seawater flows back up the system during very high tides, causing low level flooding. The likely impacts from climate change and sea level rise will need to be addressed by the mid 2000's before flooding and inundation issues begin to damage property in low lying areas.

The increasing awareness of climate change and increasing rainfall intensities will require an ongoing review of the impact of these on the programme of stream and river upgrades. Recent extreme events in excess of Q_{50} have lead to the need to review the minimum design standard and consider whether this should be increased to Q_{100} (1% probability of occurrence in any year). Further upgrading of the streams and rivers will be required as a result.

Demand Management

Demand management is aimed at modifying customer behaviour and demand to assist in deferring the need for new assets and optimise the performance and utilisation of the existing assets, thus reducing or eliminating the need for capital expenditure.

While the goal of demand management is supported in principle, any modification to stormwater demand in the city has to be looked at in the context of serious land slippage that occurred to hillsides during the low intensity/long duration rain event in December 2011.

To progress this, Council will need to work on a range of strategies associated with operations, regulations and education to manage the demand for stormwater services and the requirement for additional infrastructure.

- Low Impact Design – onsite processing/ detention reduces the burden on the reticulation network in some areas of the city;
- Promote public education on the role that maximising the day to day use of rainwater plays in stormwater reduction;
- Develop changes to the Nelson Resource Management Plan requiring minimum levels of on-site rainwater detention in appropriate zones and minimising levels of impervious surfaces.

IDENTIFYING AND MINIMISING RISKS

Council's Stormwater Risk Management Strategy is in its formative stage. Council is progressing down the path of completing, implementing and maintaining risk plans for the principal utility asset systems to minimise the likelihood of non-achievement of critical business objectives. The risk factors that have been assessed to have an extreme or high level of risk are associated with the following:

- Flood events;
- Secondary flow paths;
- Stormwater contamination.

With the exception of the impact of a greater than Q_{15} flood event on the pump stations, most identified extreme or high risk events have an existing or proposed mitigation strategy to reduce them to an acceptable level.

Risk assessment is carried out by considering possible impacts of failure of a component using the following criteria: health and safety, public health, asset performance, environmental and legal compliance, historical or cultural, financial and public perception (see Appendix E).

ASSET MANAGEMENT PRACTICES

The 'Core' Asset Management planning criteria of this manual was prepared by the New Zealand Auditor General in 2005 and is recognised as a standard minimum compliance for activity management provisions in the New Zealand Local Government Act 2002. The 'Advanced' criteria describe Audit expectations for the management of complex and high value infrastructure with high associate risks. Increasingly asset management for a city the size of Nelson is seen to be a mix of "Core" and "Advanced" practice, described as "Core Plus", depending on the function and resources available.

CONCLUSION

The Community and Council agree that the Council's stormwater assets are of strategic importance and essential to the well-being of the community. To ensure the ongoing well-being of the community the activity must be sustainable for the environment and for future generations. This will be achieved through the long-term planning that has been shown, the mitigation of known risks, the management of discharges from the activity, and the quantification of the future demands.

1. INTRODUCTION

This section sets out the philosophy for the ongoing operation and development of the Nelson City Council Stormwater Service and the scope and layout of this Asset Management Plan.

1.1 PURPOSE OF THE PLAN

Purpose of this Stormwater Asset Management Plan is to support the goal of the stormwater activity by ensuring that assets are operated and maintained, so that they provide the required level of service for present and future customers in a sustainable and cost effective manner.

The content of the Asset Management Plan further supports the purpose by:

- Demonstrating responsible, sustainable management and operation of stormwater assets which represent a significant, strategic and valuable asset belonging to Nelson City.
- Justify funding requirements.
- Demonstrating regulatory compliance under, Section 94(1) of the Local Government Act 2002 which in summary requires the Long Term Council Community Plan to be supported by:
  - Quality information and assumptions underlying forecast information.
  - Framework for forecast information and performance measures are appropriate to assess meaningful levels of service.
- Demonstrating clear linkage to community agreed outcomes with stated levels of service.

The overall objective of Asset Management planning is to:

Deliver the required level of service to existing and future customers in a sustainable and cost effective manner.

The contribution of stormwater services to the Community Outcomes and Asset Management objectives will be seen through:

- Meaningful stakeholder consultation to establish service standards.
- Implementing a programme of inspections and monitoring of the network to assess asset condition and performance.
- Undertaking a risk based approach to identify operational, maintenance, renewal and capital development needs, and applying economic analysis techniques to select the most cost effective and sustainable work programme.
- Ensuring services are delivered at the right price and quality.
- Achieving the appropriate level and quality of asset management practice.
- Continuing programme of capital works.

1.1.1 Key Stake Holders

The plan recognises the following external and internal key stake holders:

Table 1-1: Key Stake Holders

Key Stakeholders	Main Interests
External Stakeholders	
Residents and ratepayers	Public health and safety, service reliability, environment, cost.
Industrial and commercial users	Public health and safety, service reliability, environment, cost.
Nelson Marlborough District Health Board	Public health and safety, environment.
Nelson City Council (unitary authority)	Environment.
Government agencies (MoH, MoE, Audit New Zealand)	Public health and safety, service reliability, environment, cost.
Tangata Whenua	Kaitiakitanga, environment, cultural heritage, public health and safety.
Consultants, Contractors and suppliers	Procurement, technical, projects/programmes.
Internal Stakeholders	
Councillors and Sub-committees	Public health and safety, service reliability, environment, cost.
Staff	Public health and safety, service reliability, environment, cost.

1.2 HOW THIS PLAN WILL BE USED

This plan will provide the substantiation for budget forecasts put forward in the Long Term Plan (2015-2025) for stormwater collection and disposal and flood protection. Nelson City Council will:

- Implement a continuous improvement approach to asset management planning in the short term.
- Fully review the Asset Management Plan three-yearly in advance of the Long Term Plan. Annual amendments or updates will be undertaken if significant asset management changes occur.
- Report variations in the adopted annual plan budgets against the original asset management plan forecasts and explain the level of service implications of budget variations.

1.3 ASSET DESCRIPTION AND ASSETS INCLUDED IN THIS PLAN

1.3.1 Asset Description

The Nelson City Council manages the provision of a stormwater system for the residents of Nelson City minimise damage to most urban properties, roads and land from stormwater flooding. The current priorities of Nelson City Council are to manage flooding, reduce the infiltration of stormwater into the wastewater system, and take measures to protect the natural environment.

The Nelson City Council stormwater system can be categorized into two parts – a natural component and a constructed stormwater system. The natural part consists of rivers and streams that play an important role in the support of aquatic ecosystems, areas for recreation and public use and the channelling of stormwater flows in rainfall events. During high rainfall events the rivers and streams transport large volumes of water and sediment with impressive levels of energy that are capable of causing significant damage to property adjoining these areas and within the flood path, should the flow escape the channel on the adjacent flood plains.

The constructed stormwater network provides water channels to drain stormwater and flows from properties in the built up areas. The network includes pipes, channels, and overland flow paths that convey stormwater to receiving water courses or the sea. The stormwater system also incorporates pump stations and some detention systems. In many parts of the city a fully reticulated system is not provided and individual

properties discharge stormwater to onsite soakage or to the road channel as part of the primary drainage system.

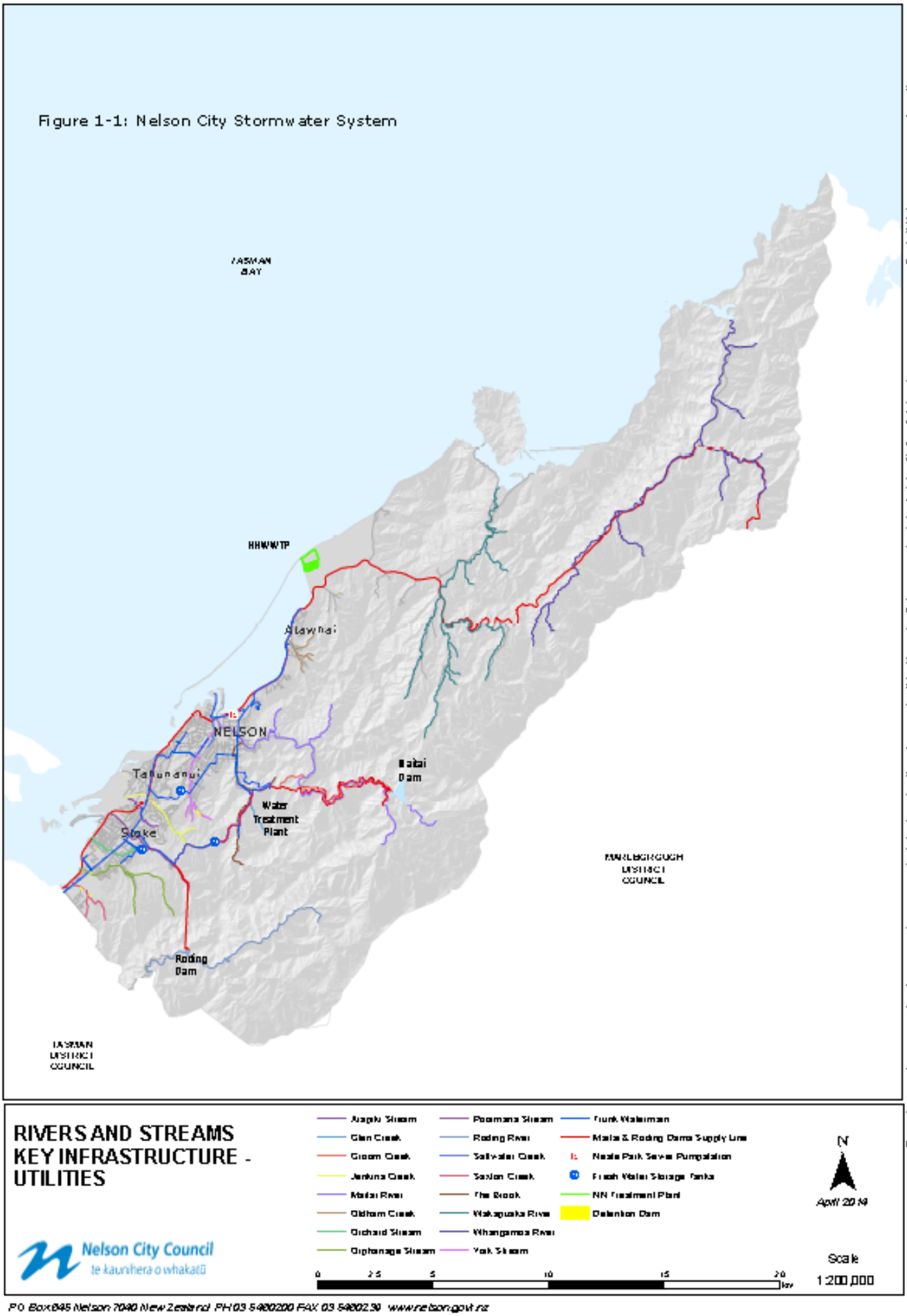
The extent of the Nelson City Council stormwater system is detailed in Figure 1-1 below and discussed in detail in Section 5 – Lifecycle Management.

The inventory of public stormwater services assets owned by Nelson City Council and managed by the Infrastructure division is shown in Table 1-2. This indicates the extent of the stormwater service and indicates that the replacement value is a significant investment within the community.

Table 1-2: Summary of Stormwater Services Assets (June 2014)

Asset Category	Quantity	Unit	Replacement Value $
Stormwater			
Mains Up To 600mm	159.4	km	75,557,050
Mains > 600mm	40.5	km	47,371,923
Channels	1.2	km	251,352
Culverts	5.8	km	16,554,691
Rocks Road Culvert	0.3	km	3,039,409
Tide Gates	24	No	175,509
Intakes	93	No	526,970
Manholes	4,404	No	20,324,201
Outfalls (with wing walls)	77	No	394,041
Sumps	593	No	1,384,972
Pump Stations	2	No	3,343,711
TOTAL			168,923,829
Flood Protection			
Bank Protection	59,222	m^2	11,978,760
Detention Dams	9	No	1,645,220
TOTAL			13,623,980

Figure 1-1: Nelson City Stormwater System



PO Box645 Nelson 7040 New Zealand PH 03 5460200 FAX 03 5460230 www.nelson.govt.nz

1.4 STORMWATER SERVICES ISSUES FOR THE PERIOD 2015 TO 2025

Council's priorities between 2015 and 2025 for the stormwater and flood protection activity will focus on the following areas:

- Maitai River flood capacity and protection of the central business district from the Maitai river, Brook stream and York stream flood flows;
- Stormwater channels (small open ditches and drains) on private properties that carry some stormwater from public spaces such as roads, parks and reserves need to be inspected and maintained. Secondary flow paths when rivers, streams and pipes are full need to be identified and landowners made aware of the need to keep clear (City wide);
- Te Tau Ihu Settlement Legislation;
- Climate change and the capacity of urban rivers and streams.

  Move to Q_{100} (1% probability of occurrence in any year) plus 500mm freeboard for Orphanage Stream/SaxtonCreek/Saxton Field bunding, York Stream, Little-Go Stream);
- Natural Hazard Security of the network in light of the recent Canterbury Earthquakes and storm events, including wider network hazards- Earthquake fault line and liquefaction;
- Capital Works. Prioritisation of new stormwater works to areas without reticulation. Slip areas/ Tahuna slope risk overlay /flood areas/with other projects. Issues with Low Impact Design (Poor performance in some soils/poor test results from percolation testing/horizontal flow issues across boundaries) and slips on hillsides from Dec 2011 event;
- Complete recovery works following extreme rainfall events in December 2011 and April 2013 (Intake structures/ gravel removal/rock protection);
- Freshwater Quality improvement.(National Environment Standards / Central Government freshwater reforms);
- Sustainable development. Nelson 2060;
- Rural rivers (Operations &Maintenance/protection works/rating);
- SCADA (Supervisory Control And Data Acquisition). Review and upgrade of radio telemetry;
- 30 year Infrastructure Strategy signalled in the Local Government Act 2002 Amendment Act 2014.

2. LEVELS OF SERVICE

The levels of service provision for the stormwater activity are defined in this section as are the performance measures by which the service levels will be assessed. The service levels are aimed at meeting the community outcomes and the goals.

This section also contains information on the customer research undertaken and the legislative requirements adhered to in arriving at the levels of service.

2.1 RATIONALE FOR COUNCIL'S INVOLVEMENT

The Council provides stormwater and flood protection facilities for the following reasons:

Health and Safety / Property Protection

Large parts of Nelson City occupy a narrow band of land wedged between the sea and low foothills, with the majority of development taking place in areas close to or influenced by rivers and streams. The provision of a robust stormwater system allows people to carry out their day to day lives with minimal disruption or adverse health effects from rainfall events or ponding.

Protection of Environment and Community Well-being

The natural stormwater system comprises vegetation and ground soakage with overflow to rivers and streams in high rainfall events. For the majority of time, rivers and streams sustain aquatic ecosystems and are increasingly linked to private properties and recreation activities, particularly for the larger rivers, by the residents of the City. This system is also where the bulk of materials washed from roads and private properties in the City first contact the aquatic ecosystem.

As the development of the City encroaches onto historical flood plains the multiple demands on the available river and stream areas needs to be balanced to ensure the [i]long term best possible outcome for the City.

Legislative Requirements

The Nelson City Council is a local authority established under the Local Government Act 2002 (the Act) with purpose and responsibilities set out in the Act. In particular the purpose is as follows:

10 Purpose of local government

(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.

and the Act further defines core services to the community as:

11A Core services to be considered in performing role

In performing its role, a local authority must have particular regard to the contribution that the following core services make to its communities:

(a) network infrastructure:

(b) public transport services:

(c) solid waste collection and disposal:

(d) the avoidance or mitigation of natural hazards:

(e) libraries, museums, reserves, recreational facilities, and other community infrastructure.

14 Principles relating to local authorities

(1) In performing its role, a local authority must act in accordance with the following principles:

(a) a local authority should—

(i) conduct its business in an open, transparent, and democratically accountable manner; and

(ii) efficient and effective manner:

(b) a local authority should make itself aware of, and should have regard to, the views of all of its communities; and

(c) when making a decision, a local authority should take account of—

(i) the diversity of the community, and the community's interests, within its district or region; and

(ii) the interests of future as well as current communities; and

(iii) the likely impact of any decision on the interests referred to in subparagraphs (i) and (ii):

(d) a local authority should provide opportunities for Māori to contribute to its decision-making processes:

(e) a local authority should collaborate and co-operate with other local authorities and bodies as it considers appropriate to promote or achieve its priorities and desired outcomes, and make efficient use of resources; and

(f) a local authority should undertake any commercial transactions in accordance with sound business practices; and

(fa) a local authority should periodically—

(i) assess the expected returns to the authority from investing in, or undertaking, a commercial activity; and

(ii) satisfy itself that the expected returns are likely to outweigh the risks inherent in the investment or activity; and

(g) a local authority should ensure prudent stewardship and the efficient and effective use of its resources in the interests of its district or region; and

(h) in taking a sustainable development approach, a local authority should take into account—

(i) the social, economic, and cultural interests of people and communities; and

(ii) the need to maintain and enhance the quality of the environment; and

(iii) the reasonably foreseeable needs of future generations.

(2) If any of these principles conflict in any particular case, the local authority should resolve the conflict in accordance with the principle in subsection (1)(a)(i).

2.2 GOAL FOR STORMWATER

The District and the community outcomes have been developed to provide a link between community issues and the current stormwater goal.

Goal of the Stormwater and Flood Protection Activity

Council provides a stormwater and flood protection system to prevent harm to people and property, contribute to community wellbeing and protect the environment from uncontrolled stormwater discharges.

Council is aware that reducing the flood risk to residents and businesses to the same standard in all stormwater catchments may not be affordable or appropriate. A design level for example of a 1 in 100 year event for high commercial areas may not be the right response for a rural area. Council has to balance priorities between different activities, as well as balancing competing priorities within the stormwater activity. There will always be a tension between design, risk factors and cost.

The 1996 Draft Strategic Plan set the Council's stormwater goal and identified a prioritisation of projects for the following 20 years. Council wanted to achieve two key items:

- Good control of surface water throughout the city.
- Improved community awareness of the environmental effects and the possible expense of careless disposal of contaminated waste in the stormwater system.

This Asset Management Plan updates the goal, reports on the issues surrounding the goal and identifies work necessary to meet the goal.

The Wastewater Asset Management Plan will be reviewed in conjunction with the Stormwater and Flood Protection Asset Management Plan (the stormwater system can have a significant impact on the wastewater system and its ability to comply with the required levels of service).

2.3 COMMUNITY OUTCOMES

Councils are required by the Local Government Act 2002 to have Community Outcomes – a statement of the measures of success that Council is working to achieve for the community. Council's community outcomes are set out in the Long Term Plan 2015-25.

Levels of service within this Plan have been developed with the objective of assisting Council in achieving the community outcomes and the priorities by linking with the following four Community Outcomes:

Table 2-1: Link between Community Outcomes and the Stormwater Activity

Community Outcome	How this Council activity contributes to the outcome
Our unique natural environment is healthy and protected	Nelson's environment is protected by an efficiently managed stormwater network that minimises damage to open spaces from rainfall events. Works to support the stormwater assets are managed as far as possible to respect the natural, recreational and heritage values that might be present.
Our urban and rural environments are people-friendly, well planned and sustainably managed	Homes, facilities and people are protected from the adverse effects of rainfall events by a well managed stormwater network.

Our infrastructure is efficient, cost effective and meets current and future needs	A good quality, sustainable and affordable stormwater network meets the needs of our current and future community.
Our region is supported by an innovative and sustainable economy	Impact on businesses and economic activity are minimised by understanding and managing the stormwater network to protect people and property.

Link between Community Outcomes and the Flood Protection Activity

Community Outcome	How this Council activity contributes to the outcome
Our unique natural environment is healthy and protected	Nelson's environment is protected by an efficiently managed flood protection network that minimises damage to open spaces from flooding events. Works to support the flood protection assets are managed as far as possible to respect the natural, recreational and heritage values that might be present.
Our urban and rural environments are people-friendly, well planned and sustainably managed	Homes, facilities and people are protected from the adverse effects of rainfall events by a well managed flood protection network.
Our infrastructure is efficient, cost effective and meets current and future needs	A good quality, sustainable and affordable flood protection network meets the needs of our current and future community.
Our region is supported by an innovative and sustainable economy	Impacts on businesses and economic activity are minimised by understanding and managing the flood protection network to protect people and property.

2.4 LEGISLATIVE REQUIREMENTS

The legislative requirements form the minimum level of service as Council is required to comply. It does not necessarily mean that all levels of service are covered within the legislation. The stormwater activity is influenced by the following legislative requirements.

The Local Government Act 2002: Defines the purpose of local authorities as enabling local decision-making by and on behalf of the community, and allows local authorities the power of general competence.

The Local Government Act 1974: Provides the authority for Nelson City Council to construct, operate and maintain the Wastewater, Water and Stormwater System.

The Health Act 1956: Places an obligation on Council to improve, promote and protect public health within the District. The provision of Stormwater services helps to promote and improve public health.

The Resource Management Act 1991: Governs all water discharges. Discharges to waterways and land occur through stormwater discharge. Resource consents currently being obtained for discharge activities will likely require parameters such as volume and quality to be monitored as well as taking steps to mitigate any adverse affects that may occur through the activity.

Health and Safety in Employment Act 1992: Council must ensure the safety of the public and all workers (including contractors) when carrying out works.

Soil Conservation and Rivers Control Act 1941

2.5 THE ROLE OF COUNCIL

Council is responsible for the provision of reticulation and disposal of stormwater from public drains along with planning and management functions.

Council also has a role in regulation and enforcement of the existing legislative and regulatory framework, including bylaws, to ensure members of the community act appropriately.

2.6 CUSTOMER RESEARCH AND EXPECTATIONS

2.6.1 Background

While the Long Term Council Community Plan consultation process incorporates the Levels of Service associated with the stormwater activity, Nelson City Council has also undertaken a range of consultation processes over the past nine years specifically targeted at gathering information on preferred levels of service or the extent of infrastructure that Council has/will be required to install. The extent of the historical and additional proposed consultation is detailed in Table 2.2 below.

Table 2-2: Stormwater Consultation Processes

Consultation Processes	Date	Reasons for Consultation	Extent of Consultation	Applicable to which Customer Value
Historical				
2006-2016 Long Term Council Community Plan process	2006	Legislative requirement criteria of Local Government Act 2002.	Public, business and Industry submissions requested. Advertising in local papers. Submissions heard and considered.	The criteria detailed in the 2006 Long Term Council Community Plan: Environmental quality Efficiency Effective planning Customer approval Effectiveness
Sustainability Policy	2008	Instigation of the Councils sustainability policy.	Special Consultative Process.	Sustainability
Water and Sanitary Services Assessments	2005	To meet sanitary services assessment criteria of Local Government Act 2002.	Consultation via the Long Term Council Community Plan for acceptance of the assessment. Consultation with Medical officer of Health and local iwi.	Reliability Capacity
Stormwater Bylaw2006	2006	Review of Bylaw.	Public, business and Industry submissions requested.	Sustainability
Annual Residents' Survey	Every year since 1998	Rate satisfaction with services provided by Council.	300-400 residents surveyed by telephone.	N/A
2012-2022 Long Term Plan process	2012	Legislative requirement criteria of Local Government Act 2002.	Public, business and Industry submissions requested. Advertising in local papers.	Sustainability Reliability Capacity Responsiveness

Consultation Processes	Date	Reasons for Consultation	Extent of Consultation	Applicable to which Customer Value
2015-2025 Long Term Plan process	2015	Legislative requirement criteria of Local Government Act 2002.	Public, business and Industry submissions requested. Advertising in local papers.	Sustainability Reliability Capacity Responsiveness

2.6.2 Water and Sanitary Services Assessments

The aim of the Water and Sanitary Services Assessments is to enable the Council to gain an overview of the Water and Sanitary Services within its district to help plan and prioritise for any improved level of service and to consider its obligations as a Unitary Authority.

2.6.3 Residents' Survey

Every year since 1998, a comprehensive survey is undertaken which, among other things, helps to establish relative priorities among the significant activity areas for Council and measures the level of satisfaction with Council performance in each of these areas.

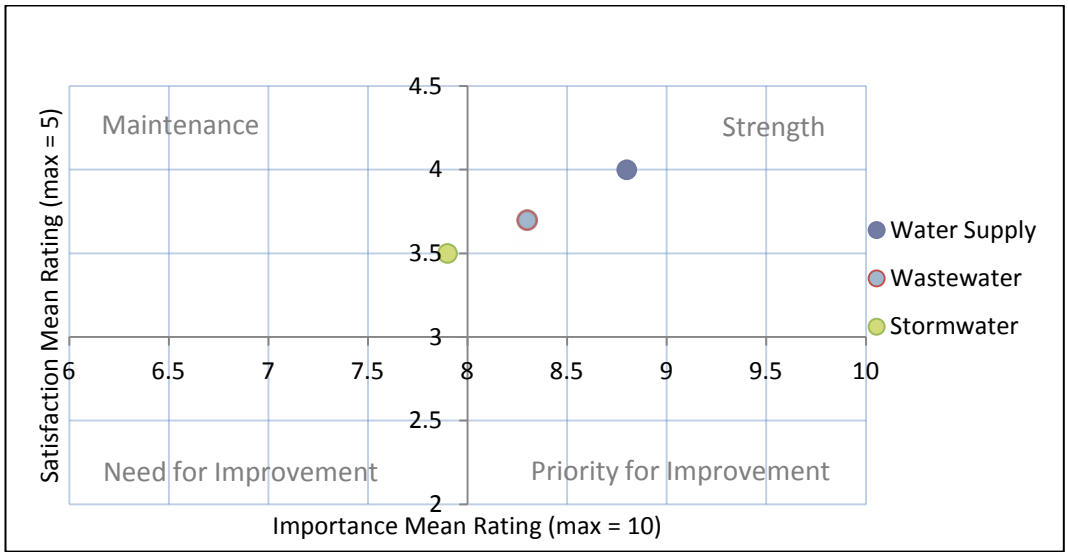
Note: The maximum margin of error on a sample size of 400 is ±4.9% (95% confidence level).

Importance Priority

The survey in 2011 rated stormwater and flood protection ninth out of the 14 Council groups for "Most Important". Water Supply, Sewage Disposal, Environmental Management, Waste Management and Transport are considered relatively more important than other significant activity areas in contributing to quality of life of Nelson residents (pattern similar to the 2004 survey). The 2008 survey rated satisfaction with Council's provision of a stormwater service as 81% satisfied or very satisfied and 11% dissatisfaction, a mid-range level.

In 2009 the survey questions changed from a 4 choice answer (Very Satisfied, Fairly Satisfied, Not Very Satisfied, Don't know) to a 5 choice answer (Very Satisfied, Satisfied, Neither, Dissatisfied, Very Dissatisfied, Don't know), therefore the results from the 2010 residents survey are not directly comparable to the previous years.

Figure 2-1: Relative Priorities in Council's Different Water Utility Areas from 2010 Residents Survey Results This figure will be updated as part of the first AMP review



2.7 LEVELS OF SERVICE

The Level of Service (LOS) is the qualitative categorisation of a particular service area. In providing stormwater services to the community, Council must balance the standard of service desired with the cost of providing the service. The LOS are designed by Council to represent the best level of service possible for a cost that the community can afford and is willing to pay.

The Levels of Service indicated in the 2015-2025 Long Term Plan and the earlier Stormwater Asset Management Plans are detailed in Appendix F.

It should be noted that LOS are not intended as a formal customer contract. Rather Council's responsibility is initially to aim to achieve these levels and then to achieve them more cost effectively through a process of improvement where it can be met within current budgets.

The Levels of Service for Nelson City Council stormwater infrastructure are specified for the following values:

- Sustainability
- Capacity
- Reliability
- Responsiveness

The above four customer values are detailed in Section 2.7.1 to Section 2.7.4 below.

2.7.1 Sustainability

Resource Consent Compliance for Stormwater Discharges from the Reticulation

Council has recently received resource consent for the discharge of stormwater to freshwater. A key condition of the consent is ongoing monitoring of the quality of stormwater discharges from various catchments in the city.

Where a stormwater drainage system exists there is a potential for contaminants to be collected and concentrated at the point of discharge. Many of the contaminants transported by stormwater systems from the land are toxic and do not readily break down. The four major contaminants are sediments, heavy metals, oils/petroleum compounds and nutrients/bacteria.

These contaminants can become attached to the sediments in the stormwater run-off, then accumulate in areas where the sediments settle, such as river gravel banks and the semi-enclosed Nelson Haven. When sufficient contaminants accumulate in a receiving environment the flora and fauna can be adversely affected. Where there is sufficient river or tidal flow, the sediments are transported to the sea.

Pollution Monitoring: Nelson City Council and Port Nelson have a long term Water Quality Monitoring Programme, established in 1996. This monitoring programme focuses on chemical contamination in sediments from sites within the Port and the lower Maitai River.

Nelson's bathing areas at Monaco and Tahunanui were classified as "Satisfactory" for swimming most of the time. Exceptions to the classifications may include periods following rainfall where stormwater washes waste material into the Haven. Such beaches are monitored regularly throughout the summer season and warning signs are erected if water quality deteriorates. Atawhai was classified as poor and Cable Bay as fair. Further research is required to better isolate the reasons for these results.

Nelson City Council has carried out surveys of stormwater discharges from various Nelson City catchments. The studies indicate significant degradation of water quality in the urban areas of Nelson City which could be classified as moderately to severely disturbed ecosystems. This degradation is consistent with that expected for an urban environment.

The Reticulated Stormwater Quality Improvement Plan 2006: Is a requirement of the Nelson Resource Management Plan if discharges from Council's stormwater

infrastructure are to be considered as a controlled activity. The relevant Plan rule, FWr.22 states:

"Nelson City Council's point source stormwater discharges to water are a controlled activity if a reticulated stormwater quality improvement plan is provided in the discharge application which outlines how best practicable options will be used to control discharges to the Council's stormwater infrastructure."

The Plan discusses a range of options available to control the quality of discharges into Council's stormwater infrastructure. The plan includes proposals and procedures to reduce contamination of stormwater discharges from:

- Roads and carparks
- Industrial and commercial activities
- Construction activities controlled through the Nelson City Council Stormwater Bylaw 2006

Catchment Management Plans: are a guide to the future management of the individual catchments and their associated rivers and streams. Catchment Management Plans set out the strategies needed to manage the catchment in a way that meets the aspirations of its stakeholders. Catchment Management Plans:

- Assist with compliance with future resource consents for discharge of urban stormwater runoff and its associated contaminants at multiple locations.
- Assist and support planning and decision making processes undertaken by the Nelson City Council and catchment users.
- Identify current and potential problems relating to stormwater within a catchment and identify options to address these problems.
- Build upon previous work detailed in the Reticulated Stormwater Quality Improvement Plan 2006 and the monitoring of the environment i.e. estuarine/coastal waters and associated sediments.
- Document the management objectives and procedures used by Nelson City Council in the administration, management and operation of the stormwater activity.
- Ensure that stormwater is managed in accordance with Nelson City Council requirements.
- Present new design philosophies for new stormwater infrastructure which are to be implemented through the use of the Nelson City Council Land Development Manual.
- Present operational philosophies for new and existing stormwater infrastructure i.e. installing stormwater filters in catchpits to collect the litter and sediment before it reaches the beaches or new techniques for stormwater quality improvement that use the natural features of a site.
- Ensure Nelson City Council stormwater systems, both primary and secondary, provide the agreed level of property and dwelling protection against stormwater flooding.

Nelson City Council will be developing catchment management plans on a priority based methodology over the next ten years.

Stormwater Regulatory Compliance

A review of the Land Development Manual is currently underway. There will be changes to the regulatory framework and compliance against that will be assessed.

2.7.2 Capacity

Managing Stream Floods

The design of the main channel for minor streams and rivers for a 1 in 50 year flood event with a minimum 400mm freeboard is in the Nelson City Council Land

Development Manual 2010 and has historically been considered adequate for the Nelson region.

Rivers and larger streams are the primary stormwater transport mechanism in the Nelson City urban area and significant sections are enhanced and maintained by Council to ensure adequate protection from flooding.

An annual inspection of the rivers and streams occurs in October each year (weather permitting). This inspection identifies the annual scheduled maintenance programme required for each river.

Maitai River Flood Capacity and Protection of the Central Business District

The Maitai River, Brook Stream and York Stream are the major watercourses that impact on the central business district. Flooding from these channels can impact on most areas of central Nelson. In order to inform options for management, computer models of these water courses are being constructed. These models can then be used to investigate flooding patterns for any rain event and look at the effectiveness of upgrade options.

The Maitai River has undergone limited upgrading in the lower reaches to allow for extreme flood events. Council has recognised the need to further develop a range of solutions in the upper residential reaches where development and recreational uses increase the complexity of flooding response. An updated flooding model has now been completed for the full length of the Maitai River. This model is being used to investigate the areas where flood waters escape the current river channel and model the possible impacts of future climate change and sea level rise.

The focus is on assessing what response may be appropriate based on risk. The first step is discussions with the community about the aspects of the Maitai River that are considered to be critical to retain.

The Brook Stream is a mix of natural and concrete lined channels, in an increasingly urbanised environment, from the intersection point with the Maitai River to the headwaters above the Brook Motor Camp. There is very limited flow information available for the stream, which has an impact for the Maitai flood protection investigation, as well as initiatives for the Brook stream itself, such as the improvement of the concrete channel section for fish passage. In 2013 Council, through its hydrology contract with Tasman District Council, installed flow monitoring equipment within the concrete channel section. The next step is to begin developing a computer model of the concrete section of the channel to look at options for creating a more natural channel environment and evaluating flood capacity into the future.

York Stream is also a mix of natural and modified channels. Upper reaches are controlled by three detention dams in the Bishopdale area and with culverted and open channel sections to Victory School. Council has begun construction of a large diameter pipeline from the York Stream intake at the Bishopdale reserve to the open channel section in Tipahi Street. This pipeline has been designed to cope with a Q_{100} (1% probability of occurrence in any year) flow event.

The area from Victory School to the sea is fully enclosed in a box culvert. Flows in excess of the various open channel/culvert capacities must flow overland through the lower Bishopdale/Vanguard Street/St Vincent Street areas to Saltwater Creek.

Currently Council is reviewing the capacity of the main culvert networks in Vanguard Street and St Vincent Street prior to starting work on a computer model that will enable a more accurate assessment of overland flow issues in the area.

Install Reticulation System to meet Q_{20} Rainfall

The design of the reticulation system for a 1 in 15 year flood event, with the provision of suitable secondary flowpaths to carry flood flows in the event of a less probable storm is in the Nelson City Council Land Development Manual 2010. The number of

more extreme rain events over the past three years has lead to a review of the current standards and the proposed incorporation of Q_{20} in the revised NCC Land Development Manual.

The Nelson City Council Land Development Manual 2010 states that reticulation systems are designed to a Q_{15} standard and specified rivers and streams to a Q_{50} standard. This standard generally requires the reticulation Q_{15} hydraulic grade to be above the river and stream Q_{50} level at its outfall.

Where this is not possible, consideration shall be given to the Q_{15} hydraulic grade line for the reticulation outfall to be lowered to the river or stream Q_{15} level. Consideration is given to the difference in time of concentrations between the reticulation catchment and the river or stream catchment as this difference will provide an indication of the likelihood of combined peak flows occurring at the outfall.

In flatter areas of the city this design criteria has proved impracticable. In these situations, consideration for the Q_{15} hydraulic grade line of the reticulation outfall to be lowered to the river and stream Q_5 level is possible. This can lead to submerged outfalls and the greater probability of surface flooding.

A move to Q_{20} as the standard for reticulation and a greater emphasis on culvert inlet design and secondary flow paths is expected to improve surface flooding in the long term.

Effects of Stormwater Runoff

The emphasis of the existing stormwater management is mainly to address flooding of properties, roads and provide erosion control. The management and design by Nelson City Council is guided by the levels of service, the Nelson Resource Management Plan and the Nelson City Council Land Development Manual 2010.

An integrated combination of measures is used to manage the effects of stormwater runoff that include:

- A ***primary stormwater system*** is designed to minimise nuisance flooding by collecting and discharging stormwater, resulting from moderate rainfall into streams and other watercourses. The primary stormwater system comprises pipes, culverts, open drains, channels, rivers and streams. A ***secondary stormwater system*** generally comprises overland flowpaths through private property and along roadways designed to convey excess floodwater with a minimum of damage when the primary stormwater system is overloaded. The provision of secondary flowpaths recognises that it is impractical to provide a primary system that can cope with extreme rainfall events.

- ***Planning and building controls*** such as restrictions on buildings in high flood risk areas and minimum floor heights for residential buildings play an essential part of stormwater management by ensuring buildings are sited clear of areas that are at risk of flooding and inundation and that an adequate level of stormwater protection is able to be practically, reliably and affordably provided to new developments.
- ***Regulatory interventions*** are intended to minimise the entry of pollutants to the stormwater system.
- A variety of ***traps*** in the stormwater system designed to reduce the quantities of contaminants that are discharged to water bodies.

2.7.3 Reliability

Minimise Stormwater Blockages within Reticulation

A 24-hour callout system provides a prompt response to any stormwater blockage. If the blockage is within the private section of the system and the landowner still wants the repair carried out then the Council's Maintenance Contractor will carry out the work and invoice the landowner directly.

2.7.4 Responsiveness

Reliable and Timely Response to Service Requests and System Failures

Generally system failures within the reticulation system are reported by the public. Whatever the means of reporting, it is important that response to failures is prompt to maintain public health and to avoid potential damage. Table 2-4 sets out the response times for system failures that are detailed in the maintenance contract with Nelmac.

Table 2-4: System Failure Response Times

Circumstance	Investigation and Appraisal	Complete Repair
Clearance of obstructions from inlet structures, watercourses and outlet structures.	1 working day	2 working days
Repairs to intake and deep trap grills including replacement.	1 working day	5 working days
Other non-urgent works.	N/A	10 working days
Blocked inlet structures during rain.	30 minutes	1 hour
Flooding and overtopping of streams and rivers.	30 minutes	1 working day
Other emergency work.	30 minutes	1 working day

Review of the existing reporting processes and procedures from Hansen and maintenance contractors will be instigated to ensure that the appropriate LOS, and asset management reporting is available.

2.8 FUTURE LEVELS OF SERVICE TARGETS

To enable future LOS targets to be achievable, additional data, modelling and analysis are to be carried out over the next ten years. Targets for the long term will be considered and consulted on in conjunction with the Long Term Plan process.

The effects on the existing LOS by the Council's Sustainability policy review might be extensive. There may also be significant funding implications in the future.

Table 2-5 outlines the proposed levels of service for 2015-25. Appendix F includes the Levels of Service from the 2012-2022 Long Term Plan, 2009-2019 Long Term Council Community Plan, 2006-2016 Long Term Council Community Plan and 2003 Stormwater Asset Management Plan.

Table 2-5: Proposed Levels of Service 2015-2025

	What Council will provide	Performance Measures	Targets			Targets in Years 4-10
			Year 1	Year 2	Year 3	
Stormwater	**Environmental Protection** **For the built and natural environment from stormwater discharges**	Level of compliance with resource consent conditions	100% compliance	Maintain	Maintain	Maintain
		Stormwater network extended throughout the city	Complete 80% capital expenditure programme	Maintain	Maintain	Maintain

	Reliability **An operational stormwater network**	Number of blockages per 100 km of pipes on an annual basis Number of flooding events	Less than 25 blockages per 100km of pipes on an annual basis No damage from flood events up to Q2 level to more than 10 per 1000 properties per year	Maintain	Maintain	Maintain
	Contractor response **Provide a prompt, reliable and timely response to service requests and system failures**	Time that contractors take to respond to events	Contractor to meet maximum response times under the contract	Maintain	Maintain	Maintain
	Response to complaints	Number of complaints per 1000 connections per year	No more than 25 complaints per 1000 connections per year	Maintain	Maintain	Maintain
Flood Protection	**Protection for the urban built and natural environment from floods through upgrading, maintaining, repairing and renewing assets to standards in the Flood Protection Asset Management Plan**	Damage to urban property from stream flooding is minimised	Urban sections of streams are inspected and maintained annually	Maintain	Maintain	Maintain
		Damage to urban property from Maitai River flooding is minimised	Urban section of Maitai River is inspected and maintained annually	Maintain	Maintain	Maintain
	Integration of ecological and flood protection requirements in urban sections of streams and rivers	Fish passage in streams is maximised and ecological impact of structures is minimised	Complete review of fish passage to Brook Street concrete channel	Undertake design of preferred option to improve fish passage to the Brook Street channel	Begin review of fish passage to remainder Brook Street channel	Fish passage in streams is maximised and ecological impact of structures is minimised
		Channel maintenance works carried out in accordance with resource consents	100% compliance with resource consent conditions	Maintain	Maintain	Maintain

3. FUTURE DEMAND

This section outlines the existing demand, demand forecasts, growth and expectations and the demand management strategies that Council utilise.

3.1 EXISTING SITUATION

3.1.1 Background

The population of Nelson City in 2011 was 46,200 and projected to increase to approximately 56,000 by 2045. The future demand drivers for the reticulated stormwater activity in Nelson City will be:

- Enhancing streams and rivers and installation of reticulation to existing streets.
- The significant population increase projections and residential expansion into greenfield areas.
- Sustainability strategies that include inflow and infiltrationreduction.
- Stormwater Catchment Management Plan requirements to support freshwater quality improvements.

The effects and consequences of the above four areas are discussed in more detail in the following sections.

3.2 CITY GROWTH FORECAST

Future Growth

Council is concentrating on providing services to areas that are zoned for development (Residential, Rural Zone High Density Small Holdings, Suburban Commercial, Industrial) but are covered by the Services Overlay because one or more servicing constraints have been identified as needing to be addressed prior to the development of that property/area. The projects to facilitate future growth identified in this Asset Management Plan therefore only consist of works required to eliminate servicing constraints on sites zoned for development and these have been prioritised in accordance with Council's strategic planning process. A Map of the areas zoned for growth but constrained by lack of services is attached in Appendix J.

Nelson Richmond Intensification Study: Nelson City and Tasman District Council (TDC) are both developing strategies for accommodating projected growth in population and households, as well as the attendant business and other demands this growth will bring.

3.2.1 Population Trends

Historic population figures and projections to 2045 are shown in Table 3.1 and Figure 3-1. The information is sourced from Statistics New Zealand local population trends, published in 2015.

Table 3-1: Nelson City Population Projections 2011 – 2045. From Statistics New Zealand 2015 (A1393084)

	2013	2015	2025	2045
Population	48,700	49,740	53,320	56,020
Households		20,470	22,310	24,150
Median age	42	43	46	50
Aged 65 years and over	8,400 17%	9,160 18%	13,120 25%	18,540 33%
Aged 15-64	31,100 64%	31,380 64%	31,360 59%	29,040 52%
Aged under 15 years	9,200 19%	9,200 18%	8,780 16%	8,260 15%

Figure 3-1: Population Projections

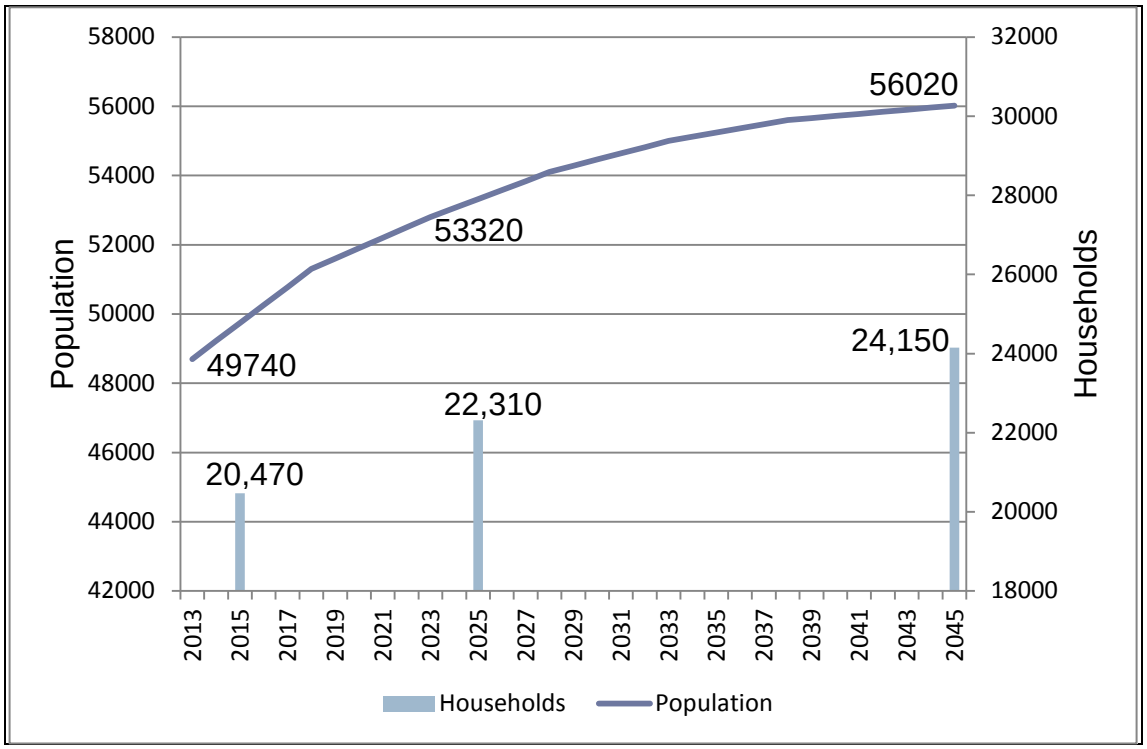


Table 3-2: Nelson City Population Projections 2011 – 2045. From Statistics New Zealand 2015 (A1393084)

POPULATION		2013	2015	2025 (change between 2015 and 2025)	2045 (change between 2025 and 2045)	TOTAL CHANGE between 2015 and 2045
NELSON		48,700	49,740	53,320	56,020	+6,280
	STOKE	17,930	18,410	20,180	22,380	+3,970
	TAHUNA	5,510	5,590	5,930	6,110	+520
	CENTRAL	19,760	20,080	20,960	20,730	+650
	NORTH	5,480	5,650	6,240	6,780	+1,130

HOUSEHOLDS		2015	2025 (change between 2015 and 2025)	2045 (change between 2025 and 2045)	TOTAL CHANGE between 2015 and 2045
NELSON		20,470	22,310	24,150	+3,680
	STOKE	7,470	8,330	9,510	+2,040
	TAHUNA	2,460	2,650	2,810	+350
	CENTRAL	8,310	8,820	8,990	+680
	NORTH	2,270	2,550	2,850	+580

Stoke Demographics

Census Data

Stoke	**Census 2006**	**Census 2013**
Usually resident population	15198	17163
As a % of Nelson	35%	37%
Households in private dwellings	5850	6726

As a % of Nelson	35%	36%

Projections

	2015	2025	2045
Stoke			
Population	18,410	20,180	22,380
Population change		+1,770	+2,200
Residents aged 14 and under	3,400 (18%)	3,370 (17%)	3,420 (15%)
Residents aged 65 and over	4,070 (22%)	5,400 (27%)	7,350 (33%)
Number of households	7,470	8,330	9,510
Housing change		+860	+1,180

3.3 FUTURE DEMAND

3.3.1 Stormwater Demand Drivers

The future demand drivers for reticulated Stormwater schemes in Nelson City will be:

- Enhancing streams and rivers and installation of reticulation to existing streets.
- The significant population increase projections and residential expansion into greenfield areas.
- Sustainability strategies that include inflow and infiltrationreduction.
- Stormwater Catchment Management Plan requirements to support freshwater quality improvements.

Table 3-3: Stormwater Demand Drivers

Stormwater Demand Drivers	Changes to Stormwater Activity
Significant population growth and residential expansion into greenfield areas	Development of new development areas on the periphery of the city and increased density in some existing developed areas leading to increased runoff rates as impermeable areas increase.
Changes in Customer Expectations	Customer expectations are increasingly tending towards higher Levels of Service, both in the extent and frequency of stormwater flooding and ponding on property and roads during and after storms, as well as enhanced stormwater discharge quality
Climatic Changes	In recent years, there has been an increase in the incidence of extreme weather events around the world. The general trend for Nelson is of winters being wetter and the other seasons being drier. More frequent heavy rainfall events have been predicted

Stormwater Demand Drivers	Changes to Stormwater Activity
Catchment Management Plan requirements	Catchment Management Plans will require the documentation of the management objectives and procedures used along with monitoring of water quality.
Sustainability strategies	Development of sustainability strategies that include infiltration reduction (into the wastewater system).

3.3.2 Reticulation Capacity

Significant upgrading of the stormwater network has occurred since 1996 as a result of the 1996 - 2016 Stormwater Strategic Plan. Appendix H details the extent of 1996 proposed capital works programme.

Progress on reticulation works is very dependent on also having reliable capacity in the rivers and streams that receive the stormwater flows. Council has historically committed to a programme of works for urban rivers and streams for a Q_{50} design capacity, which is the peak flow arising from a rainfall event with a probability of happening once in 50 years. Ongoing concerns about climate change has lead to a reappraisal of this design standard and the proposal to adopt Q_{100} as the appropriate standard. Due to the proximity of existing properties, structures and land of high natural and recreational value, work on the margins of these rivers and streams is not straightforward. Specific proposals for the Maitai River urban and rural areas are to be developed in the near future.

Work is planned in Saxton Creek and Orphanage Stream as well as the final stage of York Stream. One challenge for central Nelson's stormwater system is low-lying areas of reclaimed land in the central city. In some parts of town, particularly around Vanguard Street, seawater flows back up the system during very high tides and causes low level flooding. An investigation is currently underway reviewing the York Stream culvert and secondary flow paths in the Vanguard Street / St Vincent Street area as part of the wider Central Business District area impacted by the Maitai River, Brook Stream and York Stream.

3.4 DEMAND MANAGEMENT

Demand Management strategies are used as alternatives to the creation of new assets. They are aimed at modifying customer demands to achieve:

- The delivery of cost-effective services.
- Defer the need for new assets and optimise the performance/utilisation of the existing assets.
- Sustainability in the stormwater activity.

Nelson City Council is working on a range of strategies to manage the demand for stormwater services and therefore the requirement for additional infrastructure.

Table 3-3 details the strategies that have or will be instigated.

Table 3-4: Demand Management Strategies

Strategy	Objective / Description
Operation	Network modelling of the appropriate catchments following an risk assessment. Upgrading or renewal of the reticulation where risk factor are known to be high will be carried out to reduce known risks and / or flooding problems. Reduce direct stormwater entry into the wastewater reticulation system by detection and control. The provision of adequate public stormwater systems will reduce the likelihood of flooding and therefore inflows of floodwaters into the sewer system through gully traps and manholes.

Strategy	Objective / Description
Regulation	Protect property from flood damage and the environment from illegal discharges by enforcing appropriate regulations for housing and subdivision development, and for commercial/industrial operations. Flood protection measures include the use of regulations to set minimum floor levels for buildings and standards to ensure adequate secondary flow paths and detention areas. Stormwater bylaws control discharges from commercial and industrial sites. The use of the District Plan to control the areas in which development can occur and the associated density that is permitted.
Education	Implement a public education programme: The aim of the programme is to increase community awareness of the environmental impact of discharging pollutants into the public stormwater system.
Alternative disposal strategies	Minimising the Effect of Increased Urban Runoff through low impact design for Q_2 rainfall events. As land is converted to urban development there is an associated increase in stormwater entering the drainage system, where it is appropriate on-site soakage can be appropriate. Nelson City Council also has a need for drainage controls that reduce the quantity of stormwater entering wastewater drainage systems. The implementation of the stormwater bylaw requires at-risk sites, such as some industrial sites and service stations, to have oil and grit trap provisions.

4. RISK AND EMERGENCY MANAGEMENT

This section looks at the Risk Management processes set up by Nelson City Council for assessing and managing risk. Risk is used as a strategic decision-making tool assisting with developing and prioritising strategies and work programmes detailed in Section 6.

4.1 RISK MANAGEMENT

4.1.1 Background

Council is progressing down the path of completing, implementing and maintaining risk plans (Utility Risk Management Plans) for the principal utility asset systems to minimise the likelihood of non-achievement of critical business objectives.

Risk analysis involves consideration of the sources of risk, their consequences and the likelihood that those consequences may occur. The objective of risk analysis is to separate the low impact risks from the major risks, and to provide data to assist in the evaluation and treatment of the risks.

In the absence of component level assessments, a Risk Summary Table was established which identifies risk management strategies to minimise risks associated with the provision of the stormwater services. The risk profile will be extended to encompass assets down to a component level (Risk Management Plan).

The Stormwater Risk Management Strategy is designed to ensure that:

- All significant operational and organisational risks are understood and identified.
- The highest risks that should be addressed within a 10 year planning horizon are identified.
- Risk reduction treatments which best meet business needs are applied.
- Responsibilities for managing risks are allocated to specific staff and reporting regimes specified.

The Lifecycle Section of the Plan covers the further actions suggested for mitigation of current identified risks. Component level risk is to be assessed following the completion of the criticality assessment. It is important to note that risk management is not simply about the downside of events such as financial loss or legal proceedings. It also refers to the upside and opportunities that exist for the Nelson City Council to do things more innovatively, sustainably and effectively.

4.1.2 Potential Risks

Risks can be seen to arise from many areas of the Nelson City Council, both in the physical aspect for assets and business risks. Table 4-1 identifies the extreme and high risks associated with the ongoing planning, development and operation of the Nelson City Council and identifies all risks associated with natural causes and operational aspects of all stormwater assets owned by Nelson City Council.

The mitigation strategies are detailed and the residual risk is then ascertained. The Asset Risk Control Schedule must be updated on a regular basis, to ensure that all risks are relevant and understood. Where required, the mitigation strategies have been noted in the improvement programme.

Climate Change and the Capacity of Rivers and Streams

Climate change is expected to bring with it more extreme weather in the form of higher intensity and duration rain events (with associated flood damage) and drought periods. The issue will be monitored and future asset management plans will be adjusted to address impacts as they become better understood.

Recent extreme events in excess of Q_{50} have lead to the need to review the minimum design standard and consider whether this should be increased to Q_{100} (1% probability of occurrence in any year). The LTP 2015/25 signalled that Council will review the risk profile of streams and rivers on a case by case basis before deciding on the appropriate response to flooding.

Options for addressing the flooding risk to urban properties are being considered for three broad timebands: Current day to 2040, 2040-2070 and 2070-2100. These timebands follow preliminary assessments of the impacts of climate change on rainfall intensities carried out by the National Institute of Water and Atmospheric Research Ltd (NIWA). Detailed design for upgrading works would ideally set a framework for protecting against current flood patterns while ensuring future generations can carry out the works required for flood flows at the time.

The broad strategy for flood protection through the city is currently based on:

- Upgrading the urban stretches of rivers and streams and ensuring secondary flow paths are identified and maintained from rivers, streams and detention dams- Protecting the Central Business District- Stoke area-Atawhai area to the top of the Gentle Annie Saddle;
- Extending the piped stormwater network through the city;
- Upgrading existing open channel drains;
- Identify, maintain and upgrade secondary flow paths.

Given the expectation that climate change will result in altered rainfall intensities and frequency of extreme events an inventory of all of the urban and rural rivers and streams is shown in the future budgets.

Natural Hazards

Recent work by Council has focussed on natural hazards that might impact on the city, in particular:

- Direct damage from Earthquake shaking
- Damage from liquefaction in susceptible areas
- Damage from Tsunami
- Damage from Flooding and major storm events
- Impact of potential climate change and sea level rise

Security of the network in light of the recent Canterbury Earthquakes and Nelson storm events, including wider network hazards- Earthquake fault line, liquefaction and climate change will influence network upgrades into the future.

Future work will focus on near fault proximity of the network, possible impacts of liquefaction on existing and future infrastructure, impacts of flooding and the long term planning required as a result of climate change.

The Christchurch Earthquakes of 2010 /2011 lead to significant damage to that city's infrastructure including streams and rivers, pump stations and the underground pipe network from direct shaking and liquefaction. Recognising this and the results of other natural hazard investigation post the Nelson storm events of December 2011 and April 2013, Nelson City Council is reassessing the risk to the network from earthquakes (including liquefaction, tsunami and direct shaking), flooding, storms and sea level rise.

In particular a series of reports have been compiled, as part of the city's wider hazard planning, as follows:

- *TSUNAMI MODELLING AND EVACUATION ZONE MODELLING FOR TASMAN AND GOLDEN BAY- GNS FEBRUARY 2012 (A261963)*
- *REVIEW OF TSUNAMI HAZARD IN NEW ZEALAND (2013 UPDATE)- GNS AUGUST 2013(A371109)*
- *ASSESSMENT OF THE LOCATION AND PALEOEARTHQUAKE HISTORY OF THE WAIMEA-FLAXMORE FAULT SYSTEM IN THE NELSON-RICHMOND AREA WITH RECOMMENDATIONS TO MITIGATE THE HAZARD ARISING FROM FAULT RUPTURE OF THE GROUND SURFACE- M. R. JOHNSTON A. NICOL GEOLOGICAL CONSULTANT GNS SCIENCE 395 TRAFALGAR STREET PO BOX 30368 NELSON LOWER HUTT GNS SCIENCE CONSULTANCY REPORT 2013/186 AUGUST 2013(A673742)*

- *REVISED PRELIMINARY ASSESSMENT OF THE LIQUEFACTION HAZARD IN TASMAN AND NELSON FEBRUARY 2013 (A597463)*
- *TAHUNANUI AREA LIQUEFACTION ASSESSMENT- TONKIN AND TAYLOR LTD NOVEMBER 2013(A1117884)*
- *MAITAI RIVER FLOOD HAZARD MAPPING MODELLING REPORT TONKIN AND TAYLOR LTD AUGUST 2013(A677152)*

A further report is expected in 2015, to update the 2009 report by the National Institute of Water and Atmospheric studies (NIWA) looking at the latest state of knowledge of the impact of climate change on sea level rise.

The stormwater and flood protection network activity is likely to be impacted by sea level rise in line with other utilities because the outlet to the network is in many instances the sea or tidal margins and the reticulation is essentially gravity based, with pipes of varying depth, age and integrity. Pump stations are mostly positioned on lower level ground with potential for direct tidal impact.

Liquefaction was seen in Christchurch to be an extreme risk to the network through floating manholes and sand and silt infiltration into pipelines and manholes.

4.1.3 Analysis of Risks

The risk management framework is consistent with the joint Australian New Zealand Standard AS/NZIS4360:2004 Risk Management and the associated Risk Management Guidelines (SAA/SNZ HB 436:2004), to ensure risks are managed on a consistent basis.

Table 4-1: Asset Risk Schedule

Item	Risk Location	Risk Event	Consequence or Outcome		Mitigation Strategy			Action Plan	
				Risk Assessment	Description	Operational	Risk Assessment	(AP) Ref	Action Plan Description
3.1	Pump station	Flood > Q_{15} to Pump Stations	Serious flooding occurrence causing significant property and infrastructure damage. Minor H & S issue. Contamination from sewage system may occur.	Ext	Acceptable risk. Increasing design capacity further would be uneconomic.	No	Ext		
2.4	Streets	Flood to streets without reticulation pipes on steep land	Flooding to adjoining properties. Contamination from sewage system may occur. Erosion and structural damage possible.	Ext	S/W ditches available in some locations, otherwise stormwater systems require installation.	Yes	Low		Continue upgrade and renewal programme.
1.1	Maitai River (Collingwood - Hanby Park)	Flood to property where river/ stream not upgraded	Flooding of adjoining property, erosion of banks and foundations of structures. Minor H & S issues. Contamination from sewage system may occur.	Ext	Upgrade section to Q_{100} profile.	Yes	Low		Upgrade of Rivers and Streams as deemed necessary.
2.2(b)	SW Mains	Flood >Q_{15}, dia >300mm	Serious flooding occurrence causing significant property and infrastructure damage. Minor H & S issues Contamination from sewage system may occur.	High	Acceptable risk. Increasing design capacity further would be uneconomic and above statutory requirements.	No	High	AP5-4	Monitor 1st and 2nd tier secondary flowpaths. Continue upgrade and renewal programme.
2.6(b)		Flood Event/ period of inadequate maintenance > 300mm dia	Flooding to localised adjoining properties.	High	Culverts, intakes and outfalls regularly monitored and maintain under service providers maintenance.	Yes	High		Review reticulation maintenance strategy.
1.6		Flood Event/Period of inadequate maintenance	Flooding of adjoining property, erosion of banks and foundations of structures. H & S issues.	High	Maintenance strategy and upgrade of reticulation / streams.	Yes	Mod		Review reticulation maintenance strategy. Upgrade rivers and streams as deemed necessary.
4.2		Flood event to open channel or ditch		High	Regular inspections and maintenance programme.	Yes	Mod		Review reticulation maintenance strategy.

Item	Risk Location	Risk Event	Consequence or Outcome		Mitigation Strategy			Action Plan	
				Risk Assessment	Description	Operational	Risk Assessment	(AP) Ref	Action Plan Description
1.7		Contamination	Localised H & S issues - recreation users of streams / rivers / sea. Destroying habitat for fish, eels, wildlife etc.	High	Stormwater Bylaw, the New Zealand Building Code, NRMP	Yes	Low	AP2-3	Develop Catchment Management Plans.
new	Maitai River (Hanby Park to dam rural areas)	Flood to property where river/ stream not upgraded	Flooding of adjoining property, erosion of banks and foundations of structures. Minor H & S issues. Contamination from sewage system may occur.	High	Upgrade section to Q_{15} profile.	Yes	Low		Upgrade of Rivers and Streams as deemed necessary.
2.1(b)	SW Mains	Flood to system not upgraded >300mm diameter	Flooding of adjoining property, erosion of foundations of structures. Minor H & S issues. Contamination from sewage system may occur.	High	Upgrade reticulation to Q_{15} with secondary flow paths.	Yes	Low		Continue upgrade and renewal programme.
new	Maitai River (Hanby Park to dam residential areas)	Flood to property where river /stream not upgraded	Flooding of adjoining property, erosion of banks and foundations of structures. Minor H & S issues. Contamination from sewage system may occur.	High	Upgrade section to Q_{100} profile.	Yes	Low		Upgrade of Rivers and Streams as deemed necessary.
new	Rivers and Streams general	Flood to property where river/ stream not upgraded	Flooding of adjoining property, erosion of banks and foundations of structures. Minor H & S issues. Contamination from sewage system may occur.	High	Upgrade section to Q_{100} profile.	Yes	Low		Upgrade of Rivers and Streams as deemed necessary.
2.7		Secondary Flow paths	If secondary flow paths are not maintained and kept clear then during stormwater events flooding of surrounding properties can occur.	High	In new subdivisions secondary flood paths are designed. Existing paths require identifying and maintaining.	Yes	Low	AP5-4	Monitor 1st and 2nd tier secondary flowpaths. Document secondary flow paths and corresponding maintenance strategy

4.2 RISK SUMMARY

The extreme and high risks are associated with the following:

- Flood events
- Secondary flow paths
- Stormwater contamination

The Asset Risk Schedule needs to be further developed to a component level to be confident that the risk has been appropriately evaluated. This is necessary as different assets lend themselves to different treatment options. These treatment options may include:

- Increased maintenance
- Early replacement
- High level of procedures, decision making process, contingency plans and operation and maintenance manuals
- Accepting risk i.e. do nothing, monitor

These treatment options may increase operating and depreciation costs but offsets the high level of risks associated with Nelson City Council assets.

It is considered that if the improvements or actions indicated in the improvement and action plans are implemented then the level of risk is considered to be at an acceptable level for the ongoing operation of the Nelson City Council stormwater asset.

4.3 INSURANCE

4.3.1 Background

Nelson City Council has insurance cover for the Wastewater, Water & Stormwater services, staff and property as detailed in Table 4-2 below. The insurance cover is updated on a regular basis following valuations to ensure the insurance cover is appropriate for its purpose.

Table 4-2: Stormwater Insurance Provisions

Components / Items	QBE		LAPP	Vero	
	Public Liability	Professional Indemnity		Buildings and Contents	General Insurance
Reticulation			✓		
Pump Stations					
- Electrical					✓
- Mechanical					✓
- Structural					✓
Staff	✓	✓			
Council Vehicles					✓
Private property damage related to stormwater damage	✓				
✓ Indicates coverage by that particular insurance type					

4.3.2 Local Authority Protection Programme Disaster Fund

Nelson City Council is a member of the Local Authority Protection Programme Disaster Fund established by the New Zealand Local Government Association Incorporated. The total replacement value of stormwater assets declared for cover by the Local Authority Protection Programme Disaster Fund fund is $185M as detailed in Table 4-3 below.

In the event of a natural disaster, Local Authority Protection Programme Disaster Fund will generally cover 40% of the reinstatement cost of infrastructure assets that have been damaged and declared for cover by the Local Authority Protection Programme Disaster Fund.

The damage resulting from the Canterbury Earthquakes of 2010 and 2011 has severely depleted the reserves of the Local Authority Protection Programme Disaster funds and as a consequence the fund directors have signalled the intention to increase annual levies until the fund recovers. This will increase administration costs in this activity.

The following table also includes an allowance for small diameter pipes that would be considered public drains under the 2013 revision of Council's Drainage Ownership Policy.

Table 4-3: Infrastructure Assets Covered by Local Authority Protection Programme Disaster Fund 2013

Asset Type	Asset Description	Estimated Replacement Cost
Stream bank protection	Rock, some timber	$12,046,423
Reticulation mains - Various	Brittle 92%	$50,442,571
Reticulation mains - Various	Ductile 8%	$3,842,587
Reticulation mains - Trunk	Brittle 100%	$44,872,202
Systems	Pumping stns, gates, dams	$4,738,987
Systems	Culverts, channels	$19,679,917
Systems	Intakes, Manholes, outfalls, sumps	$20,077,692
Systems	Laterals	$29,798,783
Total		**$185,499,202**

4.4 EMERGENCY MANAGEMENT

4.4.1 Civil Defence and Emergency Response Plans

The following documents are available for guidance in the Civil Defence and Emergency Management:

- Civil Defence Emergency Management Plan.
- Nelson City Council Emergency Procedures Manual - exercises are carried out on a six monthly basis to ensure all staff are familiar with the procedures.

Section 64 of the Civil Defence Emergency Management Act 2002 requires Local Authorities to:

64 Duties of local authorities

(1) A local authority must plan and provide for civil defence emergency management within its district.

(2) A local authority must ensure that it is able to function to the fullest possible extent, even though this may be at a reduced level, during and after an emergency"

4.4.2 Local Civil Defence Emergency Management Arrangements

Nelson-Tasman Civil Defence Emergency Management Group is a joint committee of both Nelson City Council and Tasman District Council.

The Nelson Tasman Civil Defence Emergency Management Group Plan provides for an 'all hazards' approach to emergency management planning and activity within the Civil Defence Emergency Management Group area for Nelson City and Tasman District. The Civil Defence Emergency Management Group Plan states the civil defence emergency management structure and systems necessary to manage those hazards, including the arrangements for declaring a state of emergency in the Group's area. The Group Plan is the primary instrument whereby the community identifies and assesses its hazards and risks, and decides on the acceptable level of risk to be managed and how it is to be managed.

4.4.3 Lifelines Responsibility

Section 60 of the Civil Defence Emergency Management Act 2002 requires Local Authorities to:

60 Duties of lifeline utilities

Every lifeline utility must—

(a) ensure that it is able to function to the fullest possible extent, even though this may be at a reduced level, during and after an emergency

Nelson City Council participated in the Nelson-Tasman Engineering Lifelines project as a life line utility.

The following table indicates the status of the stormwater schemes in the areas of Risk Reduction, Readiness, Response and Recovery.

Table 4-4: Risk Reduction, Readiness, Response and Recovery Status

Activities Required	Description	Stormwater Status
Risk Reduction	Identifying hazards, describing risks, and taking actions to reduce the probability or consequences of potential events.	Asset Management Plan Risk Treatment Schedule and Plan.
Readiness	Planning and preparation required to equip agencies and communities to respond and recover.	Emergency procedures manual and exercises.
Response	Addressing immediate problems after an emergency.	Stormwater Mutual Aid Plan.
Recovery	Addressing the long-term rehabilitation of the community.	Nelson-Tasman Civil Defence Emergency Management Group.

4.4.4 Electricity Supply

The electricity lines suppliers are Network Tasman Ltd and Nelson Electricity Ltd.

Energy supply is currently via a contract with Trustpower.

4.4.5 Interconnectivity Effects

Interconnectivity or interdependence between different utilities during and after a disaster is of utmost importance. In the event of failure, access is necessary to visit a site and provide power for recovery or removal of debris. To enable effective and efficient recovery of lifelines from an event which disrupts their service, dependencies on other lifelines must be understood and where necessary, mitigated against.

Table 4-5 details the interdependence[1] between Nelson City Council and other utility providers following a disaster.

Table 4-5: Interdependency – Nelson City Council and other Utility Providers following a Disaster

The degree these utilities are dependent on these →	Roading	Sea Transport	Air Transport	Water Supply	Wastewater	Stormwater	Electricity	Fuel Supply	Broadcasting	Telecommunications
Roading		1	2	2	2	3	1	3	3	3
Sea Transport	2		0	1	1	0	2	2	1	2
Air Transport	3	1		1	1	0	2	2	0	1
Water Supply	3	2	2		0	0	3	3	3	1
Wastewater	3	2	2	1		0	2	2	2	1
Stormwater	3	2	2	0	0		3	3	2	1
Electricity	3	2	2	0	1	2		3	2	3
Fuel supply										
Broadcasting	2	0	2	0	0	0	3	2		3
Telecommunications	3	1	2	0	0	0	3	3	2	
Total Dependency	**22**	**11**	**14**	**5**	**5**	**5**	**19**	**23**	**15**	**15**

3 = Essential to Operations 2 = Important to Operations
1 = Low/Minimal Reliance or requirement 0 = No Reliance or Requirement

The above table shows a high dependence for Nelson City Council on roading, electricity and fuel supplies following a disaster.

4.4.6 Climate Change Effects

Significant development has occurred on historical flood plains as the City has grown. Areas that would once have contributed to the passage of flood waters are now occupied by buildings and structures.

There has been considerable work undertaken at a national level on the possible effects of climate change and sea level rise.

The Ministry for the Environment have provided the following information regarding the likely impacts of climate change in the Nelson-Tasman Region:

"Temperatures are likely to be around 0.9˚C warmer by 2040 and 2.0˚C warmer by 2090, compared to 1990. By the end of the century, some parts of Nelson-Tasman are projected to have about 10–-40 extra days per year where maximum temperatures exceed 25˚C, with around 10–40 fewer frosts per year"

"Rainfall will vary locally within the region. In Nelson, average annual rainfall is likely to increase by 4 per cent by 2090. Seasonal projections show summer, autumn and winter rainfall increasing by 5–6 per cent in Nelson by 2090, with very little change in spring rainfall. For Motueka and the Waimea plains, annual average rainfall is likely to increase slightly by 2090. Seasonal projections show slightly more rainfall in most seasons (except spring) for much of this part of Tasman. The western part of the Tasman district is likely to experience slightly less rainfall in summer, but significantly more rainfall in winter, especially by 2090. Very heavy rainfall events are likely to become more frequent throughout the Nelson-

[1] Assessment of Interdependency Workshop: February 2008

Tasman region. For example, in Richmond heavy rainfall events are likely to occur twice as often by 2090."

The key climate influences on the stormwater activity is more intense rainfall, higher sea level and tides, and storm surges.

Sea Level Rise:

The Ministry for the Environment have provided the following information regarding the likely impacts of sea level rise in New Zealand:

"New Zealand tide records show an average rise in relative mean sea level of 1.7 mm per year over the 20th century. Sea levels are expected to continue to rise into the future. The Ministry for the Environment recommends planning for future sea-level rise of at least 0.5 m, along with consideration of the consequences of a mean sea-level rise of at least 0.8 m (relative to the 1980–1999 average) by the 2090s."

Nelson City Council will factor predicted sea level rise into its minimum ground and floor level requirements for low lying sites in the Proposed Nelson Plan and Land Development Manual. The predictions for sea level rise, flooding, and storm surges will be monitored on an ongoing basis to ensure that Council's future planning documents reflect the most up to date predictions.

The High Intensity Rain Fall Analysis for Nelson Urban Area carried out by NIWA in 2008 indicated the following; *The present Nelson City design storm intensity chart is somewhat conservative: the 50 year return period totals on this chart are close to 100 year return period HIRDS estimates. However, a degree of conservatism in the estimates is probably desirable, especially since intensities increase moving to higher elevations inland from the coast*.
It is intended to commission an update of this advice in 2015/16.

The Nelson City Council Land Development Manual 2010 incorporates changes noted in the NIWA report. In view of the predicted changes in sea level and current Ministry for the Environment changes in predicted rainfall intensity, the effects on the existing reticulation (pipes and rivers) and the associated effects to the hydraulic grade lines in pipes will need to be reviewed on an ongoing basis.

Climate Change and the Capacity of Rivers and Streams

The flood flow that Nelson would experience from a Q_{50} event (2% probability of occurrence in any year) is the current standard that has been adopted for design and construction works of the major stream and river channel upgrades in the city. Recent extreme events in excess of Q_{50} have lead to the need to review the minimum design standard and consider whether this should be increased to Q_{100} (1% probability of occurrence in any year).

Options for addressing the flooding risk to urban properties are being considered for three broad timebands: Current day to 2040, 2040-2070 and 2070-2100. These timebands follow preliminary assessments of the impacts of climate change on rainfall intensities carried out by the National Institute of Water and Atmospheric Research Ltd (NIWA).

Serious flooding in the Orphanage Stream and Saxton Creek areas during April 2013 has lead to the need for urgent works to be carried out on both streams. Nelson City Council and Tasman District Council are jointly developing plans for Saxton Creek to upgrade culverts in Champion Road and the stream channel from Champion Road to Main Road Stoke. Nelson City Council will need to continue with upgrading works downstream of Main Road Stoke in future years.

Given the expectation that climate change will result in altered rainfall intensities and frequency of extreme events an inventory of all of the urban and rural rivers and streams is shown in the future budgets.

4.5 HEALTH AND SAFETY

Council has a Health an d Safety Co-ordinator who in-conjunction with the Nelson City Council Health and Safety Committee ensures the responsibilities under the Health and Safety in Employment Act 1992 are met. Regular safety training is provided to staff

and induction processes have been established for contractors and consultants working on Council sites where required. Council contracts and tenders require stringent HSE compliance.

5. LIFECYCLE MANAGEMENT

This section applies the risk polices described in Section 4 to develop the broad strategies and specific work programmes required to achieve the goals and standards outlined in Section 2 and Section 3. It presents the Lifecycle Management Plan for the stormwater assets.

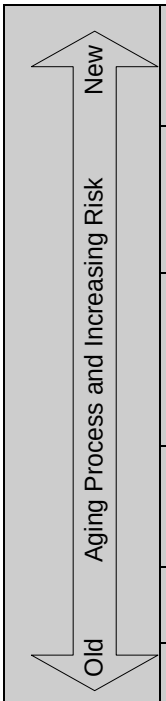
This section of the plan also provides reasons and justification for asset ownership, describes the assets, identifies critical assets and provides an overview of the asset capacity, performance and condition.

5.1 OVERVIEW

Lifecycle Management has a direct impact on the provision of stormwater services to the residents and businesses of Nelson. While section 2 identifies the Levels of Servicethat Nelson City Council is committed to delivering, this section identifies the measures that need to be implemented to achieve these levels of service. Lifecycle Management will allow Nelson City Council to clearly identify both the short and long term requirements of the stormwater system ensuring that a cost effective service is delivered to the community.

5.1.1 Asset Lifecycle

Assets have a lifecycle as they move through from the initial concept to the final disposal. Depending on the type of asset, its lifecycle may vary from 10 years to over 100 years. Key stages in the asset lifecycle are:



Asset planning	When the new asset is designed - decisions made at this time influence the cost of operating the asset and the lifespan of the asset. Alternative, non-asset solutions, must also be considered.
Asset creation or acquisition	When the asset is purchased - constructed or vested in the Nelson City Council. Capital cost, design and construction standards, commissioning the asset, and guarantees by suppliers influence the cost of operating the asset and the lifespan of the asset.
Asset operations and maintenance	When the asset is operated and maintained - operation relates to a number of elements including efficiency, power costs and throughput. Maintenance relates to preventative maintenance where minor work is carried out to prevent more expensive work in the future and reactive maintenance where a failure is fixed.
Asset condition and performance monitoring	When the asset is examined and checked to ascertain the remaining life of the asset - what corrective action is required including maintenance, rehabilitation or renewal and within what timescale.
Asset rehabilitation and renewal	When the asset is restored or replaced to ensure that the required level of service can continue to be delivered.
Asset disposal and rationalisation	Where a failed or redundant asset is sold off, put to another use, or abandoned.

5.1.2 Asset Failure Modes

Generally it is assumed that physical failure is the critical failure mode for many assets. However the asset management process recognises that other modes of failure exist. The range of failure modes includes:

Structural	Where the physical condition of the asset is the measure of deterioration, service potential and remaining life.
Capacity	Where the level of under or over capacity of the asset is measured against the required level of service to establish the remaining life.
Level of Service Failure	Where reliability of the asset or performance targets are not achieved.
Obsolescence	Where technical change or lack of replacement parts can render assets uneconomic to operate or maintain.
Cost or Economic Impact	Where the cost to maintain or operate an asset is greater than the economic return.
Operator Error	Where the available skill level to operate an asset could impact on asset performance and service delivery.

5.2 DESCRIPTION OF STORMWATER ACTIVITY

This section describes the assets and identifies critical assets and provides an overview of the asset capacity, performance and condition.

5.2.1 History of Nelson City Council Stormwater Systems

The Nelson City Council has been responsible for stormwater disposal in the city since the first piped combined stormwater/sewer disposal system was placed in approximately 1907. The city has expanded by amalgamation of adjoining areas since. Tahuna Board joined the City in 1950, Stoke was transferred from Waimea County Council in 1958, Atawhai in 1968. Whangamoa Riding was a further addition in 1989.

5.2.2 Summary of Assets

General

Nelson City Council is responsible for a wide variety of assets that constitute the Nelson City Council Stormwater System. The replacement costs of these stormwater assets are $182.5m as detailed in Table 5-1 below.

Table 5-1: Summary of Stormwater Assets (June 2014)

Asset Category	Quantity	Unit	Replacement Value $
Stormwater			
Mains Up To 600mm	159.4	km	75,557,050
Mains > 600mm	40.5	km	47,371,923
Channels	1.2	km	251,352
Culverts	5.8	km	16,554,691
Rocks Road Culvert	0.3	km	3,039,409
Tide Gates	24	No	175,509
Intakes	93	No	526,970
Manholes	4,404	No	20,324,201
Outfalls (with wing walls)	77	No	394,041
Sumps	593	No	1,384,972
Pump Stations	2	No	3,343,711
TOTAL			168,923,829
Flood Protection			
Bank Protection	59,222	m^2	11,978,760
Detention Dams	9	No	1,645,220
TOTAL			13,623,980

Sumps in legal roads are roading assets. Sump leads are also roading assets until they meet a pipe of 250mm diameter. Culverts crossing legal roads which have open channels on either side are roading assets. All other culverts are stormwater assets.

The majority of the replacement costs associated with the stormwater system is the reticulation mains, as indicated in Figure 5-1 below.

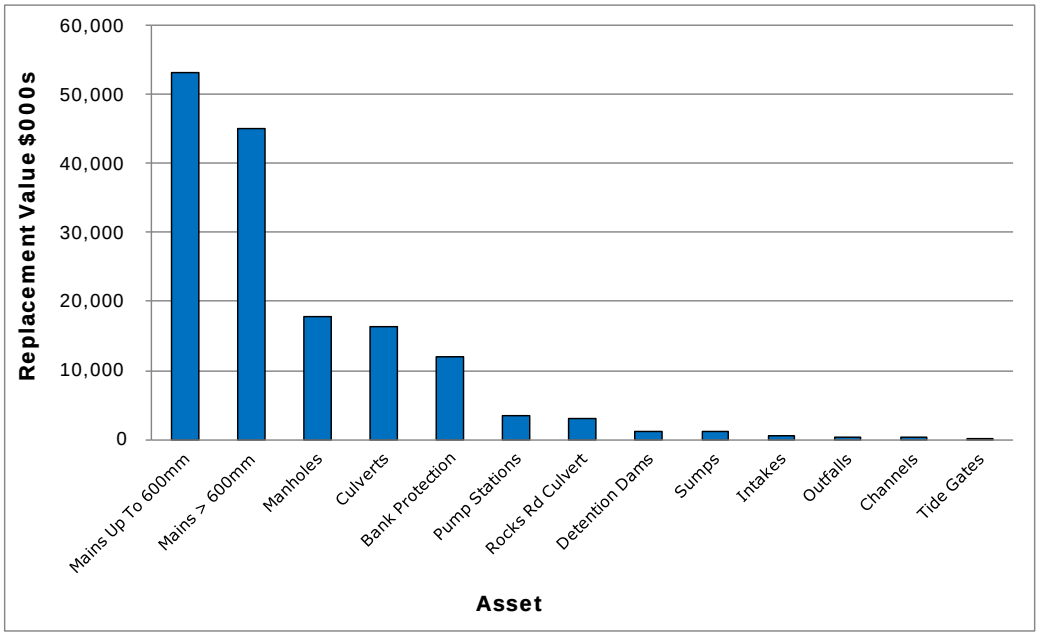
Stormwater Channels on Private Properties

These are open channels that carry some stormwater from public spaces such as roads, parks and reserves and discharge it to channels that flow through private property. In the recent past little or no maintenance was carried out on these by Council as they have been considered to be the property owners' responsibility. In 2013 Council adopted a revised drainage ownership policy that recognised the likelihood that the Courts' would consider a number of these channels to be public drains.

This issue is closely linked to the need to complete the work of identifying secondary flow paths for stormwater overflows from watercourses, channels or the piped network. These flows run along roads or private property until such time as they can return to a waterway.

A process to identify and establish responsibilities for the maintenance and upgrading of these is required.

Figure 5-1: Stormwater Asset Renewal Costs



5.2.3 Reticulation

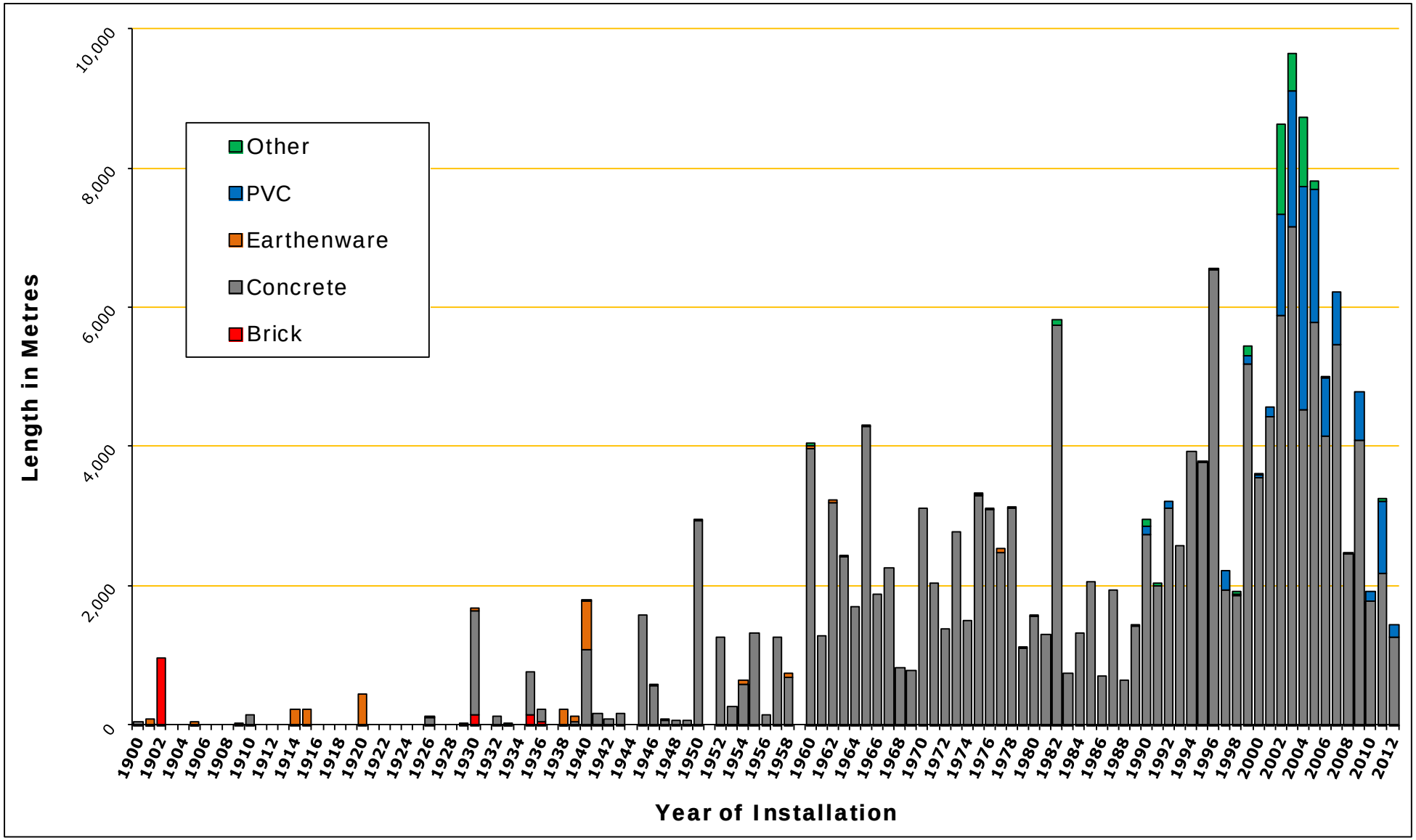
The purpose of the reticulation system is to minimise nuisance flooding by collecting and discharging stormwater, resulting from moderate rainfall, into streams and other watercourses and prevent damage to or loss of property or amenity. The reticulation system is made up of the following major components:

- Pipes
- Culverts
- Manholes
- Sumps

Stormwater Pipes

The Nelson City Council has stormwater pipe assets ranging from new to over 100 years old. The distribution of pipe length verses installation year can be seen in Figure 5-2.

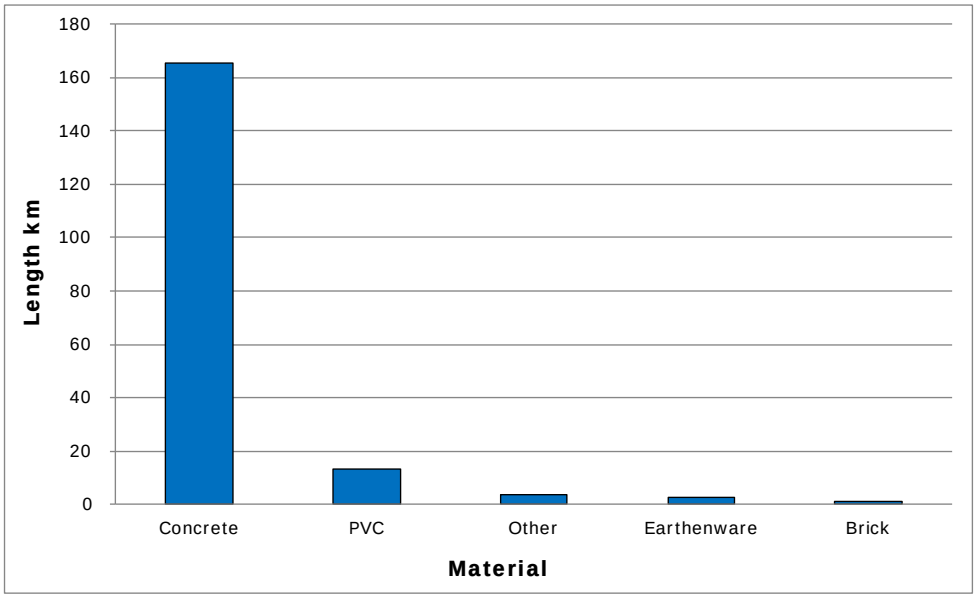
Figure 5-2: Pipe Length by Year of Installation



The pipe install date distribution increases at a steady rate for the pipes installed from the 1950's to the present date. Appendix C details the abbreviations for the pipe materials (note: figures are rounded up).

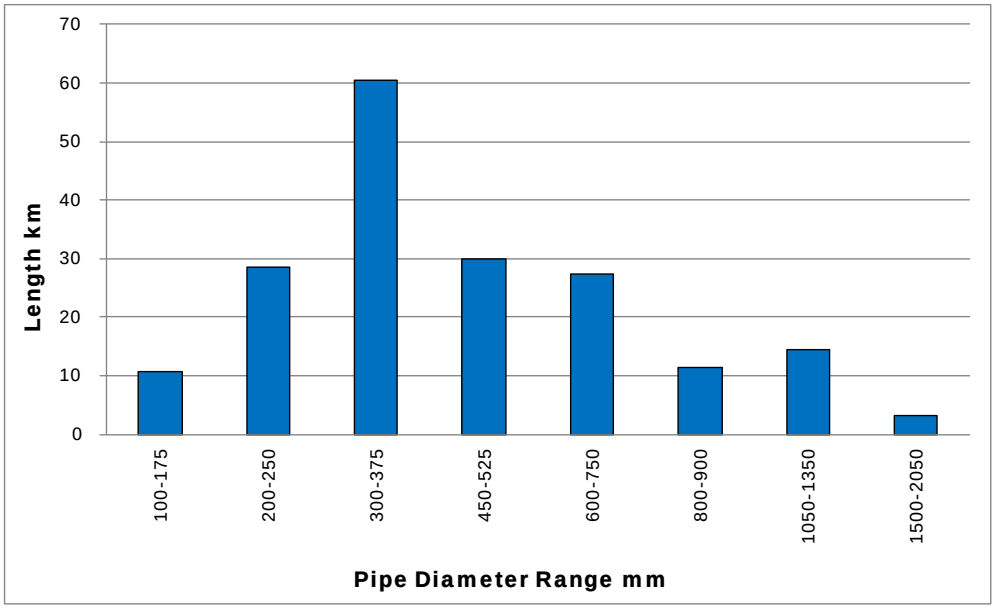
Concrete has been the predominant pipe material used and this can be seen in Figure 5-3.

Figure 5-3: Summary of Pipe Materials



The major proportion of pipe used within Nelson City Council is in the 300mm to 375mm diameter range.

Figure 5-4: Summary of Pipe Length Vs Diameter



Culverts

The Council has 6km of culverts of which 0.6km are of brick construction with an install date of approximately 1907. These are located generally in the central city area and in Ngatiawa Street. These culverts are of variable quality, some with bricks dropping out due to loss of mortar jointing and root infiltration through cracks. In some areas the invert has been eroded and cavities have formed behind the culvert wall. Council has trialled a specialist plastering technique on the Bridge Street culvert. This is being monitored for effectiveness prior to a wider application.

The large concrete box culverts in Haven Road/St Vincent Street were inspected by Aurecon in 2010/11 and in 2011/12 temporary propping has been installed and a programme is being developed to identify repair or replacement options.

Detention Dams

Six detention dams are located in the Bishopdale and Stoke areas, and are earth/ concrete detention basins with controlled outlets. These detention dams are located at:

- Bishopdale Avenue below No.70
- Clifford Avenue above the Cul-de-sac
- The Ridgeway at Panorama Drive roundabout
- Bledisloe Reserve
- Ngawhatu
- York Valley above Westley Place

The stormwater utility services contractor inspects the detention dams after floods, earthquakes or heavy rain and carries out minor maintenance.

A recent review of stormwater detention dams within the city has identified a number that have a dual use as both neighbourhood parks/reserves and detention dams.

Springlea at Frenchay Drive

Ngawhatu Valley above Bridgewater Lane

Saxton pond on Saxton Creek

Grampian Oaks at upper Motueka Street

Todd Valley at Saddleback Road

Manholes

There are 4,241 manholes in the Nelson City Council stormwater network. Nelson City Council has a number of special manholes to allow grit to accumulate for easier removal.

Diameter / Description	Number	Replacement Value $,000
1,050	3,038	$11,292
1,350	777	$3,446
1,500	265	$1,649
1,800	112	$697
Special	45	$511
DTRPL	4	$180
Total	4,241	$17,775

Stormwater Outlets

Nelson City Council has 420 stormwater outlets to rivers, streams or salt water, the size and numbers per catchment are shown in Table 5-2 below. The location of the major outlets is detailed on Figure 1-1 in Section 1. Note there are 70 outfalls with wing walls.

Table 5-2: Council Stormwater Outfalls by Pipe Diameter

	Diameter Range mm				
Creek	**0-299**	**300-699**	**700-1299**	**1300+**	**Grand Total**
Arapiki	4	13	4	1	22
Brook	25	30	7	1	63
Jenkins	13	16	8	-	37
Maitai	20	26	4	2	52
Oldham	13	13	2	-	28
Orchard	6	13	6	1	26
Orphanage	27	16	4	-	47
Poormans	11	10	1	-	22
Salt Water	11	6	1	3	21
York	42	31		3	76
below York	13	10	1	2	26
Total	185	184	38	13	420

5.2.4 Condition of Reticulation Assets

Historically asset monitoring to determine condition has been subjective, based on local knowledge and experience. Nelson City Council now has procedures to assess and report on asset condition via closed circuit television and failure mode analysis.

The cost of undertaking condition assessment can be relatively expensive and is unlikely to provide a degradation curve that can be statistically supported. The need for inspection for assets with long economic lives will in the future be based on consequence of failure (criticality), remaining life and asset performance (failure modes).

A re-evaluation of the strategy for condition profiling is required to ensure that condition profiling is conducted using a risk based methodology that is at an appropriate industry standard and will comply with Audit requirements.

Table 5-3 below details the experienced Nelson City Council O& M investigator estimate of the condition of the reticulation along with blockages and failure rates.

Table 5-3: Condition of Components Estimates (% of total of each component)

%	Very Good	Good	Moderate	Poor	Very Poor	Total
Reticulation	10%	40	30	10	10	181.1km
Intakes	10	40	20	20	10	98
Sumps	20	30	15	15	20	556
Culverts	10	20	40	10	20	6 km
Channels	5	30	20	20	25	1.2km
Manholes	20	20	20	20	20	4,031#
Tide Gates		30	20	40	10	12
Condition rating as per the New Zealand infrastructure Asset Grading Guidelines 1999 1 = Very Good 2 = Good 3 = Moderate 4 = Poor 5 = Very Poor						

5.2.5 Pump Stations

The Nelson City Council operates two stormwater pump stations; Centennial Road installed in 1999 and The Wood pump station installed in 2003. These are larger pump stations (Centennial $890k and Wood $2.05M) installed due to excessive flooding in Tahuna and the Wood areas, especially coinciding with storm events during high tide. These two pump stations operate as follows:

- Centennial Road pump station operates on average 6x / year. If there are low flows, it will be operated bimonthly as a minimum.
- The Wood pump station averages 2x/year

Pump Station System and Power Failures

All pump stations are monitored by a Supervisory Control and Data Acquisition/telemetry system. In the event of a system or power failure the system notifies on-call operators to take the necessary action. Back up electricity generators are available to the pump stations for emergency power supply.

5.2.6 Rivers and Streams

Rural Rivers

Currently, Council does not take stormwater rates from any property to the East of the Gentle Annie Saddle, nor from properties that are greater than 15 Hectares in area. Consequently the only day to day maintenance or capital upgrades carried out in the majority of these areas are where utilities and structural facilities such as bridges and buildings, owned by Council are threatened. The general exception is gravel extraction which is carried out in the Maitai River.

Council does receive occasional requests for assistance from landowners in rural areas. These requests typically follow heavy rain events and can range from assistance with the removal of tree debris and gravel build-up, to the protection of river banks from erosion. In June 2013 Council recognized the need to respond to these requests, while noting that there is currently no funding stream for any work, and agreed to the following policy of cost sharing with property owners for works that have a private benefit.

"Council will investigate bank protection and river control works to private property in the areas where stormwater rates are not applied, on a cost sharing basis with adjacent property owners"

It will be necessary to further refine the response to rural rivers as increased residential development takes place and residents' expectations about flood protection develop.

Urban Streams and Rivers

The Nelson City Council presently takes responsibility for the rivers and streams within the city's urban area as set out below:

- Orphanage Creek - Through existing urban and industrial development, as of 2003
- Orchard Creek - Songer Street. intake to outfall
- Poormans Valley Stream - Marsden Cemetery to outfall
- Arapiki Stream - Ridgeways detention dam to outfall
- Jenkins Creek - Newman Drive to outfall
- York Stream - York Valley detention structure to outfall
- Maitai River - Jeckells Bridge to outfall
- The Brook - 320 Brook Street to outfall
- Oldham Creek - Through Q_{50} upgraded sections, as of 2003
- Todd Valley - Where Q_{50} or Q_{15} upgrades have been completed
- Saxton Creek

5.2.7 Secondary Flow Paths

Major secondary flow paths have been identified for rivers and streams and shown on Geographical information system for the city via a two year inspection programme. It is essential that secondary flowpaths be kept clear of obstructions to reduce the risk of flooding or ponding. This previously relied on voluntary public co-operation. Due to the importance of the secondary flow paths an inspection regime is to be instigated for 1st and 2nd tier secondary flowpaths. 1st tier will have annual inspection and 2nd tier will be reactive.

A project to map the secondary flow paths throughout the city and inform property owners of their obligations is nearing completion. Preliminary maps have been developed. Due to the legal implications this process is expected to require extensive site verification and consultation with the property owners affected.

5.2.8 Supervisory Control and Data Acquisition System

Background

All of the Nelson City Council's strategic utility components are monitored remotely, at Civic House or by duty staff using laptop computers at home, utilising a telecommunication system.

This system has given Council the ability to ascertain faults and instigate repairs without affecting the service to the consumer and has significantly increased efficiency and reliability of the utility schemes. This function has become critical to the operation of the network and has been supported by Council's in house Information Management team up to now. There is a need to upgrade this package and at the same time consider how the technical requirements can be accommodated with the essentially office based computer network used by the majority of Council staff.

Council has a "Kingfisher" and "Intouch" system at the base station (rationalisation of system occurred in 2005). The system is used to monitor and control critical aspects of all Nelson City Council treatment plants and pump stations, 67 sites are presently monitored that include:

- Waste Water Treatment Plants
- Stormwater Pump Stations
- Wastewater Pump Stations
- Water Treatment Plants
- Water Pump Stations and Reservoirs

Appendix G details the over view of the Supervisory Control and Data Acquisition system. The system is used for:

- Monitoring the operation of sites
- Reporting, trending and analysing historical data
- Alarm monitoring (operators are informed of alarms via text messages to mobile phones)
- Some control functions

Monitoring of water, wastewater and stormwater systems by the Councils Supervisory Control and Data Acquisition system has grown to the point that without the current Supervisory Control and Data Acquisition system, maintaining the existing Levels of Service would be difficult. Supervisory Control and Data Acquisition has given the ability for Council to ascertain faults and instigate repairs without affecting the service to the consumer and has significantly increased efficiency and reliability of the utility schemes. The Supervisory Control and Data Acquisition system is a critical system in Council's operation.

Future Strategy for Councils Supervisory Control and Data Acquisition

Council's strategy for the ongoing use of Supervisory Control and Data Acquisition is:

- Maintain Supervisory Control and Data Acquisition system at a high level to ensure system reliability and ongoing reporting ability.
- Increase availability of information to the in-house Business Units in a format that will enable increased efficiencies in operation and management.
- Develop the reporting functions of the system.
- Develop further use of the system to control plant and equipment.
- To be at the forefront of Supervisory Control and Data Acquisition development by implementing new systems and technologies as appropriate.

Review and Upgrade

There is a need to upgrade this package and at the same time consider how the technical requirements can be accommodated with the essentially office based computer network used by the majority of Council staff.

5.3 CRITICAL ASSETS

Critical assets are considered to be those assets for which the consequence of failure is unacceptable and would result in a major disruption to the removal of stormwater or failure in meeting one or more levels of service.

For stormwater infrastructural assets closed circuit television inspection and pipe sampling are the most common forms of condition assessment. The current prioritization of inspection of assets is based on criticality, expected remaining life and asset performance (faults).

Assets that are considered critical within the Nelson City Council stormwater system are:

- All pump stations
- All rising mains
- All rivers and streams
- Detention dams

The effect of criticality on an asset is highlighted in the following areas:

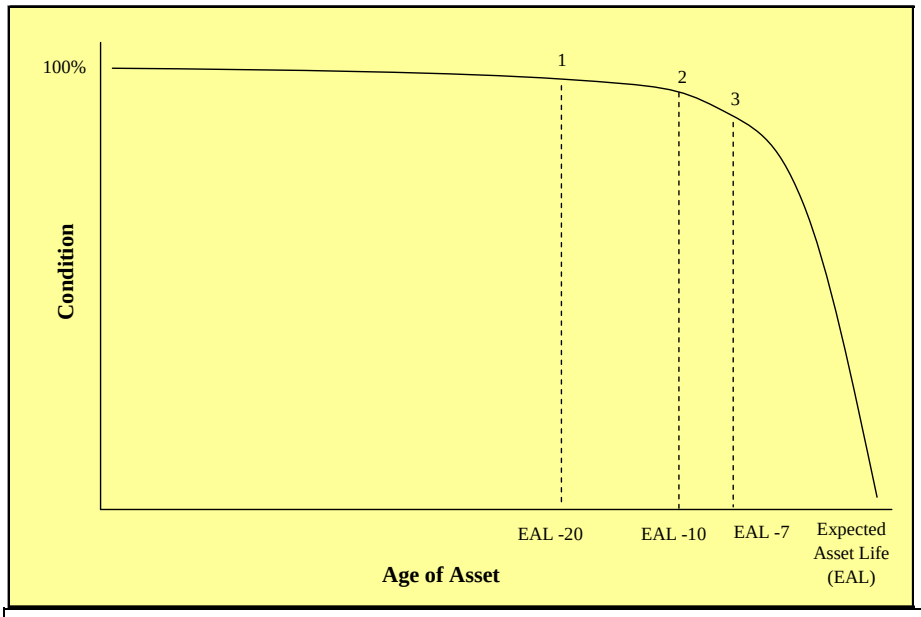
- Operation and maintenance planning
- Proactive or scheduled maintenance
- Priorities for collecting and determining the required level of reliability of data for Asset Management systems
- Priorities for undertaking condition assessments
- Adjusting economic lives with respect to renewal profiles
- Prioritising/Deferring renewals
- Prioritising expenditure
- Prioritising levels of service reviews

The role of critical assets in the stormwater network is such that failure is not an acceptable event given the difficulty of repair and the strategic role they play. By contrast non-critical assets are relatively quickly and easily repaired or replaced and expected service lives can be maximized.

Monitoring and intervention strategies are therefore quite different for both categories of asset. Critical assets attract a greater level of monitoring and ongoing condition assessment, with physical investigations taking place at a much earlier stage. Conversely non-critical assets can be expected to undergo a higher level of repair before complete replacement is considered.

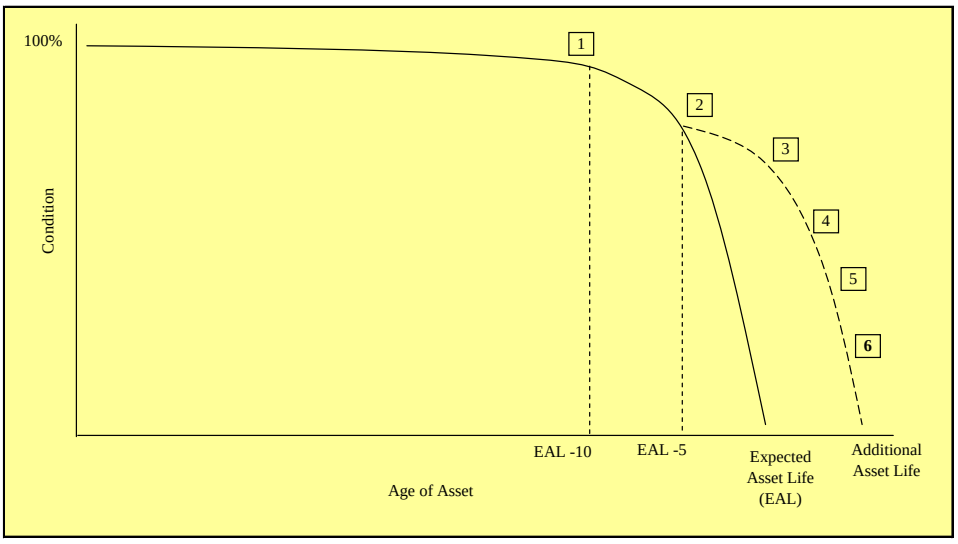
The following shows the nature and timing of interventions for both critical and non-critical assets.

Figure 5-5: Interventions for Critical Assets



Intervention: 1 Desktop review of asset and performance supported by closed circuit television inspection, 2 Physical inspection of asset and performance review. 3 Replacement initiated.

Figure 5-6: Interventions for Non-Critical Assets



Intervention: 1 Desktop review of asset and performance, 2 Physical inspection of asset with closed circuit television review and decision made on extending expected asset life, 3 Repair, 4 Repair, 5 Repair. 6 Replace asset.

A methodology for determining asset criticality to a component level will be instigated along with options to integrate criticality into the ongoing operation, maintenance, renewals and capital programme for the stormwater activity.

5.4 ENVIRONMENTAL EFFECTS

5.4.1 Resource Consents Stormwater

Council has recently been granted resource consent to discharge stormwater into waterways under the Freshwater provisions of the Nelson Resource Management Plan. The application was processed as a controlled activity and conditions were imposed relating to monitoring of runoff from urban catchments. This monitoring is expected to add to the previous monitoring in the city and allow us to develop a better picture of the contents of the stormwater runoff from various areas. Future initiatives need to be developed to reduce the level of pollutants entering the waterways in the city.

5.5 LIFECYCLE MANAGEMENT- AN OVERVIEW

The Lifecycle Management Programmes cover the four key categories of work necessary to achieve the required outcomes for the stormwater activity. These programmes are:

Management Programme:

Management functions required to support the other Programmes - Developed and Implemented by Nelson City Council

Operations and Maintenance Programme:

To ensure efficient operation and serviceability of the assets so that they achieve their service potential over their useful lives - Developed, Managed and Implemented by Nelson City Council

Renewal Programme:

To provide for the progressive replacement of individual assets that have reached the end of their useful lives - Developed, Managed and Implemented by Nelson City Council

Maintaining the service potential of the assets and ensuring that the assets achieve that potential

Development Programme:

To improve parts of the system currently performing below target service standards and to allow development to meet future demand requirements - Developed, Managed and Implemented by Nelson City Council

Closing service gaps. Meeting future demand

The Operations & Maintenance and Renewal Programmes are focused on maintaining the current service potential of assets, and are primarily driven by the condition of assets although asset performance is often an indicator of asset condition.

The Development Programme is focused on closing service gaps by increasing the service potential of the Stormwater system and is primarily driven by the performance of assets and the need to accommodate growth in the City.

5.6 MANAGEMENT STRATEGIES

Table 5-5 below sets out Nelson City Council stormwater strategy for the following categories; Strategic Planning, Data Management and Utilisation, Business Processes, Monitoring and Financial Management.

Table 5-5: Management Strategies

Strategy	Objective / Description
Strategic Planning	
Human Resources	Develop the professional skills of the staff through adequate training and experience Personal Development Plans will be agreed with staff each year and a register maintained to record training history. Staff are encouraged to belong to appropriate professional bodies and to attend appropriate conferences, seminars and training courses.
Strategic Alignment	This Asset Management Plan will support the achievement of relevant Community Outcomes for Nelson City Council. Community Outcomes for Nelson City Council are set out in the Long Term Plan. The intended contribution of the Nelson City Council stormwater service to the achievement of Community Outcomes is shown in this Asset Management Plan.
Service Levels	A clear statement of the stormwater services provided and standards to be achieved that directly link to, and support the stated community outcomes, are shown within this Asset Management Plan. Service standards are incorporated into contracts as part of an internal performance management framework for the stormwater activity and will be used for performance and monitoring purposes.
Sustainable Management	Ensures all planning for the management, operation, maintenance, renewal and development of the stormwater activity is compatible with sustainable management principles. Nelson City Council will pursue ways of limiting the use of natural resources including energy, valued landscapes (and other natural heritage) and adverse effects on waterways. This will involve auditing the systems and materials used, and developing ways to incorporate sustainable operation and development principles into Nelson City Council activities.
Data Management and Utilisation	
Network modelling	Instigate the development of computer-based hydraulic models of the reticulation network. Computer models of the stormwater reticulation enable Nelson City Council to: Determine accurately the existing capacity of the system Identify inadequate sections of the system Operate the system in the most efficient and sustainable manner Determine the impact of further development on the system Identify system upgrading requirements Compare options for upgrading the stormwater system.
Data Collection	Data collection programmes (condition, performance, asset registers) closely aligned with business needs are operated in accordance with documented quality processes. Data collection, maintenance and analysis are expensive and it is important that programmes and techniques are cost effective and consistent with business needs. Systematic processes will be introduced for the collection and upgrading of essential data based on asset criticality including: Asset attribute information Asset performance data Asset condition data. Develop index of intensity, location and effects of flood events and location of flood data and continue to record and assess storm surges.
Geographical Information System Data	Geographical information system data will be the subject of defined quality assurance processes. Nelson City Council has quality processes to ensure that all data entered to the Geographical information system meets defined quality standards and supports Asset Management through connectivity with the asset register and Asset Management data storage.
Business Processes	
Asset Management Plan Updates	This Asset Management Plan remains a strategic 'living' document and will be updated as required and reviewed at three yearly intervals to coincide with the Long Term Plan.

Strategy	Objective / Description
	The scope of the review will be influenced by changes in Community Outcomes for Nelson City Council, service standards, improved knowledge of assets and corporate strategy/ policy and process.
Risk Management	Risk Management is an essential part of Asset Management. Stormwater activity risks will be managed by implementing a Risk Management Plan for the Stormwater activity and the implementation of risk mitigation measures to maintain risk exposure at agreed levels. Risk mitigation measures will include maintaining appropriate insurance cover, emergency response planning, condition monitoring of critical assets, preventative maintenance, use of Supervisory Control and Data Acquisition, and operations manuals, review of standards and physical works programmes.
Infrastructure Asset valuation	Perform valuations in a manner that is consistent with national guidelines and Nelson City Council corporate policy for valuation cycles which are carried out every 1-3 years to reflect international financial activity and align with the Long Term Plan requirements. Asset valuations are the basis for several key asset management processes including asset renewal modelling and financial risk assessments. Valuations of the stormwater system will be carried out based on data from the Asset Management System to ensure audit ability and alignment with other processes.
Monitoring	
Level of Service Standards	Continue with the monitoring procedures to ensure stormwater activity is contributing to the community outcomes as stated and that internal controls are also monitored and managed.
Asset Performance	The performance of the stormwater assets are monitored as an input to asset renewal and asset development programmes. The Monitoring includes: Customer service requests Asset failure records Asset Maintenance records Compliance with Resource Consents Critical asset audits Supervisory Control and Data Acquisition Legislative compliance.
Financial Management	
Budgeting	Expenditure programmes for the stormwater activity indicates Council funding and budgets with a 12 year projection. Use the Asset Management Plans to provide sufficient detail to demonstrate the decision making process for those 12 year projections.
Financial management	Manage the stormwater activity budget in accordance with statutes and corporate policy. This involves: Economic appraisal of all capital expenditure Annual review of Asset Management Plan financial programmes Recording of significant deferred maintenance and asset renewals Continuous monitoring of expenditure against budget.
Sustainable Funding	Ensure the stormwater activity is managed in a financially sustainable manner over the long term. The financial requirements for the provision of the stormwater activity, sustainable and to acceptable standards over the long term will be identified and provided for in the budgets. These financial requirements include: Management of the stormwater activity Operation and maintenance of the stormwater system Asset replacement Asset development to ensure that the ability of the stormwater activity to deliver an acceptable level of service is not degraded by growth in Nelson City Council.

5.7 OPERATIONS AND MAINTENANCE PLAN

5.7.1 Introduction

Operations and Maintenance strategies set out how the stormwater activity will be operated and maintained on a day-to-day basis to consistently achieve the optimum use of assets. Operations and Maintenance activities fall into the following categories, each having distinct objectives and triggering mechanisms:

Operations - Activities designed to ensure efficient utilisation of the assets, and therefore that the assets achieve their service potential. Operational strategies cover activities such as energy usage, control of mechanical and electrical plant, inspections and service management.

Maintenance - Maintenance strategies are designed to enable existing assets to operate to their service potential over their useful life. This is necessary to meet service standards, achieve target standards and prevent premature asset failure or deterioration. There are three types of maintenance:

- Preventative Maintenance - A base level of maintenance carried out to a predetermined schedule. Its objective is to maintain the service potential of the asset system.
- Predictive Maintenance - Maintenance actioned as a result of condition or performance evaluations of components of the Stormwater system. Its objective is to avoid primary system failure
- Reactive Maintenance - Maintenance carried out in response to reported problems or system defects. Its objective is to maintain day-to-day levels of service.

5.7.2 Method of Delivery

The operation and maintenance of the Nelson City Council stormwater activity is carried out using a combination of Nelson City Council staff and external contractors consisting of:

- Network Services internal utilities business unit for design and Supervision (Nelson City Council).
- NELMAC Ltd for all reticulation operations and maintenance (CCTO).
- External contractors for specialist activities such as closed circuit television and major overhauls of mechanical equipment.

5.7.3 Operations and Maintenance Strategies

The following table sets out the operations and maintenance strategies:

Table 5-6: Operations and Maintenance Strategies

Strategy	Objective / Description
Maintenance	
Preventative Maintenance	Preventative Maintenance will be carried out in terms of defined routine maintenance items and triggers for these activities to be carried out. An annual inspection of the rivers and streams occurs in October each year. Road sweeping: City street cleaning is carried out under Council's road maintenance contract Arterial and principal streets in the Central Business District are swept twice a week Local Central Business District streets are swept three times a week Arterial roads are swept weekly Principal and collector roads every two weeks Sub-collector roads monthly

Strategy	Objective / Description
	Central Business District central asphalt footpaths are washed once every two weeks Dry material is disposed of to landfill and liquid material is disposed to the sewerage infrastructure as trade waste. Sump cleaning: Council's road maintenance contract requires every Council owned sump and Transit New Zealand owned sump in the urban area be cleaned out annually All sumps and associated pipework to be 95% clear of debris at all times All liquid cleanings are disposed to the sewerage infrastructure as trade waste. Individual river and stream maintenance programmes: Bridge, weir, culvert, bank and bed protection, using rock, timber, gabions etc Removal of trees, shrubs and grasses where necessary Cleaning of energy dissipaters, pipe outlets and fish access.
Reactive Maintenance	Remedial maintenance will be undertaken as quickly as practically possible to restore an asset to a satisfactory condition after a failure or other unsatisfactory condition has been detected.
Repairs	The detection and repair of faults causing failure will be undertaken as quickly as practically possible. The fault will be isolated and components repaired or replaced as appropriate and then if warranted the item will be tested to ensure that it meets the relevant operational standard.
Redesign and Modification	Redesign may be necessary if an asset or system does not meet its operational objective. Similarly, modifications may be necessary to improve the operating characteristics. Redesign and modifications will be undertaken in a methodical manner to ensure alternative options are considered and optimum decisions made.
Operations	
Operations	Operational activities will be undertaken via NELMAC unless specialised advice is required. Staff will be responsible for the determination and optimisation of planned and unplanned works, work methods and maintenance scheduling to achieve the target service standards.
Physical Works Monitoring	Audits of work will be carried out to verify compliance with standards.
Operation of Utilities	Utilities such as pumping stations will be operated in terms of defined parameters and standards.
Incident management	Effectively respond to and manage incidents to ensure system availability and service continuity, and mitigate adverse effects. Maintenance staff and contractors are expected to effectively manage minor incidents. Nelson City Council staff will become involved in serious incidents.
System control and monitoring	Utilise Supervisory Control and Data Acquisition systems to monitor operation of the stormwater facilities. The Supervisory Control and Data Acquisition system provides surveillance of the operation of pumping stations in the stormwater system and provides alarms when equipment fails or when operating parameters are exceeded. The Supervisory Control and Data Acquisition system also records operating data from the pumping stations.

5.8 RENEWAL / REPLACEMENT PLAN

5.8.1 Introduction

Cyclic renewal strategies are intended to provide for the progressive replacement of individual assets that have reached the end of their useful life. The rate of asset renewal is intended to maintain the overall condition of the asset system at a standard that reflects its age profile, and ensures that the Community's investment in the District's Stormwater infrastructure is maintained.

The level of expenditure on cyclic asset replacement varies from year to year, reflecting:

- The age profile of the system.
- The condition profile of the system.
- The ongoing maintenance demand.
- Customer service issues.
- The differing economic lives of individual assets comprising the overall asset system.

Failure to maintain an adequate cyclic renewal programme will be reflected in a greater decline in the overall standard of the system of assets than would be expected from the age profile of the asset system.

Cyclic renewal works fall into two categories:

- Rehabilitation: Involves the major repair or refurbishment of an existing asset. An example is the relining of an existing pipeline. Rehabilitation produces an extension in the life of an asset. It does not provide for a planned increase in the operating capacity or design loading.
- Renewal: Does not provide for a planned increase to the operating capacity or design loading. Some minor increase in capacity may result from the process of renewal, but a substantial improvement is needed before system development is considered to have occurred.
- For the purpose of developing asset renewal programmes the stormwater assets have been separated into “discrete” and “non discrete” assets.
- “Discrete” assets are assets such as pumping stations, which are separately identifiable, accessible and which can readily be inspected.
- “Non discrete” assets are assets such as buried pipelines which are part of an extensive network, are generally below ground and which cannot readily be inspected (other than by techniques such as excavation and closed circuit television).

5.8.2 Renewal/Replacement Strategies

The following table sets out cyclic renewal strategies:

Table 5-7: Renewal Strategies

Strategy	Objective / Description
Identification of Renewal Needs	Renewal/replacement needs are identified by analysing; Condition reports, maintenance records (asset failure and expenditure history), wastewater infiltration studies, request for service (RFS) records, and observations of public, staff and contractors. Renewal forecasts are based on an assessment of remaining asset lives (integrated with the valuation process). For pipe assets (non discrete assets) remaining lives are estimated using available condition data for asset groups with similar deterioration drivers (e.g. pipe material, location, etc.) and from factors such as maintenance history and customer issues. Remaining lives for aboveground assets (discrete assets) have been estimated from condition assessments, maintenance history and customer issues. The short-term asset renewal programmes are prepared from specific renewal needs identified from the above information. Long-term asset renewal programmes are prepared from the remaining life profiles for the assets. A review of the renewal strategy is required to take into consideration criticality and earlier intervention requirements along with the preparation of a integrated condition assessment programme as an input to determining useful lives of assets. This programme would include the optimisation of closed circuit television in the repair or replace process.
Prioritisation of Renewal Projects	Decisions on renewal works consider the short and long-term effects on the operating and structural integrity of the system. Renewal works are designed and undertaken in accordance with Nelson City Council Land Development Manual.

Strategy	Objective / Description
Deferred Renewals	The quantity and impact of deferred renewals (if any) is tracked The Council recognises that although the deferral of some items on cyclic renewal programmes will not impede the operation of many assets in the short term, repeated deferral will create a future Council liability. As Council currently funds asset renewals from depreciation deferred renewals are not expected.
Inspections Prior to Major Road Works	The condition of stormwater pipelines will be inspected prior to major road works to identify the risk of the road being damaged by pipeline failure or the need for pipeline replacement in the short/medium term. Pipelines in poor condition will be programmed for replacement prior to or in conjunction with the road works.

5.9 ASSET UPGRADE PLAN

5.9.1 Introduction

Asset development provides for a planned increase in the service capability of the stormwater system to:

- Close gaps between the current capability of the stormwater system and target service standards.
- Accommodate growth.
- Ensure appropriate funding mechanisms are in place such as Development Contributions.

Asset development and asset renewal can occur simultaneously. The purpose of asset renewal is to prevent a decline in the service potential of the assets whereas asset development is concerned with the service improvements, measured by asset performance.

5.9.2 Asset Upgrade Strategies

The table below sets out the strategies used for developing capital works programmes for the stormwater systems. These strategies are intended to progressively close gaps between target service standards (taking account of demographic and economic growth projections) and the current service capability of the asset system.

Table 5-8: Upgrade Strategies

Strategy	Objective / Description
Identification of Upgrade Needs	Asset upgrade needs are identified from analysis of: Demand forecasts System performance monitoring Network modelling Risk assessments (Risk Management Plan), and Customer service requests. A provisional forward capital works programme is maintained and updated at least annually.
Upgrade Project Categorisation	Upgrade Projects will be separated into projects to close service gaps and projects required to accommodate growth. Upgrade projects to close service gaps are generally funded entirely by Nelson City Council. Upgrade projects to accommodate growth may be partly or wholly funded through Development Contributions.
Prioritisation of Upgrade Projects	Upgrade projects are justified and prioritised using a risk based process. Decisions on upgrade works consider the short and long-term effects on the operating and structural integrity of the stormwater system. In determining the requirement for capital or asset upgrade works the short and long-term effects on the operating and structural integrity of the system are considered, together with any forecast increase in loading upon the system. All feasible options, including non-asset demand management options and the

Strategy	Objective / Description
	use of second-hand plant, are considered. Upgrade works are designed and undertaken in accordance with Nelson City Council Land Development Manual and system design loadings.
Project Approval	A long-term upgrade programme is prepared from projects meeting the assessment criteria, and all projects are approved through the Annual Plan process. The actual timing of asset upgrade works will reflect the community's ability to meet the cost, as determined through the Annual Plan process. Scheduled projects meeting assessment criteria not funded are listed on the forward works programme for the following year.
Project Design	All asset upgrade works will be designed and constructed in accordance with current adopted industry standards (or known future standards) and system design loading. In determining capital or asset upgrade work requirements the short and long term effects on the operating and structural integrity of the system are considered, together with the demands of any forecast increase in loading upon the system. The system will be designed to minimise supply disruptions as far as practically possible by building in an appropriate level of redundancy. The standardisation of designs and specifications will be considered in the interest of facilitating replacement and operational simplicity.
Funding Strategies	Nelson City Council will review annually funding requirements and strategies to achieve equitable funding of upgrade works through, targeted rates, development and or financial contributions.
Gifted Assets	The risk, cost and benefits of accepting any new privately funded assets constructed in association with property development will be considered on a case by case basis in approval decisions. Such assets will be accepted into public ownership when satisfactorily completed in accordance with approvals given. Council will not contribute to the cost of such work unless there are exceptional service standard or equity issues.

Decisions on priorities for new works and renewal of assets for the stormwater network are based on the following:

- Known problem areas with flooding or inundation issues
- New growth areas
- Primary flow conduits – rivers and streams
- Secondary flow paths
- Criticality of proposed works
- Multiple network project (e.g. incorporating road work, sewer, water assets)

Various components of the stormwater goal are considered when developing the final detailed design:

- Economics of various options
- Efficiency of meeting the network need
- Cultural values relating to storm water disposal to freshwater and marine environments
- Ecological values of freshwater and marine eco-systems
- Recreational values of shared rivers and streams
- Enhancing natural structures of streams and rivers where possible

5.10 DISPOSAL PLAN

5.10.1 Introduction

The disposal plan recognises that there can be activities and costs associated with the decommissioning and disposal of assets which are no longer required as part of the stormwater systems. In some situations there can be revenue resulting from asset disposal.

5.10.2 Asset Disposal Strategies

Table 5-9: Disposal Strategies

Strategy	Objective / Description
Asset Disposal	Assess each proposal to dispose of surplus or redundant assets on an individual basis, subject to the requirements of the relevant legislation. Asset disposal will comply with the requirements of the Local Government Act 2002 and in particular the requirement for councils to retain a capability to provide stormwater services. Redundant pipes are backfilled or removed where their alignment clashes with replacement pipelines or where their existence is considered dangerous. This is to ensure collapse does not occur.
Residual Value	The residual value (if any) of assets, which are planned to be disposed off, will be identified and provided for in financial projections.

5.10.3 Summary of Future Costs

Assets, which are disposed of, have generally reached the end of their useful lives and have minimal or no residual value. When a Stormwater asset is abandoned or replaced the Geographic Information System and fixed asset register are updated. A system of job number creation and asset identification is used to document this process.

5.11 SIGNIFICANT NEGATIVE EFFECTS

Table 5.10 below identifies the negative effects for the Nelson city Community that the stormwater activity may have on the social, economic, environmental or cultural well-being of the community. It indicates how the existing approach or proposed action to address these in future. There are no significant negative effects shown to occur for the Nelson City Council stormwater activity.

Table 5-10: Negative Effects – The Stormwater Activity

Effect	Status of Effect		Type of Effect		Impact on Well-Being				Existing Approach or Proposed Action to Address
	Existing	Potential	Negative	Significantly Negative	Social	Economic	Environmental	Cultural	
Pump Stations									
Noise.	Static	Static	√		Minor	Nil	Minor	Nil	High degree of noise mitigation in residential areas during storm events.
Rivers and Streams									
Sedimentation and vegetation build up.	Static	Static	√		Minor	Minor	Mod	Minor	Removal by mechanical/spraying means.
Use of chemical	Static	Static	√		Mod	Nil	Minor	Mod	Compliance with MFE and resource

Effect	Status of Effect		Type of Effect		Impact on Well-Being				Existing Approach or Proposed Action to Address
	Existing	Potential	Negative	Significantly Negative	Social	Economic	Environmental	Cultural	
sprays.									consent requirements.
Pest weeds.	Static	Static	√		Mod	Nil	Minor	Mod	Compliance with the Tasman-Nelson Pest Management Strategy.
Environmental									
If flooding were to occur on a regular basis this may affect the ability of industries to obtain or retain ongoing insurance.	Static	Static	√		Mod	Mod	Minor	Nil	Modelling of catchments to identify reticulation (drains and pipes) that are at capacity and may constrain future development or be at risk of flooding upgrade streams and rivers to Q_{100} capacity.
Discharge of contaminated stormwater into waterways and without treatment.	Static	Reducing	√		Minor	Nil	Mod	Mod	Environmental monitoring programme. Instigation of catchment management plans. Pollution prevention plans for high risk industries is a requirement of the NRMP.
If increased development and population growth occurs, stormwater may contain more pollutants.	Static	Static	√		Minor	Minor	Mod	Mod	NRMP and stormwater bylaw has controls for stormwater treatment and discharge when growth within the community is being considered.

6. FINANCIAL

This Section sets out financial statements, funding strategy, depreciation forecast and charges for the Stormwater Services in Nelson City.

6.1 OVERVIEW

The Local Government Act 2002 (Part 6 Subpart 3) requires local authorities to manage their finances "prudently and in a manner that promotes the current and future interests of the community. This implies compliance with applicable Financial Reporting Standards, which include New Zealand equivalents to International Financial reporting Standards (New Zealand IFRS).

In determining how activities will be funded Local Authorities are required to take the following into consideration:

- The contribution to the achievement of Community Outcomes (strategic alignment).
- Beneficiaries of each activity (beneficiary/user pays principles).
- The period over which benefits from the activity will occur (intergenerational equity issues).
- The extent to which identifiable individuals contribute to the need to incur expenditure (exacerbator and user pays principles).
- The costs and benefits of funding the activity compared to other activities (cost/benefit, prioritisation principles).
- The impact of funding the activity on the well-being of the community (ability to pay principles).

This Asset Management Plan provides the basis for meeting these requirements.

6.2 ASSET VALUATION AND DEPRECIATION

6.2.1 Definition

The basic value of an asset reduces in accordance with the wearing out over the asset's life arising from use, the passage of time, or obsolescence. This reduced value is called the depreciated replacement cost. It is accounted for by the allocation of the cost (replacement cost) of the asset less its residual value over its useful life.

6.2.2 Valuation Method

Every two years Council uses a professional external valuation company to re-value assets. In the intervening years Council adjusts the valuation by indexing to the construction cost index.

The 30 June 2015 asset valuations have been completed in-house, by Council staff. The in-house valuations have been based on Council's Hansen Asset Management System for Sewerage, Stormwater and Water Supply assets.

As the valuations have been completed in-house, there is a requirement from Audit New Zealand that the work be externally reviewed. Opus International Consultants performed this independent audit.

6.2.3 Assumptions

Typical useful lives from the New Zealand Infrastructure Asset Valuation and Depreciation Guidelines – Version 1.0 have been used as a guide in determining base lives. However the manual generally provides insufficient detail for our asset components and so Nelson City Council experience from the renewals of its assets has been used to vary these base lives.

A policy was developed for deciding how the ownership of stormwater assets on legal road is split between roading and stormwater. The general rules are as follows:

- Sumps in legal road are a roading asset.
- Connections from sumps in legal road to the stormwater system are a roading asset until they meet a pipe of diameter 250mm or greater which originates from outside legal road.
- All manholes are stormwater assets.
- Culverts crossing legal road which have open channel on both sides are roading, others are stormwater, with a few exceptions of special culverts which run parallel to legal road and are stormwater assets.

Where an asset has exceeded its nominated base life, a residual life of 5 years is assumed.

6.2.4 2014, 2012 Valuation Results

The 2012 valuation as compared to the June 2010 valuation are presented in Table 6-1 below:

Table 6-1: 2014, 2012 and 2010 Valuation Comparison

Asset Category	Quantity	Unit	Replacement Value $
Stormwater 2014			
Mains Up To 600mm	159.4	km	75,557,050
Mains > 600mm	40.5	km	47,371,923
Channels	1.2	km	251,352
Culverts	5.8	km	16,554,691
Rocks Road Culvert	0.3	km	3,039,409
Tide Gates	24	No	175,509
Intakes	93	No	526,970
Manholes	4,404	No	20,324,201
Outfalls (with wing walls)	77	No	394,041
Sumps	593	No	1,384,972
Pump Stations	2	No	3,343,711
TOTAL			168,923,829
Flood Protection 2014			
Bank Protection	59,222	m^2	11,978,760
Detention Dams	9	No	1,645,220
TOTAL			13,623,980

Asset Category	June 2012				June 2010			
		RV	DRV	Depr		RV	DRV	Depr
	Km / units / m^2	($)	($)	($)	Km / units / m^2	($)	($)	($)
Mains Up To 600mm	144.9	53,228,816	37,410,981	600,708	142.1	55,493,451	39,813,603	626,988
Mains > 600mm	41.1	45,003,941	30,133,239	498,195	39.0	42,487,525	28,978,587	470,472
Channels	1.2	259,945	145,504	2,963	1.2	245,993	143,411	2,805

Asset Category	June 2012				June 2010			
		RV	DRV	Depr		RV	DRV	Depr
	Km / units / m^2	($)	($)	($)	Km / units / m^2	($)	($)	($)
Culverts	6.1	16,282,692	12,006,413	181,315	6.0	15,042,650	11,338,210	167,590
Rocks Road Culvert	0.3	3,039,410	2,822,960	33,771	0.3	2,867,369	2,726,933	31,860
Bank Protection	59,222	11,986,491	8,839,660	119,311	59,222	11,325,561	8,572,539	112,905
Intakes	95	533,926	390,652	6,574	98	514,693	376,926	6,344
Manholes	4,241	17,774,535	13,671,923	197,200	4,031	17,319,610	13,444,797	192,109
Outfalls	70	288,763	181,330	4,955	70	272,443	176,658	4,681
Sumps	588	1,195,976	892,089	13,235	556	895,155	673,973	9,907
Pump Stations	2	3,343,720	2,234,913	102,455	2	3,154,461	2,298,778	97,058
Tide Gates/flaps	13	175,521	105,237	5,168	13	165,600	107,962	4,936
Detention Dams	6	1,196,169	1,076,071	4,933	6	1,130,354	1,026,569	4,645
TOTAL		154,309,906	109,910,972	1,770,783		150,914,863	109,678,945	1,732,298

Subdivision activity since 2006 has seen an increase in the quantities of pipes and manholes.

Table 6-2: Pipe Asset Lives

Material	Life
Asbestos cement	80
Aluminium	60
Armour coil	60
Brick	80
Cast Iron	80
Concrete	90
Drainage coil	50
Earthenware	80
High Density Polyethylene	80
Perforated concrete	80
Plastic	80
Concrete lined steel	50

6.3 REVENUE AND FINANCING POLICY - STORMWATER

Distribution of Benefits

- Community benefits
  - Disposes of stormwater and keeps urban areas (roads, land amenities, shops etc) free from floods
  - Contributes to public health and safety and maintains quality of life
  - Enhances amenity and property values
- Individual benefits
  - All landowners with stormwater runoff receive a private benefit

The Costs and Benefits of Funding the Activity Distinctly from Other Activities

The benefits of funding Council's stormwater activity apply to all those who live in the areas where Council provides a stormwater system. Therefore Council used a fixed rate as the most equitable form of funding this activity.

The stormwater rate is a separate fixed rate under section 16 of the Local Government (Rating) Act 2002 to recover the funding required by Council for stormwater. It is payable by all ratepayers other than properties in excess of 15 Ha throughout the city, and all properties east of Gentle Annie saddle.

See Nelson City Council Long Term Plan 2015/25 for unit definition and details.

6.4 ROUTINE MAINTENANCE PLAN

6.4.1 Definition

Routine maintenance is the regular ongoing day-to-day work necessary to keep assets operating, including instances where portions of the asset fail and need immediate repair to make the asset operational again. This includes:

- Regular and ongoing annual expenditure necessary to keep the assets at their required service potential.
- Day-to-day and/or general upkeep works designed to keep the assets operating at required levels of service.
- Works which provide for the normal care and attention of the asset including repairs and minor replacements.
- Unplanned (corrective) maintenance, i.e. isolated failures requiring immediate repair to make the asset operational again.

6.4.2 Maintenance Contract

The operations and maintenance of the reticulation network is operated under a contract with Nelmac.

6.4.3 Maintenance Planning

Currently much of the asset maintenance is reactive and preventative. Further work moving towards advanced asset management planning techniques for critical components is considered appropriate to apply predictive maintenance programmes. This approach would allow for maximising the useful life of an asset while minimising the consequences of unforeseen failures. See table 6-3 for a breakdown of the maintenance costs.

Table 6-3: Stormwater 12 Year Operations and Maintenance Projections ($,000)

Year		1	2	3	4	5	6	7	8	9	10	11	12
Long Term Plan		**2015/25 LTP**			**2018/28 LTP**			**2021/31 LTP**			**2024/34 LTP**		
O&M Expense	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27
Administration	1,972	858	865	857	865	857	865	857	865	857	865	865	865
Depreciation	1,883	2,005	2,027	2,044	2,076	2,109	2,160	2,238	2,302	2,349	2,397	2,397	2,397
Electricity	10	11	11	11	11	11	11	11	11	11	11	11	11
Mtce: Physical Works - Programmed Reticulation	16	20	20	20	20	20	20	20	20	20	20	20	20
Mtce: Physical Works - Reactive Reticulation	206	250	250	250	250	250	250	250	250	250	250	250	250
Mtce: St Vincent culvert		2	2										
Mtce: Monitor Streams Cawthron	21	20	20	20	20	20	20	20	20	20	20	20	20
Building Act: Dams		120	20	20	20	20	20	20	20	20	20	20	20
Mtce: Wakapuaka Land Drainage	6	6	6	6	6	6	6	6	6	6	0	0	0
Freshwater Bylaw Compliance	5												
Update NIWA rainfall/ Natural Hazards Risk Assessment		70		50									
Network Capacity for Growth		50	50										
Port Hills S/W Strategy					150								
Stoke S/W Strategy							150						
Tahuna S/W Strategy									150				
Stream Maintenance Code of Practice		75											
Prelim Capex Investigations		10	10	10	10	10	10	10	10	10	10		
Total [a] ($,000s)		3,497	3,281	3,288	3,428	3,303	3,512	3,432	3,654	3,543	3,593	3,583	3,583

Table 6.4: 12 Year Flood Protection Operations and Maintenance.

Year		1	2	3	4	5	6	7	8	9	10	11	12
Long Term Plan		**2015/25 LTP**			**2018/28 LTP**			**2021/31 LTP**			**2024/34 LTP**		
O&M Expense	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27
Administration		264	264	264	264	264	264	264	264	264	264	264	264
Mtce: Open Channel Programmed		2	2	2	2	2	2	2	2	2	2	2	2
Mtce: Open Channel Reactive		200	200	200	200	200	200	200	200	200	200	200	200
Depreciation		139	171	245	309	326	327	328	329	367	419	419	419
Total ($,000s)		605	637	711	775	792	793	794	795	833	885	885	885

6.5 RENEWAL STRATEGY

6.5.1 Definition

Renewal expenditure is major work that does not increase the asset's design capacity but restores, rehabilitates, replaces or renews an existing asset to its original capacity. Work over and above restoring an asset to original capacity is deemed to be new capital. Work displaying one or more of the following attributes is classified as rehabilitation or renewal expenditure:

- Works which do not increase the capacity of the asset, i.e. works which restore them to their original size, condition, capacity etc
- The replacement component of augmentation works which increase the capacity of the asset, i.e. that portion of the work that restores the asset to their original size, condition, capacity etc
- Reconstruction or rehabilitation works involving improvements and realignment
- Renewal and/or renovation of existing assets, i.e. restore the assets to a new or fresh condition

6.5.2 Renewals Strategy

Nelson City Council renewal strategy is currently based on condition and age. Within the next ten years it is expected that this will move to a strategy based on a combination of the following:

- Performance
- Asset criticality (using the business and extended asset risk schedules)
- Capacity
- Condition (age data used to estimate condition when condition data not held)
- Ability to combine with other utility or roading projects in the area

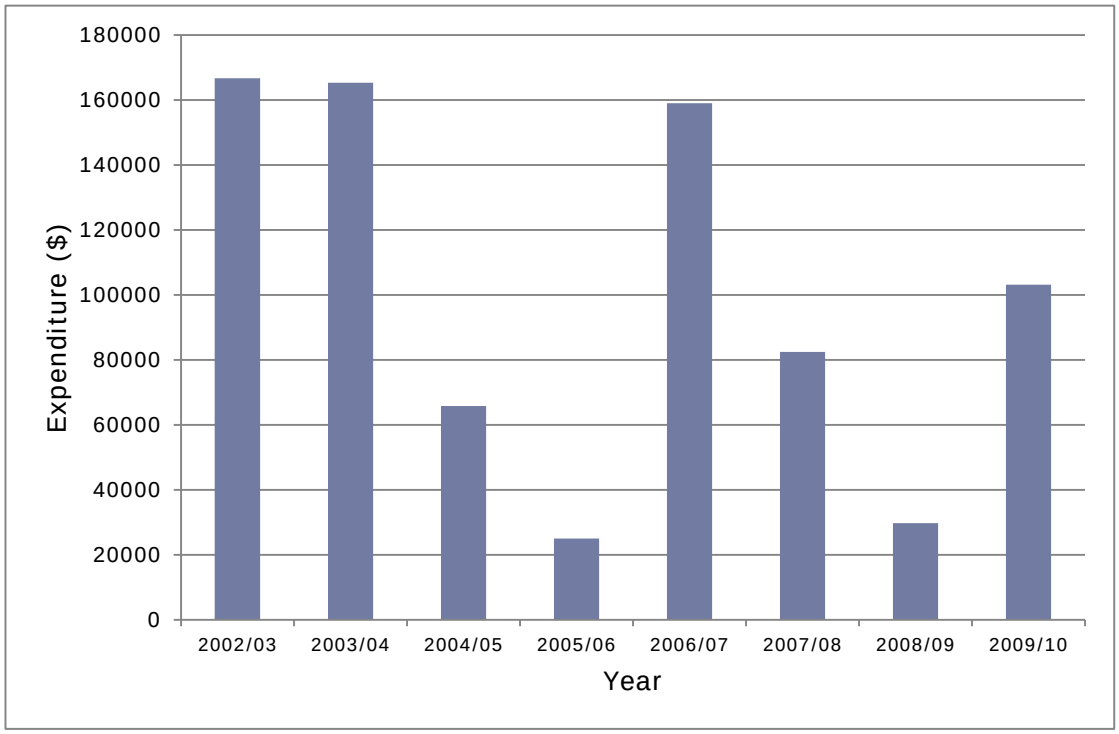
The transition to the renewal strategy will take some time to implement as supporting evidence of the above is obtained. These will include:

- Field maintenance condition feedback
- Asset failure records
- Pipe sampling programmes
- Specific inspections and condition rating of assets

6.5.3 Actual Renewal Expenditure

The actual renewal expenditure for the period 2002/03 to 2009/10 is detailed below.

Figure 6-1: Renewal Expenditure 2002/03 to 2009/10



This table will be updated as part of the first plan review.

6.5.4 Deferred Renewals

This plan indicates no deferred renewals.

6.5.5 12 Year Renewal Plan

The renewal programme for 2015/16 to 2026/27 is detailed in Table 6-4. For this Asset Management Plan renewals continue to be based on age of reticulation.

6.5.6 Sensitivity of Renewal Plan

The renewals programme is based on a transitional stage as detailed in Section 6.6.2 and as this renewal strategy is developed the renewal programme will be reviewed.

Table 6-5: 12 Year Renewal Plan ($,000)

Year		1	2	3	4	5	6	7	8	9	10	11	12
Long Term Plan		**2015/25 LTP**			**2018/28 LTP**			**2021/31 LTP**			**2024/34 LTP**		
Renewals Project Area	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27
Pipe Renewals		96	50	50	50	50	50	50	50	50	50	50	50
Pump Station Renewals		20	0	40	0	200		0	460	80	130		
Tide Gate Renewals			25					15					
Total ($,000s)		116	75	90	50	250	50	65	510	130	180	50	50

6.6 UPGRADE AND NEW ASSETS CAPITAL PROGRAMME

6.6.1 Definition

New works are those works that create a new asset that did not previously exist or works which upgrade or improve the capacity of pipelines through infill development. They may result from growth, social or environmental needs. Capital expenditure projects display one or more of the following characteristics:

- Construction works which create a new asset that did not previously exist in any shape or form.
- Expenditure which purchases or creates a new asset (not a replacement) or in any way improves an asset beyond its original design capacity.
- Upgrading works which increase the capacity of the asset.
- Construction works designed to produce an improvement in the standard and operation of the asset beyond its present capacity.

Areas of Inadequate Stormwater Systems

Nearly 3,000ha of Nelson City is serviced by inadequate stormwater reticulation systems. It is not economically viable to upgrade all these systems over the next 10 years. A project prioritisation process has been developed in Appendix J as a means of ranking projects.

River and Stream Upgrading

Maitai River Flood Capacity and Protection of the Central Business District

The Maitai River, Brook Stream and York Stream are the major watercourses that impact on the central business district. Flooding from these channels can impact on most areas of central Nelson. In order to develop long term plans for flood protection, computer models of these water courses are being constructed. These models can then be used to investigate flooding patterns for any rain event and look at the effectiveness of upgrade options.

The Maitai River has undergone limited upgrading of the river in the lower reaches only to allow for extreme flood events. Council has recognised the need to further develop a range of solutions in the upper residential reaches where development and recreational uses increase the complexity of flooding design. An updated flooding model has now been completed for the full length of the Maitai River. This model is being used to investigate the areas where flood waters escape the current river channel and model the possible impacts of future climate change and sea level rise.

The primary issue being considered is whether or not it is possible to contain flood flows within the “banks” of a modified river cross section and if this is possible, at what cost to the current walkways and reserves that have been developed in these areas. Inevitably there will have to be some trade off made between protecting properties from flooding and maintaining the natural and recreational values of the river. The first step is discussions with the community about the aspects of the Maitai River that are considered to be critical to retain.

Sections of the Maitai river adjacent Clouston’s Bridge and Riverside Drive are expected to be the focus for initial detailed investigation.

The Brook Stream is a mix of natural and concrete lined channels, in an increasingly urbanised environment, from the intersection point with the Maitai River to the headwaters above the Brook Motor Camp. There is very limited flow information available for the stream, which has an impact for the Maitai flood protection investigation, as well as initiatives for the Brook stream itself, such as the improvement of the concrete channel section for fish passage. In 2013 Council, through its hydrology contract with Tasman District Council, installed flow monitoring equipment within the concrete channel section. The next step is to begin developing a computer model of the concrete section of the channel to look at options for creating a more natural channel environment and evaluating flood capacity into the future.

York Stream is also a mix of natural and modified channels. Upper reaches are controlled by three detention dams in the Bishopdale area and with culverted and open channel sections to Victory School. Council has begun construction of a large diameter pipeline from the York Stream intake at the Bishopdale reserve to the open channel section in Tipahi Street. This pipeline has been designed to cope with a Q_{100} (1% probability of occurrence in any year) flow event.

The area from Victory School to the sea is fully enclosed in a box culvert. Flows in excess of the various open channel/culvert capacities must flow overland through the lower Bishopdale/Vanguard Street/St Vincent Street areas to Saltwater Creek.

Currently Council is reviewing the capacity of the main culvert networks in Vanguard Street and St Vincent Street prior to starting work on a computer model that will enable a more accurate assessment of overland flow issues in the area.

Climate Change and the Capacity of Rivers and Streams

The flood flow that Nelson would experience from a Q_{50} event (2% probability of occurrence in any year) is the current standard that has been adopted for design and construction works of the major stream and river channel upgrades in the city. Recent extreme events in excess of Q_{50} have lead to the need to review the minimum design standard and consider whether this should be increased to Q_{100} (1% probability of occurrence in any year). The LTP 2015/25 signalled that Council will review the risk profile of streams and rivers on a case by case basis before deciding on the appropriate response to flooding.

Options for addressing the flooding risk to urban properties are being considered for three broad timebands: Current day to 2040, 2040-2070 and 2070-2100. These timebands follow preliminary assessments of the impacts of climate change on rainfall intensities carried out by the National Institute of Water and Atmospheric Research Ltd (NIWA). Detailed design for upgrading works would ideally set a framework for protecting against current flood patterns while ensuring future generations can carry out the works required for flood flows at the time.

The broad strategy for flood protection through the city is currently based on:

- Upgrading the urban stretches of rivers and streams and ensuring secondary flow paths are identified and maintained from rivers, streams and detention dams- Protecting the Central Business District- Stoke area-Atawhai area to the top of the Gentle Annie Saddle;
- Extending the piped stormwater network through the city;
- Upgrading existing open channel drains;
- Identify, maintain and upgrade secondary flow paths.

While most of the urban streams maintained by Council have had substantial stretches upgraded to meet pre-climate change Q_{50} flows, increased development in upper reaches has highlighted some weak areas. Serious flooding in the Orphanage Stream and Saxton Creek areas during April 2013 has lead to the need for urgent works to be carried out on both streams. Nelson City Council and Tasman District Council are jointly developing plans for Saxton Creek to upgrade culverts in Champion Road and the stream channel from Champion Road to Main Road Stoke. Nelson City Council will need to continue with upgrading works downstream of Main Road Stoke in future years.

6.6.2 Capital Works Programme 2015/16 to 2026/27

There are still large parts of Nelson that do not have access to a reticulated stormwater system. Where these areas are developed on a good gravel base, on-site soakage has not caused any particular problems over the years. Where these areas discharge stormwater onto clay based sites with very limited soakage, overland flow into open ditches quickly results. Land stability issues, neighbour to neighbour relationships, public health issues arising from water ponding and insect breeding, together with the aesthetic and economic cost of maintaining open ditches have led previous Councils to support a programme of providing a reticulated stormwater network in the City. Priority has been given to those areas with poor soakage, inundation and land stability issues.

Over the next three years a review of the stormwater provisions within the Tahunanui Slope Risk Area will be undertaken.

Improvements in the stormwater and flood protection networks requiring separate capital expenditure currently follow a priority order:

- Reactive emergency works;
- Wider areas impacted by significant flooding or land slippage;
- Streams and rivers capacity upgrade;
- Streets without stormwater reticulation.

Various components of the stormwater goal are considered when developing the final detailed design:

- Economics of various options;
- Efficiency of meeting the network need;
- Cultural values relating to storm water disposal to freshwater and marine environments;
- Ecological values of freshwater and marine eco-systems;
- Recreational values of shared rivers and streams;
- Enhancing natural structures of streams and rivers where possible.

The capital works programme for the next 12 year period is based on the following:

- Continuation of the stormwater upgrade strategy
- Upgrade of stormwater network to service future development areas
- Identification of appropriate stormwater disposal mechanisms throughout the city

Figure 6-2 below indicates that the significant proportion of capital works programme is associated with LOS requirements.

Figure 6-2: Capital Works - Growth and LOS

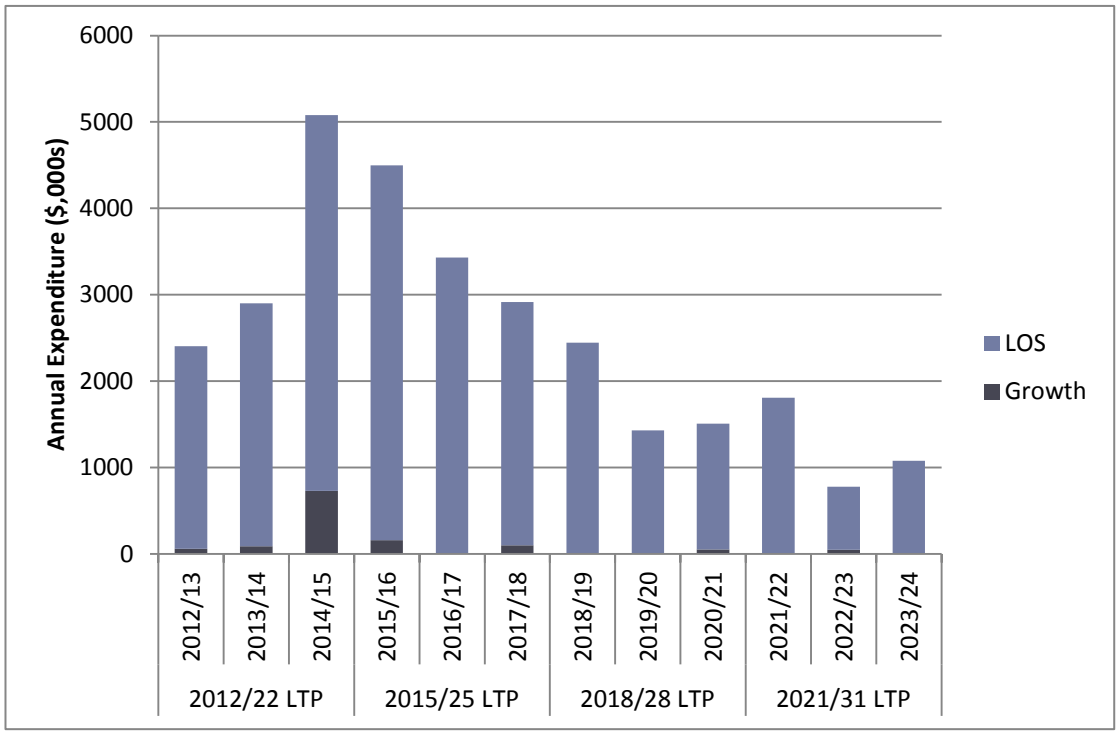


Table 6.6: 12 Year Stormwater Capital Expenditure Projections($,000)

Year		1	2	3	4	5	6	7	8	9	10	11	12
Long Term Plan		2015/25 LTP			2018/28 LTP			2021/31 LTP			2024/34 LTP		
Capital Projects	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27
Airlie St			50	50	300								
Anglia/Scotia									50	150			
Arapiki Rd					100	50	200	300					
Ariesdale/Thompson Tce				40	165								
Beach Road							35	20	150				
Beatson Road									50	50	300		
Bisley Avenue		20	70										
Black						10	10	100					
Brooklands							35	10		135			
Brougham Street								30	300				
Buxton Carpark N-W Cnr		10	60										
Catchment Management Plans													
Catchment/Freshwater Improvements							100	250					
Cawthron Crescent						30	20	150					
Chamberlain Street (16 - 22)													
Cherry/Baigent/Ridgeway									75	30	500		
Coleridge Pl Secondary flow path			20	20	50								
Collingwood Street									80	50	20	550	600
Dodson Valley							45	20	100				
Examiner						50	20	250					
Fifeshire		100	250										

Year		1	2	3	4	5	6	7	8	9	10	11	12
Long Term Plan		2015/25 LTP			2018/28 LTP			2021/31 LTP			2024/34 LTP		
Capital Projects	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27
Fountain Place													
Golf/ Parkers					35	15		400					
Halifax (Maitai-Milton-Halifax St East)		50	25	850									
Hampden/ Wigzell / Alfred / Tipahi / Eckington					250		600		300				
Hardy (Tasman-Alton)										45	20	500	
Harford Court Secondary Flow Path									20	20	80		
Hill Street North					50		500						
Isel Place							50	20	150				
Jellicoe/Bledisloe/Kaka/Kea/Freyberg/Maple					50			500					
Karaka				50	20	250							
Kauri Street			10	50									
Matai/Titoki/Ranui				50	20	150							
Kipling											45	20	200
Kowhai						30	10	100					
Mahoe/Orsman/Matipo					50	100		35	50		400		
Main Road Stoke (Hays cnr - Louisson)							25		350				
Main Road Stoke (Louisson - Marsden)							25		650				
Manson Ave						50		250					
Manuka											45	20	500
Marlowe Street													
Marsden Valley Cemetery diversion						20	10	175					
Martin								50	20	250			
Marybank / Tresillian Ave						100	50	500					

Year		1	2	3	4	5	6	7	8	9	10	11	12
Long Term Plan		2015/25 LTP			2018/28 LTP			2021/31 LTP			2024/34 LTP		
Capital Projects	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27
Milton (Cambria - Grove)					25		200						
Montcalm St/Arrow St/Washington Valley Rd/Hastings		180	150		1,000	1,000	700						
Morrison/Hope/Alma/Buxton/Bridge													90
Mount/Konini				50			500			500			
Nayland Road / Galway		50	70										
Neale/Kea/Kaka/Railway Reserve													
Newmans Link					10				10	100			
Ngaio/Maitland						65	20	200					
Nile Street East / Clouston Terrace		50	500										
North Esk/Beccles		2											
Orakei/Tamaki/Rangiora intersection							30						
Paru Paru											10	10	100
Pateke							10	10	100				
Poynters Crs & Albert Road								15	20	150			
Public/Private Drains & Open Chanel Upgrade Programme							500	500	500	500	500	500	500
Railway Reserve - Saxton Rd West - Dryden Street		80	750			270							
Railway Reserve/Newall/Bledisloe/Louisson/Main Rd Stoke (West)							500						
Rangiora Tce					100								
Renwick / Wellington Street/Waimea Rd				50	50		100	100	100				
Riverside							30	10	100				
Rotoiti						30		100					
Russell Street Reserve					25	25	100						
Rutherford - Stage 1 - Girls College		80	50	250									

Year		1	2	3	4	5	6	7	8	9	10	11	12
Long Term Plan		2015/25 LTP			2018/28 LTP			2021/31 LTP			2024/34 LTP		
Capital Projects	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27
Rutherford - Stage 2 - Review of box culvert					150			250	100		1,000	1,000	
Sadlier/Hobhouse/Mules/Suter													50
Salt Water Creek/Haven Rd Culvert		5											
Seaton/Allisdair								50	200				
Shelbourne St (Bronte - #42)							50	150					
St Vincent St/Hastings St culvert		100	150	1,500	1,500								
Stafford Ave						30	20	150					
Stanley/Beachville		263											
Stansell (Pvte/Public)		138											
Suburban Club		34											
Tahuna Slope Risk Area		100	100	100	500	500	500						
Tasman (Bronte-Nile-Manuka)													
Tasman (Cambria - Grove)													
Tasman (Halifax-grove)													
Tidal Gates													
Totara/Hutcheson						10	10	100					
Trafalgar Square (Betts Carpark & up to 353 T/Sq)						70	100	750					
Tui Glen							35			135			
Vanguard Street Stormwater		50	50	300					50	250			
Viewmount/Ridgeway									25		150		
Wastney Terrace - South		881											
York Terrace									30		300		
Natural Hazards Risk Remediation						100	100	100					

Year		1	2	3	4	5	6	7	8	9	10	11	12
Long Term Plan		2015/25 LTP			2018/28 LTP			2021/31 LTP			2024/34 LTP		
Capital Projects	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27
Network Capacity Confirmation for Growth Areas									100	100	100	1,250	
Network Upgrades Nelson North													
Network Upgrades Nelson Central												800	800
Network Upgrades Nelson South													
Piping Ditches		50	50	50	50	50	50	50	50	50	50	50	50
Public/Private Drains		100	100	100	100	100	100	100	100	100	100	100	100
Private Drains / Subdvn (50% share)			50		50	50	50	50	50	50	50	50	50
Total ($,000s)		2,346	2,505	3,510	4,650	3,155	5,440	5,845	3,880	2,665	3,670	4,850	3,040

Table 6.7: 12 Year Flood Protection Capital Expenditure Projections($,000)

Year		1	2	3	4	5	6	7	8	9	10	11	12
Long Term Plan		**2015/25 LTP**			**2018/28 LTP**			**2021/31 LTP**			**2024/34 LTP**		
Capital Projects	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27
Inventory of Rural Streams												100	150
Inventory of Urban Streams		600											
Secondary Flow Paths												50	50
Maitai River		100	100	100	2,000	2,000	1,000	1,000					
York Catchment Evaluation													
York Stream (below Waimea)		750	750	500	500								
York Stream - Lower												100	100
Fish Passage upper Brook St channel		50	50	250									
Brook Stream Outlet Low flow		50	50	250									
The Brook		85					100	100	500	500	500		
Hampden St East - Little Go Stream - Stage 1													
Hampden St East - Little Go Stream - Stage 2		4,000	700										
Flood mitigation		748	150	150	100	100	100	100	100	100	100		
Saxton Creek Upgrade		2,873	2,000	1,500									
Saxton Creek Culvert Upgrade		100	80						3,000	3,500			
Minor Flood Improvement Programme													
Main Rd Stoke/Poormans Stream/Culvert opp. Fire Station												50	250
Whakatu Drive (Storage World)		50	50	500									
Emano St channel (8may2014)									150	50	50	1,000	
Murphy Street(27June2014)												150	50
Global RC		50											
Programme of Stream Upgrades													
Urban Sections of **Urban** Streams													
Orphanage Stream upgrade													

Orphanage Stream Upgrade - Stage 1		608	150	750	750	750							
Orphanage Stream Upgrade - Stage 2											100	100	1000
Orphanage Stream/ Sunningdale(May 2014)			50	50	200								
Orchard Stream												100	100
Review of Jenkins & Arapiki (airport)					200	50	500						
Jenkins Stream												100	100
Arapiki Stream								50			250		
Maire Stream stg 1		50	50	250									
Maire Stream stg 2												50	50
Poormans Stream (27 June 2014)												100	100
Year		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Long Term Plan		**2015/25 LTP**			**2018/28 LTP**			**2021/31 LTP**			**2024/34 LTP**		
Capital Projects	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27
Urban Sections of **Rural** Streams													
Oldham Creek												80	50
Todd Valley Stream		20										100	80
Lud River													
Teal River													
Wakapuaka Flats Drainage (June 2014)												50	100
Rural Sections of **Urban** Streams		***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Rural Sections of **Rural** Streams		***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Total ($,000s)		**10,134**	**4,180**	**4,300**	**3,750**	**2,900**	**1,700**	**1,250**	**3,750**	**4,150**	**1,000**	**2,130**	**2,180**

6.7 ASSUMPTIONS AND UNCERTAINTIES

Table 6-8 below details the possible and actual significant forecasting assumptions and uncertainties relating to the Nelson City Council stormwater system.

Table 6-8: Significant Forecasting Assumptions and Uncertainties

No.	Assumption	Degree of Risk or Uncertainty	Likely Impact if the Assumption is (or is Not) Realised or is Not Acceptable
1	Interest rates for new loans raised or existing debt refinanced during the years are forecasted in the range of 7.5-8%.	Low	Level of debt is moderate. Interest costs are not expected to vary significantly.
2	Growth is based on figures provided by statistics New Zealand and Nelson City Council growth projections.	Low	Any significant increase in the growth may require upgrading of reticulation to occur at an earlier stage than presently proposed.
3	The actual remaining lives of assets will not deviate significantly from those contained in the asset valuation.	Medium	Changes in estimated asset lives could lead to significant changes in asset renewal projections, depreciation and renewal budgets.
4	The replacement values are a realistic cost and have taken into consideration engineering fees, resource consents etc.	Low	Replacement values have gone through a review process.
5	Upgrade/capital estimates are as follows: Concept +/- 30% Initial & Planning +/-10 to +/- 25% Delivery/Construction +/- 5% Projects of unusual complexity or presenting landowner / regulatory issues that cannot be quantified and such that estimating with accuracy is difficult, may lie outside these figures.	Medium	Costs of upgrades are estimated only without detailed project planning.
6	Maintenance cost of service for Reticulation and Treatment will be within -5% and +10% of budget.	Low	Historically maintenance costs % variations for reticulation have been low.
7	Depreciation based on estimated useful lives not on condition of pipework.	Medium	If proposed condition assessments indicate that Councils mains have decreased useful lives, depreciation presently taken will be less than that required for replacement.

Assumptions for 2015-25 Nelson Long Term Plan 2015-25

Council is required to identify the significant forecasting assumptions it has made in preparing its ten year Long Term Plan. Assumptions are necessary to allow Council to plan for expenditure and costs over the next ten years. They are the best reasonable assessment made on the basis of currently available information.

Forecasting Assumptions	Risk	Impact	Comment
Population growth: Based on advice from Statistics New Zealand in February 2015, the population in Nelson has grown faster than was expected. Nelson's population is expected to grow by 3,600 residents in the next 10 years to almost 53,400 by 2025. The age group with the biggest proportional increase is those over 75 years, which will rise from 8% in 2015 to 20% by 2045. The rate of population growth is then expected to slow down after 2025, reaching 56,000 in 2045. The number of households in Nelson is projected to increase by about 1,800 in the next 10 years to reach almost 22,400 in 2025, and almost 24,200 in 2045. Approximately half of the growth during the life of this Long Term Plan will be in the wider Stoke area.	Growth higher than projected, putting pressure on Council services and infrastructure. The age profile could vary from forecast, with more accelerated ageing putting pressure on certain services/facilities.	Low	Council takes a generally conservative approach in applying population growth estimates in its infrastructure planning, using a mid-range estimate and continually updating and revising as new data is available. This limits the risk exposure.
Affordability: The Nelson Tasman economy has grown more slowly than the national average for a number of years but overall has weathered the global economic downturn reasonably well. Council is taking a cautious approach to prospects for the regional economy, noting that the ageing demographic will bring older residents who are no longer in employment and potentially less able to afford increasing rates.	Economic pressures lead to more residents defaulting on rates payments than expected.	Medium	This will be a medium to long term impact particularly if, as predicted, the average retirement age also rises significantly.
Census data shows that those entitled to superannuation in paid employment is less than the national average, however this may change as the age of superannuation entitlement may be raised over the period of this Long Term Plan. Housing affordability in the area continues to be an issue, with Nelson remaining in the five least affordable regions in New Zealand (Statistics NZ, Roost).	There is a risk that as a result of a higher cost of living in the region and the higher percentage of older residents, that there may be difficulties in attracting key staff		The risks of an ageing demographic may be balanced by the potential to bring economic opportunity to the region in specific industries such as retirement villages, and specialised services.
Inflation/Price changes: Council uses inflation forecasts from Business and Economic Research Ltd (BERL) to estimate inflation over time. These figures were updated in September 2014, and are prepared specifically for Local Government. It is assumed that inflation rates are as predicted and modelled in budgets.	Inflation higher than expected, increasing costs for Council.	Medium	Likely to be some variation in actual rates of inflation from predictions and this will impact on the financial results of Council. Changing costs may mean the timing of projects needs to be adjusted. Council has relied on the current parameters the Reserve Bank is required to operate under in terms of inflation being held within the range of 1 – 3 %

Forecasting Assumptions	Risk	Impact	Comment
Year end -ing CPI% BERL LGCI Opex % BERL LGCI capex % BERL LGCI % 30-Jun-16 1.7 2.2 2.3 2.2 30-Jun-17 1.9 2.3 2.6 2.5 30-Jun-18 2.0 2.4 2.6 2.5 30-Jun-19 2.1 2.6 2.7 2.6 30-Jun-20 2.1 2.7 2.8 2.8 30-Jun-21 2.2 2.9 3.0 2.9 30-Jun-22 2.3 3.0 3.1 3.0 30-Jun-23 2.4 3.1 3.3 3.2 30-Jun-24 2.4 3.3 3.5 3.4 30-Jun-25 2.5 3.4 3.7 3.5 CPI = Consumer price index LGCI = Local government cost index Opex = Operating expenditure Capex = Capital expenditure			
Interest rates: In preparing the Long Term Plan Council has assumed an interest rate of between 5.15 and 5.45%. Assumptions are based on detailed analysis of the cost of both existing and future debts and anticipated interest rates.	The prevailing interest rates differ significantly from those estimated by the Reserve Bank of New Zealand.	Medium	Increase in interest rates flow through to higher debt servicing costs and higher rates funding requirements. Council has mitigated these risks with a prudent hedging programme developed within the limits of a prudent treasury policy.
Development contributions: Assumptions on development contributions are included in the updated Development and Financial Contributions Policy. With changes to the legislation around development contributions there is uncertainty about the level of contributions and any costs associated with the new processes. Council has assumed it will collect $1.2 million per year in Development Contributions during the 10 year of the Plan.	The level of development contributions collected could be insufficient to cover the costs of required growth infrastructure.	Low	Costs for infrastructure will need to be met from other allocations.
Not all lots available for development will be developed during the 10 years of the Plan and therefore the development contributions collected will be less than the maximum calculated	Low	Low	Council has made a conservative estimate of income from development contributions.

Forecasting Assumptions	Risk	Impact	Comment
under the policy.			
Climate change and natural disasters: It is assumed that natural disasters will occur with increasing frequency. This has been the experience of recent years and is consistent with predictions of climate change impacts. Exposure of low lying land to the risk of inundation from sea level rise is another assumption related to climate change. Council relies on Ministry for Environment guidelines in estimating sea level rise. Council's Land Development Manual currently provides for a 0.5m sea level rise by the end of the century but this will be reviewed in line with the latest MfE advice (1m for 100 years). The Nelson Tasman Civil Defence Emergency Plan states that the most significant natural hazards for Nelson are: earthquakes (greatest impact) and flooding (most likely). The probability of a magnitude 7 earthquake in Nelson is 87% in the next 50 years, and 98% in the next 100 years. The probability of a magnitude 8 earthquake is 43% in the next 50 years, and 67% in the next 100 years.	Climatic events lead to increased costs for Council in both responding to events and building greater resilience into infrastructure.	Medium	A characteristic of the Nelson community is the concentration of lifelines infrastructure (roading network, port, airport etc) on low-lying areas. Council has been increasing its contributions to the Emergency Fund as one method of mitigating the risk of natural disasters.
Hazards: It is expected that dealing with contaminated land in capital and maintenance projects will become more common as the HAIL register is refined and added to.	Investigation, consenting, handling and disposal of contaminated material lead to an increased overall cost of projects.	Medium	Increased design and construction budgets in the annual and long term plans. If Council has made past decisions that were compliant with the legislation at the time of consent being granted, then it is unlikely that it would then be financially liable for remediation or mitigation of identified hazards after that time. In relation to the private use of land, council has a duty of care in issuing LIM's, and must ensure that an applicant has been informed properly and fairly about relevant features or characteristics of the land and its uses. Council includes HAIL information on LIM reports to ensure all known information is made available. In granting a resource consent, where there are likely or known hazards, then any consent issued requires these hazards or adverse effects to be mitigated or removed.
Useful lives of significant assets: It is assumed that there will be no reassessment of the useful lives of assets during the 10 year period covered by this plan. The detail of useful lives for each	Assets wearing out earlier than predicted and funding needs to be found for	Low	This may result in changes needing to be made to the underlying capital expenditure programme.

Forecasting Assumptions	Risk	Impact	Comment
asset category is covered in the Statement of Accounting Policies.	replacements.		
Loan arrangements: It is assumed that Council's bankers will continue to renew the existing loan facilities.	Access to committed loan facilities less than expected.	Low	The Local Government Funding Agency now in place should allow Council to diversify funding sources away from the local banks as well as being able to borrow for longer terms.
NZ Transport Agency funding: NZTA has reviewed the principles and methods used in setting its financial assistance rates. For 2015/16 the FAR will be 47% and will rise by 1% per year to 51% over six years.	NZTA providing less funding than currently indicated and Council's share of project costs therefore increasing.	Medium	Changes to the funding priorities of NZ Transport Agency are outside Council control.
Weather tight building claims: It is assumed that there will continue to be claims for weather tightness but these will not be significantly more than accounted for.	Claims on Council higher than forecast.	Medium	A higher level of claims would impact on rates by increasing the rate requirement.
Earthquake prone buildings: It is assumed that Council will face ongoing costs with regard to earthquake prone building assets, but that decisions about works to undertake and the timing of any necessary works will allow costs to be adequately spread. The proposed Building (Earthquake-Prone Buildings) Amendment Bill proposes that Councils must complete seismic capacity assessments of specified buildings not later than 5 years after the day the Act comes into force. New work is identified, or required work is more significant than anticipated. Medium Significant additional expenditure on earthquake strengthening buildings could not be met by the current budget.	New work is identified, or required work is more significant than anticipated.	Medium	Significant additional expenditure on earthquake strengthening buildings could not be met by the current budget.
Resource consents: It is assumed that resource consents held by Council will not be significantly altered and any due for renewal during the life of the plan can be renewed accordingly.	Conditions of resource consents altered and significant new compliance costs or consents cannot be renewed as expected.	Medium	Budgets are in place for renewal of resource consents and there is no expectation of significant departure from requirements over the next 10 years.
Vested Assets: It is assumed that vested assets increase by $3m per year adjusted by inflation. Council assumes that the impact of vested assets will be neutral, in that the costs associated with the additional assets will be offset by a proportionate increase in rates revenue.	That Council will have more assets vested thereby increasing the depreciation expense in subsequent years that is not offset by a proportionate increase in rates	Low	Assets must be maintained by Council, so there would be an impact on costs if more assets than expected were vested in Council. An example of where a vested asset may increase cost to Council is where land is bequeathed to be maintained as a reserve, or similar. Vested assets can fluctuate from

Forecasting Assumptions	Risk	Impact	Comment
	revenue.		year to year but the impact is ordinarily offset by a proportionate increase in rates revenue. It would be highly unusual for Council to enter into an arrangement with a developer where the ongoing costs associated with the vested assets are disproportionate to the increase in rates revenue.
Insurance costs: It has been assumed that insurance premiums continue at current levels plus inflation and that we can get 100% cover and that the Local Authority Protection Programme Disaster Fund continues	Premiums increasing above inflation and/or Council cannot get 100% cover.	Medium	Any increase in premiums above the level assumed will have an impact on rates. Council may need to make decisions about cover levels during 10 year period.
Return on investments: It is assumed that the return on investments and retained earnings on subsidiaries will continue at current levels plus inflation. While planning in the Long Term Plan will take a conservative approach with expected returns on investments, there will be an expectation when agreeing on annual performance that higher returns will be generated.	Returns lower than expected.	Low	This would impact on Council's ability to fund services and infrastructure and would likely require an increase in rates.
Government Policy Changes: It is assumed that any future Government legislation changes will take into account the need for a stable working and statutory framework. The Government has made known its intention to reform the Resource Management Act 1991, to receive a report back from the Rules Reduction Taskforce, and to continue to seek ways of addressing housing affordability and social housing need. It has also introduced the Building (Earthquake-Prone Buildings) Amendment Bill which includes a requirement on Councils to complete seismic assessments and to earthquake strengthen specified buildings. Further changes to legislation impacting on local government may take place, but this is not known at this time. It is assumed that Government will work with Councils to ensure that any legislative changes are managed appropriately.	Government policy shifts may result in new or amended legislation either requiring significant response and cost to administer by Council or result in changes to services delivered.	Medium	Financial impact resulting from a need to respond to significant legislation changes would impact on rates or fees and charges. It is not possible to quantify the potential financial impact of any future legislative changes at this time.
Co-funding arrangements: It is assumed that for projects where other partners are contributing part of the funding, this funding will still be available.	Partners will no longer be in a position to provide funding which will result in an increased level of input from Council,	High	Viability of projects would be threatened and Council would need to consider its ongoing funding commitment.

Forecasting Assumptions	Risk	Impact	Comment
	or the termination of the project		
Treaty Settlements for Te Tau Ihu: It is assumed that Council obligations to work with Iwi as a result of Treaty settlements can be met within existing resources. This may involve provision of training to current staff, increased emphasis on relevant experience in the recruitment of new staff, or a need in some instances to employ external assistance.	Establishing new ways of working with Maori requires greater Council resource than anticipated.	Low	Financial impact of dedicating resources to meet Treaty commitments would impact on rates
Emissions Trading Scheme: New climate change agreement to be concluded by end of 2015 to come into force by 2020 which will increase costs to Council for waste disposal to landfill and increase costs for the operation of the landfill site.	Carbon pricing costs higher than expected or impact earlier.	Medium	Financial impact of responding to unexpected changes in carbon pricing would affect rates.
Accounting Policy: Nelson City Council's accounting policy provides for its most significant asset classes (infrastructure assets and land, excluding land under roads) to be revalued with sufficient regularity that the carrying value does not differ materially from fair value. Infrastructure assets are revalued annually and land is reviewed annually and revalued at least every five years or if there is a material movement. For the purposes of this long-term plan, land revaluation is assumed to occur in years 2, 5, and 8. Council's investment property is revalued annually in accordance with generally accepted accounting practice. Revaluations have been based on the Business and Economic research Ltd (BERL) forecasts of price level change adjusters and revaluation movements are shown in the prospective Statement of Comprehensive Revenue and Expense.	Actual revaluation results differ significantly from those forecast in this long term plan.	Medium	If the revaluations are different from those forecast it will affect fixed asset values and impact levels of depreciation expense and the rates funding requirement. Future Annual Plans and Long-term Plans will reflect the outcomes of actual revaluations.
Growth in rating units: The estimated growth in the City's ratings units is 1% for each of the 10 years of the Long-term Plan. As a result, the 'real' average increase in rates funding required is reduced by an equivalent amount as there are a greater number of ratepayers across which the rates funding requirement will be allocated.	Growth in rating units is higher or lower than projected.	Low	Council has used current property information from its valuation service provider (Quotable Value) to assess the level of growth in rating units, along with an assessment of year by year increases from recent years.
Sources of funds for the future replacement of assets: It is assumed that funding for the replacement of existing assets will be obtained from the	That a particular funding source is unavailable.	Low	Depreciation is used to fund renewals and is funded mainly through rates and user charges. Should other

Forecasting Assumptions	Risk	Impact	Comment
appropriate sources as detailed in Council's Revenue and Financing Policy.			

Stormwater Assumptions

As well as the general assumptions that apply across Council's work, assumptions specific to stormwater include the following:

The most efficient, equitable, safe and cost-effective means of disposing of stormwater is a council-provided system for the Nelson urban area

Stormwater reticulation will be designed for a Q20 event with roads and overland flow providing the flow path for larger events

Council expects that a storm event with more than Q5018 rainfall would be very likely to cause major flood damage, which would have to be managed by Emer-gency Management systems

No new environmental legislation will be imposed during the next decade that would require a higher level of stormwater works than Q20

A Q50 rainfall event is defined as one with a 2% probability of occurring in any year. We expect, on average, to have one of these events every 50 years.

No significant effects on stormwater structures are expected within the next 10 years from climate change-induced sea level rise; however, such effects are ex-pected to arise in the longer term

Factors such as climate change and population growth will receive increased analysis as the Infrastructure Strategy is reviewed in future years.

Flood Protection Assumptions

Council expects that a storm event with more than Q50 rainfall would be very likely to cause major flood damage, which would have to be managed by Emergency Management systems

No new environmental legislation will be imposed during the next decade that would require a higher level of flood protection works than Q100.

No significant effects on flood protection structures are expected within the next 10 years from climate change-induced sea level rise; however, such effects are expected to arise in the longer term.

6.8 ASSET DISPOSAL PLAN

Mechanical equipment that has been replaced will be reused for parts or sold as scrap metal unless it is considered to have genuine resale value. In this case, the piece of surplus equipment will be sold with income directed to the Nelson City Council account.

7. ASSET MANAGEMENT PRACTICES

This section outlines the information available on the asset, information systems used and process used to make decisions on how the asset will be managed. It also provides details on planning for monitoring the performance of the Asset Management Plan. Asset Management is recognised as a critical component of Infrastructure Management globally and this sector has benefited from initiatives to formalise the practise of asset management since November 1996. The Association of Local Government Engineering New Zealand (Inc) and the Institute of Public Works Engineering of Australia have lead the development of the International Infrastructure Management Manual that forms the basis of Infrastructure Asset Management Practices at Nelson City Council.

The 'Core' Asset Management planning criteria of this manual was prepared by the New Zealand Auditor General in 2005 and is recognised as a standard minimum compliance for activity management provisions in the New Zealand Local Government Act 2002. The 'Advanced' criteria describe Audit expectations for the management of complex and high value infrastructure with high associate risks. Increasingly asset management for a city the size of Nelson is seen to be a mix of "Core" and "Advanced" practice, described as "Core Plus", depending on the function and resources available.

Improvement Programme

An important component of this Asset Management Plan is the recognition that it is a live document in need of ongoing monitoring, change and improvement. The Stormwater Asset Management Plan is a regularly revised and evolving document and will be updated at least every three years to coincide with the Long Term Plan.

The Asset Management Plan will be improved throughout its life cycle as further condition, performance and service delivery information is collected. Nelson City Council is committed to advanced data collection and management systems that will allow for a greater appreciation of the performance and condition of the Nelson City Council stormwater assets and the achievement of the appropriate level of Asset Management.

7.1 INTRODUCTION

The goal of infrastructure asset management is to:

"Deliver the required level of service to existing and future customers in a sustainable and cost effective manner."

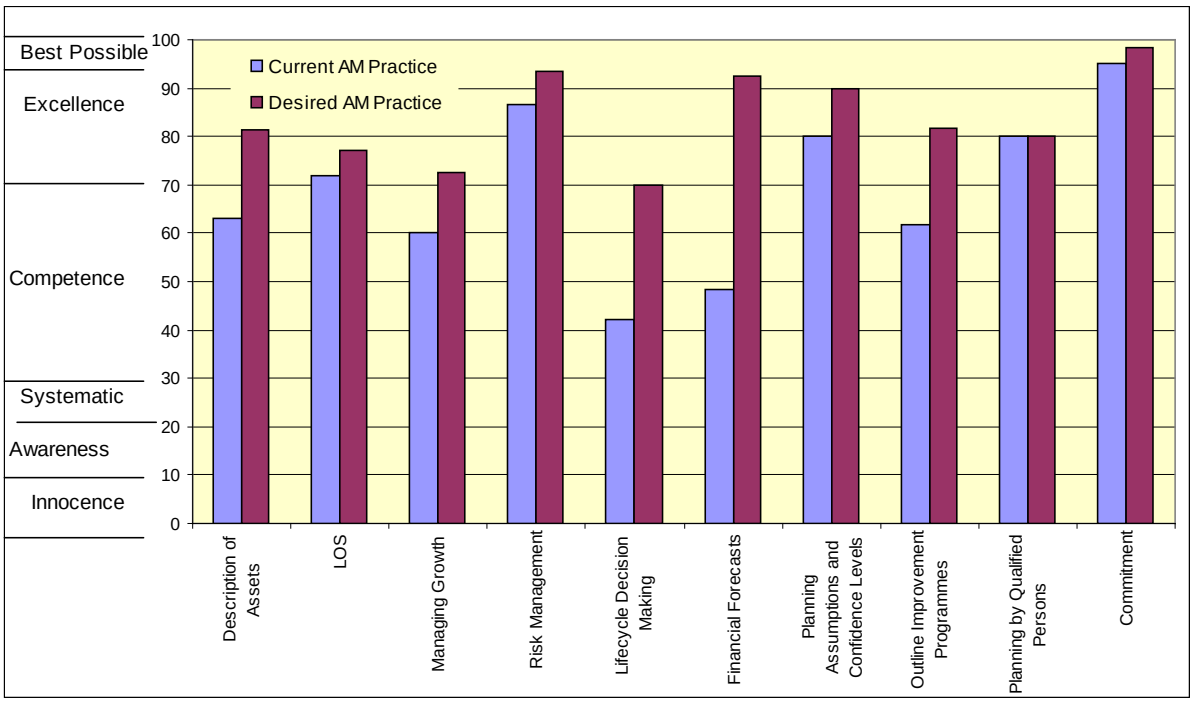
A formal approach to the management of assets is essential in order to provide services in the most cost-effective manner, and to demonstrate this to customers and other stakeholders. The benefits of improved asset management are:

- Improved governance and accountability
- Enhanced service management and customer satisfaction
- Improved risk management
- Improved financial efficiency
- More sustainable decisions

The key elements of Infrastructure Asset Management are as shown below:

Figure 7-1 below indicates the desired Asset Management level and performance in the ten areas of Asset Management for the stormwater services.

Figure 7-1: Nelson City Council Appropriate Asset Management and Performance Analysis



Inconsistent scores are indicated across the ten areas of Asset Management practices, with ratings in the low average competence to the high excellence range.

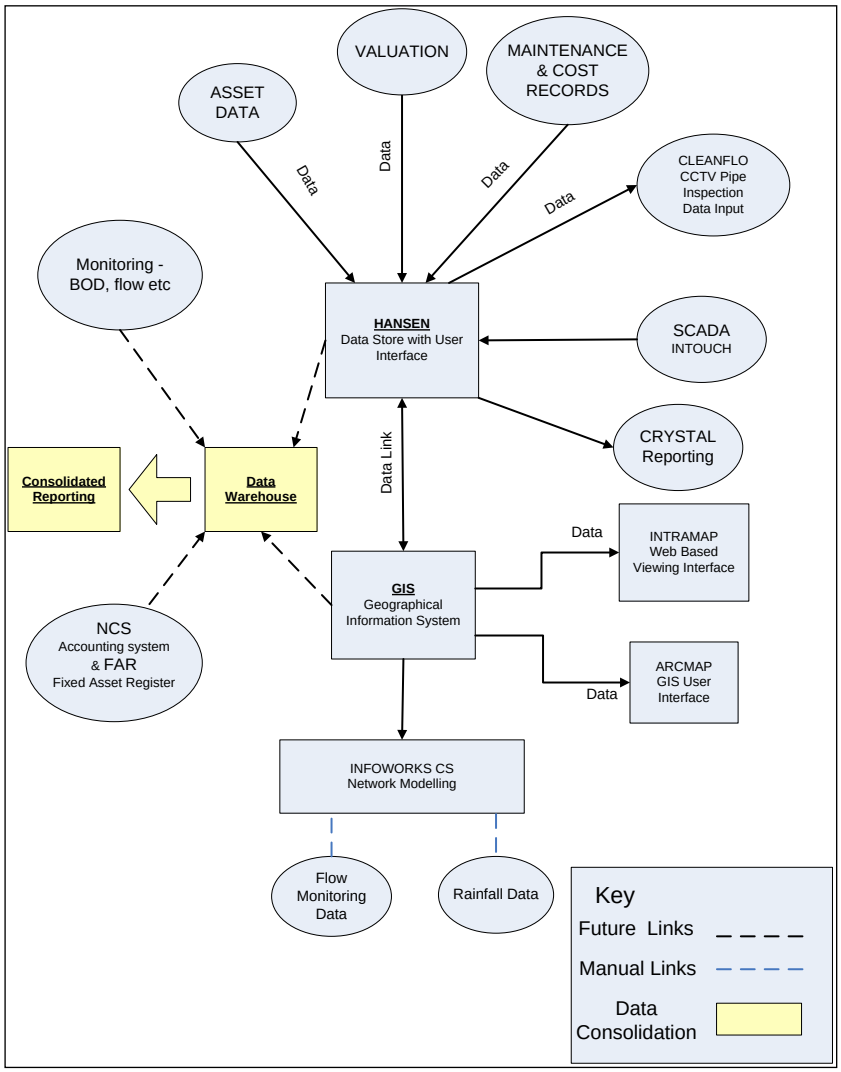
7.2 INFORMATION SYSTEMS

7.2.1 Background

All asset information is stored on Arcinfo, a computer based geographical information system and Hansen Asset Management System . The accounting system used is integrated computer software supplied by Napier Computer Systems. An overview of the asset information system in its existing state and future state is depicted in Figure 7-2 below. The warehousing of specific data and further development of reporting will assist in management of the assets.

The Council has a number of information systems (Hansen, InTouch, Network Model, and closed circuit television) that are not integrated. The integration of these systems is considered to assist in the Optimisation of operations, renewals and the ongoing development of the wastewater activity.

Figure 7-2: Asset Information Systems



7.2.2 Accounting and Financial Systems

Background

Accounting is currently carried out to Generally Accepted Accounting Principles to comply with the Local Government Act 2002. The Nelson City Council uses integrated computer software supplied by Napier Computer Systems. The General Ledger is linked to packages that run Debtors, Creditors, Banking, Rates, Fixed Assets, Invoicing, Water Billing, Job Costing, and Payroll. Internal monthly financial reports are generated by

Council significant activity and sub-activity categories. External financial reports by significant activity are published in the annual report.

Definition of Expenditure Categories

All expenditure on infrastructure assets falls into one of three categories:

- Operations and Maintenance expenditure
- Capital Expenditure – renewals
- Capital Expenditure – new or upgraded assets

Maintenance Expenditure

Maintenance may be planned or unplanned and is the regular day to day work necessary to keep assets operating, including instances where parts of the asset fail and need immediate repair to make the asset operational again. This includes:

- Regular and ongoing annual expenditure necessary to keep the assets at their required service potential.
- Day to day and/or general upkeep works designed to keep the assets operating at required levels of service.
- Works which provide for the normal care and attention of the asset including programmed repairs and minor replacements of sub-components (i.e. asset components not individually listed in asset register).
- Unplanned (reactive) maintenance, i.e. isolated failures requiring immediate repair to make the asset operational again.

Capital Renewal./Replacement Expenditure

Renewal expenditure is major work that does not increase the asset's design capacity but restores, rehabilitates, replaces or renews an existing component to its original capacity. This includes:

- Works that do not increase the capacity of the asset but restores them to their original size, condition capacity, etc.
- Reconstruction or rehabilitation works involving improvements and realignment.
- Renewal and/or renovation of existing assets, restoring the assets to a new or fresh condition consistent with the original asset.

Capital Creation/Upgrading Expenditure

Capital works create a new asset that previously did not exist, or upgrade or improve an existing asset. They may result from growth, social or environmental needs. This includes:

- Expenditure which purchases or creates a new asset (not a replacement) or in any way improves an asset beyond its original design capacity.
- Upgrading works which increase the capacity of the asset.
- Construction works designed to produce an improvement in the standard and operation of the asset beyond its present capacity.

7.2.3 Geographical Information System

Background

Geographical information system was implemented in 1994 with data captured using photogrammetry (1994) and progressively delivered over the following years. Nelson City Council staff carried out accuracy checks on the geographical co-ordinate data supplied, searched all the engineering plans and field books for information on pipe alignment, material and age and entered this information into the Geographical information system.

Accuracy Limitations

The data captured by photogrammetry was required to be accurate to within a tolerance of +/- 0.3m. In inaccessible areas, it was not considered economic to search for buried

fittings. Instead, the best estimated position was entered and the accuracy limitation flagged. Similarly, only limited fieldwork has been done to confirm the pipe material and sizes. The accuracy of this information is verified through time by asset data collection procedures.

Maintenance of Geographical Information System Data

Procedures are in place to update new data into the Geographical information system on a monthly basis via Nelson City Council engineering staff.

Council's Engineering Standards require that any work on a Council sewer must be proposed to Council by means of an engineering plan for approval and an "As-built" record submitted at the completion of works.

Data on assets associated with renewal and upgrade capital are now updated into the asset register by Nelson City Council Engineering and Finance staff. This ensures a high level of reliability.

7.2.4 Closed Circuit Television

Currently, Closed Circuit Television condition inspections are carried out by an external contractor only as required. The review of the renewal strategy will include the optimisation of the use of Closed Circuit Television in the condition assessment and repair or replace process of stormwater mains.

The Hansen system is used to assist in the selection of pipes to be checked. The Closed Circuit Television inspection records are inputted into the Hansen system via Cleanflow.

7.2.5 Asset Management System

Background

In 2000 the Hansen Asset Management System was selected as best suited to meet the future asset management planning requirements of Council. The Hansen system presently utilises Version 7.5. Updating to Version 8 is scheduled for 2014/15 and will require significant changes to the database structure. The use of the Hansen system has enabled the following:

- Customer enquiries being logged directly and sent immediately to the contractor for action.
- Contractor directly enters resolution confirmation at completion of job.
- Tracking of expenditure on assets to allow assets that have a disproportionately high maintenance cost to be identified - upgrade or renewal can then be prioritised.

Nelson City Council principal contractor Nelmac has a live interface with Hansen. Any work associated with unscheduled maintenance is entered into Hansen work order by the contractor. Completed work orders forms the basis of the contractors' payment.

There are known issues with the existing implementation of Hansen surrounding the work order processes including a lack of reporting to trend results and alert for operational issues. With confirming the required reporting outputs for all levels of management the work order processes and data captured by the contractor and/or Nelson City Council staff can be refined to ensure the needs of all parties are met.

7.2.6 Consolidated Reporting

Consolidated reporting is a methodology to allow continuous monitoring of performance. Consolidated reporting process can provide an overview of Nelson City Council status, overall direction and trends. The objectives for consolidated reporting are:

- Better management - By being better informed.
- Compliance – Ensuring that legislative and key performance indicator requirements are being met.
- Risk management – Through knowing what is occurring or analysis indicates.
- Economics – Through timely intervention.

- Accountability - Ensuring that maintenance contractors, Council staff and management are shown to be responsible.
- Accomplishment – By indicating that Council, staff and maintenance contractors are achieving their goals and objectives.

7.3 CONFIDENCE RATING IN ATTRIBUTES, CONDITION AND PERFORMANCE

The Council has generally a high confidence in the processes for the attributes data, condition and performance of assets within the stormwater activity as indicated in Table 7-1 below. Where the confidence rating requires to be increased additional resources will be required to resolve this issue. Example of this is:

- The ongoing updating of the asset register of the pipe assets when repairs are carried out and the attributes are compared with the asset register attributes
- The development of modelling for the reticulation on a catchment by catchment basis

Table 7-1: Confidence Rating in Attributes, Condition and Performance

Attribute	All Data Estimated	Significant Data Estimated	50% Estimated	Minor Inaccuracies	Accurate	Comment
Attributes						
Reticulation						
Size						The data was captured using photogrammetry in 1994 and progressively delivered over the following three years. Nelson City Council staff carried out accuracy checks on the co-ordinate data supplied, searched all the engineering plans and field books for information on pipe alignment, material and age and entered this information into the Geographical information system.
Depth						
Material						
Install Date						
Location						
Pipe Length						
Pump Stations– all components						High level of knowledge known on both pump stations due to their recent installation.
Condition						
Reticulation						Limited inspections to date.
Intakes						
Sumps						
Culverts						
Manholes						Limited inspections to date.
Channels						
Tide Gates						
Pump Stations– all components						High level of knowledge known on both pump stations due to their recent installation.
Performance						
Reticulation						Limited inspections to date.

Attribute	All Data Estimated	Significant Data Estimated	50% Estimated	Minor Inaccuracies	Accurate	Comment
Intakes						
Sumps						
Culverts						
Manholes						Limited inspections to date.
Channels						
Tide Gates						
Pump Stations– all components						High level of knowledge known on both pump stations due to their recent installation.

8. SUSTAINABLE DEVELOPMENT

8.1 OVERVIEW OF SUSTAINABILITY

The Local Government Act 2002 requires that local authorities take a sustainable development approach to everything they do. Council adopted a Sustainability Policy in 2008 setting out Council's commitment to sustainability through the services it provides and in the way it operates as an organisation.

In doing this we are required to take into account:

- The social, economic and cultural interests of people and communities; and
- The need to maintain and enhance the quality of the environment; and
- The reasonably foreseeable needs of future generations
- Council seeks to strengthen its previous efforts in this area through the Sustainability Policy

8.2 NELSON CITY COUNCIL'S SUSTAINABILITY STRATEGY

Overview of Sustainability

The Local Government Act 2002 requires that local authorities take a sustainable development approach to everything they do. The publication, Nelson 2060 (June 2013) was developed by Council through an inclusive process called "Framing our Future" and sets out Nelson's sustainability strategy.

The framework and checklist outlined in this document will be used to guide the management of the city's infrastructure.

Community infrastructure is installed and maintained on the understanding that the assets are provided in perpetuity for the benefit of future generations. Longevity of an asset is a prime consideration when design and planning is undertaken for new or replacement components in the network.

Actions for Future Improvement

Further action in promoting the sustainability of this activity centres on the following areas:

- Ongoing construction of a stormwater and flood control network to protect people and property;
- Ensure the design of watercourses allows for flood flows, enhanced natural characteristics and the wider community recreational use of the area;
- Ongoing monitoring of the condition and operation of the asset to ensure proper performance and minimise repair and replacement costs;
- The development of catchment management plans for all catchments on a priority based methodology over the next ten years.

8.3 SUSTAINABILITY AND LIFE CYCLE

Historically Council has recognised the fundamentals of sustainable development in the stormwater activity through the adoption of initially the Engineering Standards and more recently the Land Development Manual, and construction practices with the use of long life materials.

Recently the recognition of formal asset management planning and network modelling have created a framework for future improvements in this area.

Sustainability has been reflected in the decision making process when designing and constructing the stormwater network in the following areas.

- Recognising the use of low impact urban design where appropriate.
- Investing in new technologies to rehabilitate existing reticulation, where appropriate, rather than excavate and replace.
- Developing multi-use detention dams and structures as an alternative to upgrading the stormwater network.
- Identification and rectification of groundwater infiltration into the network leading to reduced volumes of wastewater in reticulation and pump stations.

These initiatives meet the Sustainability Policy criteria of:

- Optimise the efficient use of resources and minimise waste.
- Increase the use of renewable resources and reduce greenhouse gas emissions.

Community infrastructure is installed and maintained on the basis that the assets are provided in perpetuity for the benefit of future generations. Longevity of an asset is a prime consideration when design and planning is undertaken for new or replacement components in the network.

Increasingly Council is recognising the benefits that come from formalising asset management plans and better monitoring and modelling of the condition and operation of the network. Advances in technology have allowed Council to move towards better prediction of an assets performance and adopt a more strategic approach to maintenance and renewals.

8.4 ACTIONS FOR FUTURE

Further action in promoting the sustainability of this activity is considered to centre on the following areas:

- Ongoing construction of a stormwater and flood control network to protect people and property;
- Ensure the design of watercourses allows for flood flows, enhanced natural characteristics and the wider community recreational use of the area;
- Ongoing monitoring of the condition and operation of the asset to ensure proper performance and minimise repair and replacement costs;
- Developing ways to incorporate wider inter-departmental and community involvement enhancing the major natural waterways.
- Additional effort to reduce stormwater infiltration rates into the wastewater system to reduce sewer overflows and reduce pumping costs.

9. ASSET MANAGEMENT PLAN IMPROVEMENT AND MONITORING

This section outlines the information available on the assets, information systems used and process used to make decisions on how the asset will be managed. It also provides details on planning for monitoring the performance of the Asset Management Plan.

9.1 GENERAL

An important component of this Asset Management Plan is the recognition that it is a "live" document in need of monitoring, change and improvement over time.

Nelson City Council Stormwater Asset Management Plan is a regularly revised and evolving document and will be reviewed annually and updated at least every three years. The Asset Management Plan will be developed throughout its life cycle as further information about the stormwater system assets are collected in terms of condition, performance and service delivery. Nelson City Council is committed to advanced data collection and management systems that will allow for a greater appreciation of the performance and condition of the Nelson City Council assets.

9.2 PERFORMANCE MONITORING AND MANAGEMENT

The effectiveness of the Asset Management plan will be monitored by the following procedures:

- Financial expenditure projections prior to year end
- Resource consent monitoring as required by consents
- Operations and Maintenance reports on a monthly basis

The continued monitoring of these performance measures and ongoing analysis of results will result in:

- Optimisation of expenditure through the asset lifecycle
- Service levels actively monitored and reported on
- Management of risk and control of failures

9.3 TEN YEAR IMPROVEMENT PLAN

The improvement plan required is summarised in Table 9.1 below.

Table 9-1: Ten Year Improvement Programme

Action
2014: Review Levels of Service (especially in relation to sustainability & infiltration)
2015-2025: Improve accuracy of data through review and modification of collection, storage, and auditing
2015: Include a more detailed strategy for critical assets such as open channels and streams and rivers
2015-2025: Expand focus on inter-relationship of network components and development of improved strategies for maintenance, renewals, and upgrades
2015-2025: Expand sustainable practice, as noted in the Sustainability Policy, throughout stormwater activity
2015-2025: Development of a Three Waters Activity Management Plan
2015-2025: Ongoing refinement of lifecycle decision making and financial forecasts

9.4 MONITORING AND REVIEW PROCEDURES

9.4.1 Asset Management Plan Review

The plan will be reviewed annually and revised every three years to coincide with the Long Term Plan and to incorporate improved decision making techniques, updated asset information, and Nelson City Council policy changes that may impact on the levels of service.

9.4.2 Statutory Audit

The Local Government Act requires that an independent, annual, financial audit of the operations of the Nelson City Council be carried out.

9.4.3 Internal Audit

Annual internal audits will be taken to assess the effectiveness of the plan in achieving its objectives. The internal audit will also assess the adequacy of the asset management processes, systems and data.

9.4.4 Benchmarking

Benchmarking (trending) of the activity is to be instigated to give the Manager increased understanding of:

- The efficiency and efficiency variations of individual activities.
- Effects of any programmes instigated by the Asset Management Plan.
- Operating costs over range of individual activities.

Examples of types of benchmarking that are to be considered include tracking progress, responsiveness to service calls, operation costs i.e. $/m/year and energy costs. As data is obtained and implications understood the benchmarking can be used for additional or revised Levels of Service and can be incorporated into a graphical display.

In 2014 Nelson City Council participated in a Local Government New Zealand benchmarking exercise for water based utilities.

10. ACTION PLAN

10.1 EXPLANATION

The Action Plan itself is subject to constant reappraisal and change. While reappraisal is an on-going process, the Improvement Plan will form the basis of the stormwater activity annual business planning.

The progress of the action plan items noted in the 2005-2008 and 2009-2012 Asset Management Plans are shown in tables 10-1 and 10-2. Table 10-3 lists the actions identified in this Asset Management Plan, focussing on the priorities outlined in the Executive Summary.

Table 10-1: 2005-2008 Asset Management Plan Action Plan

	Action	Progress to Date
Levels of Service	Environmental	
	Rivers and Streams	
	Submit report on sediment sampling and discharge monitoring data Develop options report aimed at reducing contaminants from the stormwater reticulation system, initially in high priority rivers and streams	State of environment report. Started. NIWA options report on road sweeping Rad #1159739
	Set up long term river and stream enhancement programme	Not done
	Continue to monitor and record river and stream sediment samples taken from established locations	Ongoing (consent condition)
	Monitor and record sediment samples from new locations as recommended by Cawthron – immediately downstream of intake, focussing on iron and manganese levels.	Report due Oct 2011
	Inspect rivers and streams to identify if further projects should be added to Appendix B	Pending
	Record and report on Appendix B project progress	Pending
	Reticulation	
	Monitor and record reticulation discharges at 4 representative locations bi-annually during and after rainfall	Ongoing (resource consent)
	Create an overlay on Geographical information system to show location of reticulation outfalls, to enable catchment plans to be developed for each outfall	Completed
	Commission report on causes and methods of improving reticulation discharge quality	Done Reticulated Stormwater Quality Improvement Plan 2006
	Reliability and Capacity	
	Rivers & Streams	
	Record, report and implement progress of Appendix C projects each year	Ongoing
	Commission limited level survey of building floor levels adjacent to Maitai River	Completed
	Correlate the information commissioned and prepare options report and recommendations by October 2006 in a Maitai River Floodplain Management Plan	Started Tonkin & Taylor report underpins future options study
	Inspect and prepare rivers and streams proactive maintenance programme by 31 October each year	Ongoing
	Reticulation System	
	Record, report and implement programme of upgrades each year	Ongoing

	Action	Progress to Date
	Identify secondary flowpaths for reticulation systems >525mm diameter by June 2005	Completed
	Prepare programme of mapping and recording secondary flowpaths	Completed
	Record number of blockages each year and monitor for regular blockages and direct maintenance programme accordingly	Ongoing
Demand Management	Develop index of intensity, location and effects of flood events and location of flood data	Not done
	Continue to record and assess storm surges	Ongoing
	Produce a document to encourage residential storage systems, incorporating installation guidelines and promoting residential water storage	Addressed through Land Development Manual 2010
	Review and update condition areas by December 2004 and establish procedure to ensure condition areas are continually updated as development occurs	Not done
Life Cycle Management	Verify and record asset data on existing bank protection structures in annual river and stream walkovers	Ongoing
	Review Utility Services Contract in annual river and stream walkovers	Ongoing
	Prepare and submit river and stream resource consents following notification of Freshwater Plan in April 2004	Completed
	Develop scheduled maintenance programme	ongoing
	Establish checking procedure of Utility Service provider's performance	ongoing
	Develop renewals programme of works for rivers and streams	Ongoing
	Continually reassess and update project specific ranking assessments as circumstances offer	Ongoing
Lifecycle Management	Prepare report to identify ways of improving reticulation discharge quality	Part Completed (Reticulated Stormwater Quality Improvement Plan 2006). Ongoing resource consent.
	Develop scheduled maintenance programme	Completed
	Identify and record secondary flowpaths	Completed
	Carry out cost/benefit analysis on automated tide gates to Saltwater Creek	Now considered not to be a priority

Table 10-2: 2009 – 2012 Action Plan

Section	AP	Action	Completion Date
1	Introduction		
	AP 1-1	Expand implementation of Council's Sustainability Policy within the stormwater activity	ongoing
2	Levels of Service		
	AP 2-1	Review all LOS and performance targets, recommend adjustments as needed	2012
	AP 2-2	Further research be instigated to ascertain the reasons for water quality classification of Atawhai as poor and Cable Bay as fair	Low priority
	AP 2-3	Develop Catchment Management Plans	2014/15
	AP 2-4	Appoint additional staff for Stormwater bylaw (pollution prevention) monitoring	Completed
	AP 2-5	Develop a strategy and monitoring processes to ensure the medium and long term CO2 emissions targets are achieved	Part of sustainability strategy

Section	AP	Action	Completion Date
	AP 2-6	Prepare report on status of Maitai waterway and establish appropriate level of protection in both urban and non-urban areas	Started
	AP 2-7	Review of Hansen LOS and contractor key performance indicator reports	TBD
	AP2-8	Ascertain data and monitoring requirements to enable future LOS targets to be achieved	Ongoing
4	Risk Management		
	AP 4-1	Risk management plans extended to a component level	TBD
	AP 4-2	Consider benefits of succession planning and how it might be implemented	TBD
	AP 4-3	Review the effects of sea rise, and increased rainfall intensity on the stormwater network (pipes & rivers) and the associated effects to the hydraulic grade lines in pipes	Completed (NIWA report and Land Development Manual 2010)
5	Lifecycle Management		
	AP 5-1	A re-evaluation of the strategy for condition profiling (including Closed Circuit Television) is required to ensure that condition profiling is conducted using a risk based methodology, it is at an appropriate industry standard and will comply with Audit requirements. This will also include the inserting data into Hansen	TBD
	AP 5-2	Formalise strategy for failure of pump stations that include contingency planning, lifelines and emergency management	Started
	AP 5-3	Review all pump stations for vandalism risk and develop mitigation strategies to the appropriate security level.	TBD
	AP 5-4	Monitor 1st & 2nd tier secondary flowpaths. 1st tier will have annual inspection tied to them, 2nd tier will be reactive	TBD
	AP 5-5	Integration of criticality into the ongoing operation, renewals and capital programme	Ongoing
	AP 5-6	Develop index of intensity, location and effects of flood events and continue to record and assess storm surges	Ongoing
	AP 5-7	Review of the renewal strategy to take into consideration criticality and earlier intervention requirements	TBD
	AP 5-8	Expanded use of multi-criteria analysis to determine the optimal solution while incorporating both short and long term economic, cultural, social, and environmental factors	Ongoing
6	Financial		
	AP 6-1	Review of asset base lives to ensure accurate valuation and forecasting of future depreciation costs	ongoing
	AP 6-2	Improve level of understanding and confidence in financial projections of Operations and Maintenance Strategies and capital	TBD
	AP6-3	Gain better understanding of lifecycle maintenance costs for assets to assist with forecasting including optimisation of mtce costs and develop more reporting and also ensure the capture of all lifecycle costs, i.e. from creation to disposal	TBD
	AP 6-4	Develop sensitivity analysis to account for varying assumptions associated with future operations, renewals and development costs	TBD
	AP 6-5	In depth review of asset replacement costs using recent contract data to ensure accurate valuation and associated depreciation requirements and forecasting of future work. To include processes (in Hansen) of capturing renewal/capital contract costs that allows reporting out of actual costs to compare with valuation unit rates.	Annual

Section	AP	Action	Completion Date
	AP6-6	Review city areas without stormwater reticulation, establish needs and costs, and prioritise within list of capital projects	Annual
7	Asset Management		
	AP 7-1	Evaluate integration of Hansen, InTouch and Closed Circuit Television applications	Underway
	AP 7-2	Review of Hansen work order process, activity codes, and reports	Underway
	AP 7-3	Develop a consolidated reporting process and explore options for graphical display	TBD
	AP 7-4	Review current reporting methodology and associated quality assurance procedures to ensure appropriate for LOS and management reporting	TBD
8	Asset Management Plan Improvement and Monitoring		
	AP 8-1	Develop benchmarking in critical areas of administration and operation	TBD

Table 10-3: 2012-2022 Action Plan

Priority	Action	Completion Date
Rural Rivers	Options report to Council for raising stormwater rates in rural areas. (Report 2013 addressed stormwater issues in rural areas)	2011/12
Stormwater Inflow and infiltration	Development of strategy (Not started 2013/14)	2012
Maitai River flood capacity	Tonkin & Taylor report underpins future options study, leading to construction programme of capacity improvements (Report completed in 2013)	Construction programmed 2014/15
Stormwater channels on private properties	Development of Policy (Drainage Ownership Policy completed 2013)	2011/12
Climate change and the capacity of rivers and streams	Complete inventory of urban and rural rivers to access Q_{50} capacity	Starting 2015/16
Freshwater Quality improvement	Engage external agencies to help us better understand the quality issues with the streams and formulate a plan to address the impacts (Maitai water quality initiatives started 2014)	Starting 2012/13
Low Impact Design	Monitoring of existing Low Impact Design initiatives to better understand long term issues. Information gathered will feed into the next Land Development Manual 2010 update	Ongoing
Sustainability	Integrating Council's sustainability vision into individual stormwater activities and projects	Ongoing

APPENDIX A: GLOSSARY OF TERMS

Term	Definition
Activity	The work undertaken on an asset or group of assets to achieve a desired outcome.
Advanced Asset Management	Asset management which employs predictive modelling, risk management and optimised renewal decision making techniques to establish asset lifecycle treatment options and related long term cashflow predictions. (See Basic Asset Management.)
Annual Plan	The Annual Plan provides a statement of the direction of Council and ensures consistency and co-ordination in both making policies and decisions concerning the use of Council resources. It is a reference document for monitoring and measuring performance for the community as well as the Council itself.
Annual Report	The audited report published annually (by 30 November) which provides information on how the Local Authority has performed with respect to its policies, objectives, activities, targets, budgets and funding proposals.
Asset	A physical facility of value which enables services to be provided and has an economic life greater than 12 months.
Asset Management	The combination of management, financial, economic, engineering and other practices applied to physical assets with the objective of providing the required level of service in the most cost effective manner.
Asset Management Plan	A plan developed for the management of one or more infrastructure assets that combines multi-disciplinary management techniques (including technical and financial) over the lifecycle of the asset in the most cost effective manner to provide a specified level of service. A significant component of the plan is a long term cashflow projection for the activities.
Asset Management Strategy	A strategy for asset management covering, the development and implementation of plans and programmes for asset creation, operation, maintenance, renewal, disposal and performance monitoring to ensure that the desired levels of service and other operational objectives are achieved at optimum cost.
Asset Management System	A system (usually computerised) for collecting analysing and reporting data on the utilisation, performance, lifecycle management and funding of existing assets.
Asset Management Team	The team appointed by an organisation to review and monitor the corporate asset management improvement programme and ensure the development of integrated asset management systems and plans consistent with organisational goals and objectives.
Asset Register	A record of asset information considered worthy of separate identification including inventory, historical, financial, condition, construction, technical and financial information about each.
Asset	A physical component of a facility which has value, enables services to be provided and has an economic life of greater than 12 months.
Benefit Cost Ratio (B/C)	The sum of the present values of all benefits (including residual value, if any) over a specified period, or the life cycle of the asset or facility, divided by the sum of the present value of all costs.
Business Plan	A plan produced by an organisation (or business units within it) which translate the objectives contained in an Annual Plan into detailed work plans for a particular, or range of, business activities. Activities may include marketing, development, operations, management, personnel, technology and financial planning.
Cash Flow	The stream of costs and/or benefits over time resulting from a project investment or ownership of an asset.
Components	Specific parts of an asset having independent physical or functional identity and having specific attributes such as different life expectancy, maintenance regimes, risk or criticality.
Condition Monitoring	Continuous or periodic inspection, assessment, measurement and interpretation of resulting data, to indicate the condition of a specific component so as to determine the need for some preventive or remedial action.
Consequence	The outcome of an event expressed qualitatively or quantitatively, being a loss, injury, disadvantage or gain. There may be a range of possible outcomes associated with an event.

Term	Definition
Critical Assets	An asset where failure would have significant consequences, either in the ability of the system to provide service to customers or the effect on the environment.
Current Replacement Cost	The cost of replacing the service potential of an existing asset, by reference to some measure of capacity, with an appropriate modern equivalent asset.
Deferred Maintenance	The shortfall in rehabilitation work required to maintain the service potential of an asset.
Demand Management	The active intervention in the market to influence demand for services and assets with forecast consequences, usually to avoid or defer CAPEX expenditure. Demand management is based on the notion that as needs are satisfied expectations rise automatically and almost every action taken to satisfy demand will stimulate further demand.
Depreciated Replacement Cost (DRC)	The replacement cost of an existing asset after deducting an allowance for wear or consumption to reflect the remaining economic life of the existing asset.
Depreciation	The wearing out, consumption or other loss of value of an asset whether arising from use, passing of time or obsolescence through technological and market changes. It is accounted for by the allocation of the historical cost (or revalued amount) of the asset less its residual value over its useful life.
Economic life	The period from the acquisition of the asset to the time when the asset, while physically able to provide a service, ceases to be the lowest cost alternative to satisfy a particular level of service. The economic life is at the maximum when equal to the physical life however obsolescence will often ensure that the economic life is less than the physical life.
Facility	A complex comprising many assets (e.g. a water treatment plant, recreation complex, etc.) which represents a single management unit for financial, operational, maintenance or other purposes.
Frequency	A measure of the rate of occurrence of an event expressed as the number of occurrences of an event in a given time.
Geographic Information System	Software which provides a means of spatially viewing, searching, manipulating, and analysing an electronic data-base.
GUI	Graphical User Interface is a particular case of user interface for interacting with a computer which employs graphical images in addition to text to represent the information and actions available to the user.
IMS	Hansen IMS software - Asset Management software product purchased as result of PAMS project.
InTouch	The brand of Graphical User Interface (GUI).
Infrastructure Assets	Stationary systems forming a network and serving whole communities, where the system as a whole is intended to be maintained indefinitely at a particular level of service potential by the continuing replacement and refurbishment of its components. The network may include normally recognised 'ordinary' assets as components.
Level of service	The defined service quality for a particular activity (i.e. sewerage) or service area (i.e. sewage disposal) against which service performance may be measured. Service levels usually relate to quality, quantity, reliability, responsiveness, environmental acceptability and cost.
Life	A measure of the anticipated life of an asset or component; such as time, number of cycles, distance intervals etc.
Life Cycle Cost	The total cost of an asset throughout its life including planning, design, construction, acquisition, operation, maintenance, rehabilitation and disposal costs.
Maintenance Plan	Collated information, policies and procedures for the optimum maintenance of an asset, or group of assets.
Maintenance Standards	The standards set for the maintenance service, usually contained in preventive maintenance schedules, operation and maintenance manuals, codes of practice, estimating criteria, statutory regulations and mandatory requirements, in accordance with maintenance quality objectives.
Maintenance	All actions necessary for retaining an asset as near as practicable to its original condition, but

Term	Definition
	excluding rehabilitation or renewal.
Multi-Criteria Analysis	Analysis technique that takes a range of criteria into account which are both qualitative and quantitative and reflect the social, cultural, economic, and environmental characteristic of the project outcomes.
NZPIM	New Zealand Pipe Inspection Manual - National manual for inspecting and scoring stormwater pipes. Published by NZWWA - Second Edition March 1999.
NZWWA	New Zealand Water and Wastes Association - National industry association formed for the advancement and application of fundamental and practical knowledge to natural water resources, water use and wastes.
Operations & Maintenance Expenditure	The cost of operating and maintaining assets. Operations and Maintenance Strategies expenditure does not alter the value of an asset and is not included in the asset valuation.
Objective	An objective is a general statement of intention relating to a specific output or activity. They are generally longer term aims and are not necessarily outcomes that managers can control.
ODRC - Optimised Depreciated Replacement Cost	The Optimised Replacement Cost after deducting an allowance for usage to reflect the remaining life of the asset.
Operation	The active process of utilising an asset which will consume resources such as manpower, energy, chemicals and materials. Operation costs are part of the life cycle costs of an asset.
Optimised Renewal Decision Making	An optimisation process for considering and prioritising all options to rectify performance failures of assets. The process encompasses Net Present Value analysis and risk assessment.
Optimised Replacement Cost	The minimum cost of replacing an existing asset by another asset offering the same utility most efficiently. The optimisation process adjusts the value for technical and functional obsolescence, surplus assets or over-design.
Outcome	The end result for the community which Council hopes to achieve.
Output	Services, actives or goods produced by Council which contribute to achieving an outcome.
Performance Measure	A qualitative or quantitative measure of a service or activity used to compare actual performance against a standard or other target. Performance indicators commonly relate to statutory limits, safety, responsiveness, cost, comfort, asset performance, reliability, efficiency, environmental protection and customer satisfaction.
Performance Monitoring	Continuous or periodic quantitative and qualitative assessments of the actual performance compared with specific objectives, targets or standards.
Rehabilitation	Works to rebuild or replace parts or components of an asset, to restore it to a required functional condition and extend its life, which may incorporate some modification. Generally involves repairing the asset using available techniques and standards to deliver its original level of service (i.e. heavy patching of roads, slip-lining of sewer mains, etc.) without resorting to significant upgrading or replacement.
Renewal	Works to upgrade, refurbish, rehabilitate or replace existing facilities with facilities of equivalent capacity or performance capability.
Renewal Accounting	A method of infrastructure asset accounting which recognises that infrastructure assets are maintained at an agreed service level through regular planned maintenance, rehabilitation and renewal programmes contained in an asset management plan. The system as a whole is maintained in perpetuity and therefore does not need to be depreciated. The relevant rehabilitation and renewal costs are treated as operational rather than capital expenditure and any loss in service potential is recognised as deferred maintenance.
Repair	Action to restore an item to its previous condition after failure or damage.
Replacement	The complete replacement of an asset that has reached the end of its life, so as to provide a similar, or agreed alternative, level of service.
Risk	The chance of something happening that will have an impact upon objectives. It is measured in terms of consequences and the likelihood of a particular risk.

Term	Definition
Risk Assessment	The overall process of risk analysis and risk evaluation.
Risk Management	Risk Management is the systematic application of management policies, procedures and practices to the tasks of identifying, analysing, evaluating and monitoring those risks that could prevent a Local Authority from achieving its strategic or operational objectives or Plans or from complying with its legal obligations.
Routine Maintenance	Day to day operational activities to keep the asset operating (replacement of light bulbs, cleaning of drains, repairing leaks, etc.) and which form part of the annual operating budget, including preventative maintenance.
Service Potential	The total future service capacity of an asset. It is normally determined by reference to the operating capacity and economic life of an asset.
Strategic Plan	Strategic planning involves making decisions about the long term goals and strategies of an organisation. Strategic plans have a strong external focus, cover major portions of the organisation and identify major targets, actions and resource allocations relating to the long term survival, value and growth of the organisation.
TKN	Total Kjehldahl Nitrogen. TKN is the combination of organically bound Nitrogen and Ammonia. The combination of the organic nitrogen and the inorganic nitrogen (NH_4 Ammonia, NO_3 Nitrate, NO_2 Nitrite) make up the total nitrogen.
Unplanned Maintenance	Corrective work required in the short term to restore an asset to working condition so it can continue to deliver the required service or to maintain its level of security and integrity.
Upgrading	The replacement of an asset or addition/ replacement of an asset component which materially improves the original service potential of the asset.
Valuation	Estimated asset value which may depend on the purpose for which the valuation is required, i.e. replacement value for determining maintenance levels or market value for life cycle costing.

A1 ACRONYMS

Term	Definition
AC	Asbestos cement pipe
ADWF	Average dry weather flow
ATAD	Autothermal thermophilic aerobic digestion plant
AV	Average flow
BOD	Biochemical oxygen demand
BTWWTP	Bells island waste water treatment plant
CCTV	Close circuit television
CDEM	Civil Defence Emergency Management
FAR	Fixed asset register
GAAP	Generally Accepted Accounting Principles
HDPE	High-density polyethylene pipe
KPI	Key Performance Indicators
LA	Local Authority
LID	Low impact design
LAPP	Local Authority Protection Programme Disaster Fund
LDM	Land Development Manual 2010
LTCCP	Long Term Community Plan
MCA	Multi-Criteria Analysis

Term	Definition
NAMS	National Asset Management Steering Group
NCS	Napier Computer System
NPV	Net present value
NRSBU	Nelson Regional Sewerage Business Unit (replaced NRSA in July 2000)
NTL	Network Tasman Ltd
NUGS	The Nelson Urban Growth Strategy
P/S	Pump station
QA/QC	Quality Assurance and Quality Control
RCRRJ	Reinforced concrete rubber ring joint pipe
RMA	Resource management act
SCADA	Supervisory control and data acquisition
SS	Suspended solids
TA	Territorial Authority
uPVC	Unplasticised Polyvinyl Chloride pipe
WWTP	Wastewater treatment plant

APPENDIX B: BIBLIOGRAPHY

Title	Date	Author
Nelson City Council Stormwater Asset Management Plan	2003	Nelson City Council
The Development of Business Process Mapping for Asset Management Systems	June 2000	Opus International Consultants Ltd
New Zealand Infrastructure Assets Grading Guidelines	1999	NZWWA
The High Intensity Rain Fall Analysis for Nelson Urban Area	2008	NIWA
Nelson City Council Long Term Council Community Plan 2006-16	2006	
Nelson City Council Stormwater Bylaw		Nelson City Council
2008 Valuation	Sept 2008	Nelson City Council
Reticulated Stormwater Quality Improvement Plan	2007	Nelson City Council

APPENDIX C: ASSET DATA AND OVERVIEW

Appendix Table 1: GIS List of Code Definitions used by Nelson City Council

Value	Description
2000	2000: Meter type
3000	3000: Meter type
ACBK	Black Asbestos Cement
ACMT	Asbestos Cement
ALUM	Aluminium
ARMC	ArmourCoil
BLBT	Blue Brute Pipe
BLKA	Black Asbestos Cement
BRCK	Brick
CIDT	Ductile Cast Iron
CIPT	PitCast Iron
CISP	Spun Cast Iron
CNIL	Concrete (InsituFORM lined)
CONC	Concrete
COPR	Copper
DRNC	Drainage Coil
DTRPL	Deep Trap Large
EWRE	Earthenware
FGLS	Fibreglass
FLDT	Field Tiles
GALV	Galvanised
HDPE	HDPE
HELA	Helcoil Aluminium
HELS	Helcoil Steel
MDPE	Medium Density Pe
NAPP	Not Applicable
OTHR	Other
PE1H	Pe 100 Material
POLE	Pole Construction
PRFC	Perforated Concrete

Value	Description
PVC	uPVC
STCL	Steel Concrete Lined
STNY	Nylon Coated Steel: Used in pump stations
STPL	Steel Pitch Lined
UNKW	Unknown

Appendix Table 2: Mains Material Data

Diameter / Description	Length (m)						Replacement Value
	BRCK	CONC	EWRE	OTHR	PVC	TOTAL	($000's)
100		25	60	2,062	407	2,553	$431
150		1,220	695	1,222	4,906	8,043	$1,474
160				18		18	$3
175		22			20	42	$11
200		113			440	552	$151
225		21,035	621		4,336	25,992	$7,100
250		8			37	44	$12
300		35,100	769	307	866	37,043	$10,647
325		99				99	$28
350		72		32		104	$36
355				22		22	$7
375		19,087	178		115	19,380	$6,697
450	6	19,012	168	111		19,297	$8,065
500	52	7				60	$27
525	22	8,145				8,167	$3,646
600		15,984				15,984	$9,346
675		3,436				3,436	$2,220
750	492	6,705				7,197	$5,542
800				14		14	$12
825	856	2,253				3,108	$2,704
900	54	7,520				7,574	$7,196
1050		3,256				3,256	$3,745
1075		481				481	$577
1200		3,707				3,707	$4,819
1350		5,955				5,955	$8,933
1500		1,030				1,030	$1,699
1600		248				248	$447
1800		1,707				1,707	$3,499
2000		12				12	$27
2050		15				15	$33
Total	1,482	156,253	2,491	3,788	11,127	175,141	$89,134

Appendix Table 3: Intakes, Manholes, Wing Walls and Sumps

Diameter / Description	Number	Replacement Value $,000
Intakes		
Dia < 300	20	$45
300 <= Dia < 600	40	$145
600 <= Dia < 900	13	$58
900 <= Dia < 1500	17	$156
Dia >= 1500	7	$91
Total	97	$495
Manholes		
1,050	2,548	$6,529
1,350	727	$2,822
1,500	226	$1,278
1,800	96	$736
Special	43	$385
DTRPL	4	$159
Total	3,644	$11,909
Wing Wall Outfalls		
Dia < 300	8	$80
300 <= Dia < 600	27	$40
600 <= Dia < 900	15	$38
900 <= Dia < 1500	8	$9
Dia >= 1500	12	$80
Total	70	$248
Sumps		
Standard	547	$839
Non return	1	$3
Total	548	$842

APPENDIX D: GAP ANALYSIS AND APPROPRIATE PRACTICE

Appendix Table 4: GAP Analysis and Appropriate Practice

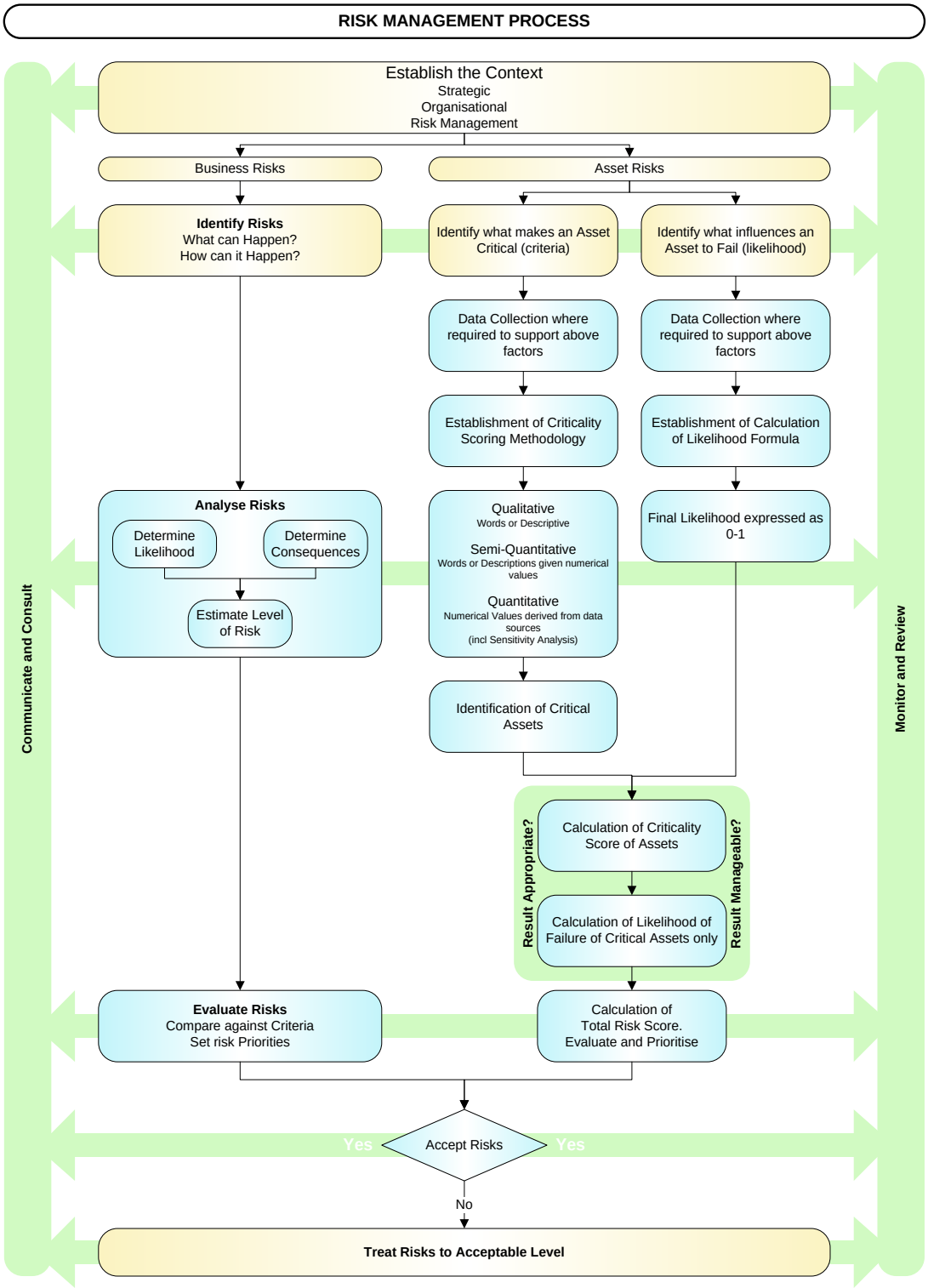
Gap Analysis	Assessment Score	Description of Assets													Levels of Service											Managing Growth				
		Physical Description of Asset		Financial Description of Asset		Remaining useful life		Aggregate & Disaggregate information		- Physical attributes (location, material, age etc)		- Systematic monitoring of condition		- Systematic measurement performance	Define LOS or performance	Linkage to strategic/community outcomes	Links to other planning documents	Levels of consultation identified and agreement	Service life of network stated	- Evaluating LOS Options	- Consult LOS options with community	- Adoption LOS & Standards after consultation	- Public communication of service level via customer charter or similar	- Monitoring & public reporting	Asset Management Plan's reflect agreed LOS & how service is delivered	Demand Forecasts (10 year)	Demand Management drivers & strategies	Sustainability Strategies	Forecasts include f actors that comprise demand	Sensitivity of asset development (Capital Works) to demand changes
		1.2		1.3		1.4		1.5		1.6		1.7		1.8	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	2.10	2.11	3.1	3.2	3.4	3.5	3.6
Best	100																													
Excellence	95																													
	90																													
	85																													
	80																													
	75																													
Competent	70																													
	65																													
	60																													
	55																													
	50																													
	45																													
	40																													
	35																													
Systematic	30																													
	25																													
Aware	20																													
	15																													
Innocent	10																													
	5																													
		CA	NCA	CA	NCA	CA	NCA	CA	NCA	CA	NCA	CA	NCA	CA	NCA															
Current		100	100	80	60	80	50	80	80	80	80	50	10	25	10	90	90	80	80	50	50	50	80	50	80	90	90	80	60	60	70
Desired		100	100	95	80	95	60	80	80	95	80	80	50	95	50	90	90	90	90	90	50	50	80	50	80	90	90	90	95	80	80
5 Year Gap		0		15		15		0		15		30		70		0	0	10	10	40	0	0	0	0	0	0	0	10	35	20	10

Gap Analysis	Assessment Source	Risk Management									Lifecycle Decision Making										Financial Forecasts					
		Identify critical assets	Identify significant negative effects	Identify associated risks and RM strategies	Recognition & application of principles of integrated risk management to assets	Apply standards (AU/NZ4360) & industry good practice	Integrated with Corporate risk management	-RM encompass identification and risk management strategies for critical assets	RM integrated with Lifelines, disasters recovery, Continuity plans	Integrate with maintenance and replacement strategies	Identify gaps btwn current and req'd svc capability - reflect in development programme		Evaluation and ranking based on criteria of options for significant capital invest decisions for		Ability to predict robust options for asset treatment that assist in achieving optimal costs over life cycle		- Apply agreed evaluation tools to prioritise work programmes		- Predictive modelling to support long-term financial forecasts for maintenance, renewals & new capital		10 year Financial plan – Maintenance, Renewals, New Capital (LOS and demand).	Validate the Depreciation/ Decline in Service Potential	Translate operational, planned maint, renewal & new work into financial terms over timeframe in which the asset network must deliver services	Translate operational, planned maint, renewal & new work into financial terms over period of strategic plan	Provide consistent financial forecasts & Substantiate	Sensitivity of forecasts
		4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5.2		5.3		5.5		5.6		5.7		6.1	6.2	6.3	6.4	6.5	6.6
Best	**100**																									
Excellence	**95**																									
	90																									
	85																									
	80																									
	75																									
Competent	**70**																									
	65																									
	60																									
	55																									
	50																									
	45																									
	40																									
	35																									
Systematic	**30**																									
	25																									
Aware	**20**																									
	15																									
Innocent	**10**																									
	5																									
											CA	NCA	CA	NCA	CA	NCA	CA	NCA	CA	NCA						
Current		90	90	90	90	90	80	80	80	90	80	30	80	50	30	30	30	30	30	30	70	70	50	50	25	25
Desired		100	100	100	90	90	90	90	90	90	90	50	90	50	90	50	90	50	90	50	95	95	95	90	90	90
5 Year Gap		10	10	10	0			10	10	0	10		10		60		60		60		25	25	45	40	65	65

Gap Analysis	Assessment Score		Planning Assumptions and Confidence Levels								Outline Improvement Programmes						Planning by Qualified Persons		Commitment					
		List all assumptions and possible effects	Confidence level on asset condition, performance	Accuracy of asset inventory	Confidence level demand/growth forecasts	Confidence level on financial forecasts	List all assumptions including organisations strategic plan that support Asset Management - linkages with other planning documents	Confidence levels - Inventory Data; Critical Assets (1), Non Critical (2)	Confidence levels - Condition Data; ; Critical Assets (1-2), Non Critical (1,2,3)	Confidence levels- Performance Data; ; Critical Assets (1-2), Non Critical (1,2,3)	Identify improvements to AM processes & techniques	Identify weak areas & how they will be addressed	Timeframes for improvements	Identify resources required (human & financial)	Improvement programmes are monitored against key performance indicator's	Previous improvements identified and formally reported against key performance indicator's	Asset Management Planning should be undertaken by a suitably qualified person	Process should be Peer reviewed	Plan adopted by Council including improvement programme	Plan key tool to support Long Term Council Community Plan	AM Plan regularly updated and should reflect progress on improvement plan	Asset Management Plan requirements are being implemented and discrepancies formally reported	Asset Management Plans evolving as Asset Management systems provide better information	Asset Management Plans updated every 3 years along with organisations strategic planning cycles
		7.1	7.2	7.3	7.4	7.5	7.6	7.7	7.8	7.9	8.1	8.2	8.3	8.4	8.5	8.6	9.1	9.2	10.1	10.2	10.3	10.4	10.5	10.6
Best	**100**																							
Excellence	**95**																							
	90																							
	85																							
	80																							
	75																							
Competent	**70**																							
	65																							
	60																							
	55																							
	50																							
	45																							
	40																							
	35																							
Systematic	**30**																							
	25																							
Aware	**20**																							
	15																							
Innocent	**10**																							
	5																							
Current		80	80	80	80	80	80	80	80	80	70	60	70	70	50	50	80	80	100	100	100	95	95	80
Desired		90	90	90	90	90	90	90	90	90	90	80	80	80	80	80	80	80	100	100	100	95	95	100
5 Year Gap		10	10	10			10		10	10	20	20	10	10	30	30	0	0	0	0	0	0	0	20

APPENDIX E: RISK

E1 RISK MANAGEMENT PROCESS



E2 RISK SCHEDULES

Risk, likelihood and consequence are:

- Risk is the combination of the likelihood and consequence of an event occurring.
- Likelihood is a description of the probability or frequency of an event occurring.
- The consequence is the outcome of an event being a loss, injury, disadvantage or gain.

For each event the likelihood score is multiplied by the consequence score for each area of impact (there will be only one likelihood but several consequences for each event) – See Appendix Table E.4 below. These multiples are then totalled to produce the risk score for the event. The likelihood and consequence tables are shown in the Supplementary Section.

The risk priority ratings and the risk response of the mitigation strategies are detailed in Appendix Table 6 below.

Appendix Table E.1 Likelihood Ratings (Semi Qualitative Measure)

Rating		Description	Score
A	Almost Certain	Likely to occur frequently and several times a year.	0.9
B	Likely	Likely to occur more than once during the life of the project.	0.7
C	Moderate	Likely to occur during the life of the project.	0.4
D	Unlikely	May occur once in up to 100 years.	0.2
E	Rare	Might occur once in 100+ years.	0.01

Appendix Table E.2: Risk Priority Rating

Risk Score	Level of Risk	Risk Response
>200	Extreme	Awareness of the event to be highlighted to the board
150 - 200	High	Risk treatment required. Risk to be eliminated or mitigated by 30 June 2009
100 - 150	Moderate	Risk treatment required
0 - 100	Low	Managed by routine procedures

Appendix Table E.3: Semi-Quantitative Measures of Consequence and Areas of Impact

Areas of Impact	Descriptor				
	Negligible (10)	**Minor (30)**	**Moderate (50)**	**Major (70)**	**Catastrophic (100)**
Health and Safety	Minor injury possible.	Serious injury to one person.	Serious injury to multiple members of staff, contractor or public.	Single fatality of staff, contractor or public.	Multiple fatalities of staff, contractors or public.
Public Health	Temporary but non-serious health impacts.	Localised serious health impact on one person.	Localised serious health impact on more than 20 people.	Localised or widespread serious health impact on more than 100 people.	Localised or widespread serious health impact on more than 1,000 people.
Asset Performance	Asset failure impacting on one or more persons.	Asset failure impacting on more than 4 people/ day.	Asset failure impacting on more than 40 people/ day.	Asset failure impacting on more than 400 people/day.	Asset failure impacting on more than 4,000 people/day.
Environment and Legal Compliance	Short term and temporary impact requiring no remedial action.	Medium term environmental impact with immaterial effects on environment or community.	Measurable environmental harm to an internationally or nationally significant site. Loss of public access or conservation value of the site.	Major environmental damage with long-term recovery significant investment. High profile legal challenge. Loss of public access or conservation value of a significant environment.	Permanent environmental damage to an internationally or nationally significant site. Large scale class action.
Historical or Cultural	Loss of important records about a site. Work required restoring them.	Unsympathetic development compromising the integrity of a registered historical, cultural or archaeological site.	Damage to a registered historical, cultural or archaeological site, but capable of restoration.	Loss or permanent damage to a registered historical, cultural or archaeological site.	Permanent loss of national icon.
Financial	Capital cost/loss.	Capital cost/loss $100k - $500k.	Capital cost/loss.	Capital cost/loss.	Capital cost/loss.
	<$100k.		$500k - $1million.	$1million-$5million.	> $5 million.
Public Perception	Service Request.	Minor complaint.	Justifiable complaint / information request.	Ministerial questions / third party investigations.	Public or ministerial enquiry.

Appendix Table E.4: Asset Risk Schedule

Item	Asset Group	Risk Event	Consequence or Outcome	Gross Risk				Mitigation Strategy		Residual Risk				Action Plan	
				Likelihood	Impact	Gross Risk	Risk Assessment	Description	Operational	Control Effectiveness	Likelihood	Residual Risk	Risk Assessment	(AP) Ref	Action Plan Description
Reticulation															
3.1	Pump station	Flood > Q_{15} to Pump Stations	Serious flooding occurrence causing significant property and infrastructure damage. Minor H & S issue. Contamination from sewage system may occur.	0.7	330	231	Ext	Acceptable risk. Increasing design capacity further would be uneconomic.	No	1	0.7	231	Ext		
2.2(b)	SW Mains	Flood >Q_{15}, dia >300mm	Serious flooding occurrence causing significant property and infrastructure damage. Minor H & S issues Contamination from sewage system may occur.	0.7	270	189	High	Acceptable risk. Increasing design capacity further would be uneconomic and above statutory requirements.	No	2	0.7	189	High		Continue upgrade and renewal programme
2.6(b)		Flood Event/ period of inadequate maintenance > 300mm dia	Flooding to localised adjoining properties.	0.7	250	175	High	Culverts, intakes and outfalls regularly monitored and maintain under service providers maintenance.	Yes	1	0.7	189	High		Review reticulation maintenance strategy
1.6		Flood Event/Period of inadequate maintenance	Flooding of adjoining property, erosion of banks and foundations of structures. H & S issues.	0.7	250	175	High	Maintenance strategy and upgrade of reticulation/ streams.	Yes	3	0.7	133	Mod		Review reticulation maintenance strategy Upgrade rivers & streams as deemed necessary
4.2		Flood event to open channel or ditch		0.9	170	153	High	Regular inspections and maintenance programme.	Yes	1	0.9	117	Mod		Review reticulation maintenance strategy
2.1(a)	SW Mains	Flood to system not upgraded <300mm dia	Flooding of adjoining property, erosion of foundations of structures. Minor H & S issues. Contamination from sewage system may occur.	0.9	110	99	Low	Upgrade required and programmed in order of priority. Importance of secondary flood routes recognised.	Yes	2	0.7	105	Mod		Continue upgrade and renewal programme
1.7		Contamination	Localised H & S issues - recreation users of streams / rivers / sea. Destroying habitat for fish, eels, wildlife etc.	0.9	170	153	High	Stormwater Bylaw and pollution prevention plan.	Yes	3	0.9	99	Low		
new	Maitai River (Hanby Park to dam rural areas)	Flood to river stream not upgraded	Flooding of adjoining property, erosion of banks and foundations of structures. Minor H & S issues. Contamination from sewage system may occur.	0.7	230	161	High	Upgrade section to Q_{15} profile.	Yes	2	0.7	91	Low		Upgrade of Rivers and Streams as deemed necessary
2.4	Streets	Flood to streets without reticulation pipes on steep land	Flooding to adjoining properties. Contamination from sewage system may occur. Erosion and structural damage possible.	0.9	230	207	Ext	S/W ditches available in some locations, otherwise stormwater systems require installation.	Yes	2	0.7	91	Low		Continue upgrade and renewal programme
1.2	River	Flood >Q_{50} to upgraded rivers and streams	Serious flooding occurrence causing significant property and infrastructure damage. Contamination from sewage systems may occur.	0.2	350	70	Low	Civil defence and emergency management response. Emergency procedures manual.	Yes	1	0.2	70	Low		
1.10		Structure Failure of Maltai stopbank combined with flood event	Flooding of properties, erosion of banks and foundation of structures. Minor H& S issues.	0.2	350	70	Low	Regular inspections carried out under utility providers maintenance contract. Engineering certification required.	Yes	1	0.2	70	Low		Establish inspection record register and quantify expected capacity of stop bank
2.2(a)	SW Mains	Flood >Q_{15}, dia < 300mm to upgraded systems < 300mm dia	Flooding of adjoining property, erosion of foundations of structures. Minor H & S issues. Contamination from sewage system may occur.	0.7	90	63	Low	Acceptable risk. Increasing design capacity further would be uneconomic and above statutory requirements.	No	2	0.7	63	Low		Continue upgrade and renewal programme
1.9		Drought Event	Fish life unsupported.	0.7	90	63	Low	1250m of low flow channel installation required. Further assessment required.	Yes	3	0.7	63	Low		Review Brook St concrete channel for fish passage
2.1(b)	SW Mains	Flood to system not upgraded >300mm dia	Flooding of adjoining property, erosion of foundations of structures. Minor H & S issues. Contamination from sewage system may occur.	0.9	190	171	High	Upgrade reticulation to Q_{15} with secondary flow paths.	Yes	2	0.7	63	Low		Continue upgrade and renewal programme

Item	Asset Group	Risk Event	Consequence or Outcome	Gross Risk				Mitigation Strategy		Residual Risk				Action Plan	
				Likelihood	Impact	Gross Risk	Risk Assessment	Description	Operational	Control Effectiveness	Likelihood	Residual Risk	Risk Assessment	(AP) Ref	Action Plan Description
2.3	Streets	Flood to streets without reticulation pipes on flat land	Flooding to adjoining properties. Contamination from sewage system may occur.	0.9	150	135	Mod	S/W ditches available in some locations, otherwise stormwater systems require installation.	Yes	2	0.7	63	Low		Continue upgrade and renewal programme
2.6(a)	Properties	Flood Event/Period of inadequate maintenance <300mm dia	Flooding to localised adjoining properties.	0.9	90	81	Low	Culverts, intakes and outfalls regularly monitored and maintain under service providers maintenance.	Yes	1	0.7	63	Low		Review reticulation maintenance strategy
3.3	Pumps, Mains, Electrical	Pump / Rising main / Electrical / Failure and Flood Event	Flooding of adjoining properties. Minor H & S issues. Contamination from sewage system may occur.	0.4	310	124	Mod	Continuing inspections carried out on regular basis under service providers maintenance contract.	Yes	2	0.2	62	Low		
2.5	SW Mains	Earthquake / Landslip	Blockage of pipe and subsequent flooding and use of secondary flood paths.	0.2	250	50	Low	Insured risk.	No	2	0.2	50	Low		
1.1	Maitai River (Collingwood - Hanby Park)	Flood to river stream not upgraded	Flooding of adjoining property, erosion of banks and foundations of structures. Minor H & S issues. Contamination from sewage system may occur.	0.7	310	217	Ext	Upgrade section to Q_{50} profile.	Yes	1	0.4	36	Low		Upgrade of Rivers and Streams as deemed necessary
new	Maitai River (Hanby Park to dam residential areas)	Flood to river stream not upgraded	Flooding of adjoining property, erosion of banks and foundations of structures. Minor H & S issues. Contamination from sewage system may occur.	0.7	270	189	High	Upgrade section to Q_{50} profile.	Yes	2	0.4	36	Low		Upgrade of Rivers and Streams as deemed necessary
new	Rivers and Streams general	Flood to river stream not upgraded	Flooding of adjoining property, erosion of banks and foundations of structures. Minor H & S issues. Contamination from sewage system may occur.	0.7	270	189	High	Upgrade section to Q_{50} profile.	Yes	2	0.4	36	Low		Upgrade of Rivers and Streams as deemed necessary
2.7		Secondary Flow paths	If secondary flow paths are not maintained and kept clear then during stormwater events flooding of surrounding properties can occur.	0.7	270	189	High	In new subdivisions secondary flood paths are design. Existing paths require identifying and maintaining.	Yes	2	0.4	36	Low		Document secondary flow paths and corresponding maintenance strategy
2.9(a)	Brick or Earthenware Mains	Structure Failure - Brick or earthenware >80 years old, Dia < 300mm	Flooding of adjoining properties. Minor H & S issues. Contamination from sewage system may occur.	0.7	110	77	Low	Renew asset.	Yes	1	0.4	28	Low		Continue upgrade and renewal programme
2.9(b)	Brick or Earthenware Mains	Structure Failure - Brick or earthenware > 80 years old, Dia > 300mm	Flooding of adjoining properties. Minor H & S issues. Contamination from sewage system may occur.	0.7	110	77	Low	Renew asset.	Yes	1	0.4	28	Low		Continue upgrade and renewal programme
2.10(a)	Concrete Mains	Structure Failure - Concrete >80 years old, dia < 300mm	Flooding of adjoining properties. Minor H & S issues. Contamination from sewage system may occur.	0.7	110	77	Low	Renew asset.	Yes	1	0.4	28	Low		Continue upgrade and renewal programme
2.10(b)	Concrete Mains	Structure Failure - Concrete >80 years old, dia > 300mm	Flooding of adjoining properties. Minor H & S issues. Contamination from sewage system may occur.	0.7	190	133	Mod	Renew asset.	Yes	1	0.4	28	Low		Continue upgrade and renewal programme
4.5	Stormwater Assets	Stormwater Assets not install to Nelson City Council Engineering Standards on new Development	Unknown asset failure may cause flooding, H & S issues on contamination.	0.4	170	68	Low	Inspection and sign off of plans and construction by Nelson City Council staff.	Yes	2	0.2	26	Low		Document inspections
2.11(a)	Brick or Earthenware Mains	Structure Failure - Brick or earthenware 45-80 years old, dia < 300mm	Flooding of adjoining properties. Minor H & S issues. Contamination from sewage system may occur.	0.4	110	44	Low	Monitor condition and performance, replace at risk assets.	Yes	1	0.2	14	Low		Continue upgrade and renewal programme
2.11(b)	Brick or Earthenware Mains	Structure Failure - Brick or earthenware 45 - 80 years old, dia > 300mm	Flooding of adjoining properties. Minor H & S issues. Contamination from sewage system may occur.	0.4	190	76	Low	Monitor condition and performance, replace at risk assets.	Yes	1	0.2	14	Low		Continue upgrade and renewal programme

Item	Asset Group	Risk Event	Consequence or Outcome	Gross Risk				Mitigation Strategy		Residual Risk				Action Plan	
				Likelihood	Impact	Gross Risk	Risk Assessment	Description	Operational	Control Effectiveness	Likelihood	Residual Risk	Risk Assessment	(AP) Ref	Action Plan Description
2.12(a)	Concrete Mains	Structure Failure - Concrete 45-80 years old, dia < 300mm	Flooding of adjoining properties. Minor H & S issues. Contamination from sewage system may occur.	0.2	110	22	Low	Monitor condition and performance, replace at risk assets.	Yes	1	0.2	14	Low		Continue upgrade and renewal programme
1.4		Flood/ High Tide or Tidal Wave (Tsunami)	Serious flooding occurrence causing significant property and infrastructure damage. Major H & S issues.	0.01	560	5.6	Low	Civil Defence and Emergency Mgmt Pump systems at Tahunanui and The Wood, will mitigate the consequences to a limited extent. The remaining risk is insured.	Yes	1	0.01	4.6	Low		
1.3		Earthquake	Major release of water from upper catchment causing damage to structure's erosion and flooding. Major H & S issues. Contamination from sewage system may occur.	0.01	390	3.9	Low	Civil defence and emergency management response. Emergency procedures manual.	Yes	1	0.01	3.9	Low		
4.1	Detention Ponds	Structure Failure of detention ponds combined with flood event	Flooding of adjoining properties. Minor H & S issues. Contamination from sewage system may occur.	0.2	390	78	Low	Continuing inspections carried out on regular basis.	Yes	1	0.01	3.9	Low		Document inspections
3.2		Earthquake / Flood Q_{15}	Flooding of adjoining properties. Minor H & S issues. Contamination from sewage system may occur.	0.01	350	3.5	Low	Pump stations design to withstand earthquakes and not located over known fault.	No	1	0.01	3.5	Low		
1.5	Upgraded Streams	Flood/ High Tide or Tidal Wave (Tsunami) to upgraded streams	Flooding occurrence causing property and infrastructure damage.	0.01	470	4.7	Low	Civil Defence and Emergency Mgmt Pump systems at Tahunanui and The Wood, will mitigate the consequences to a limited extent. The remaining risk is insured.	Yes	1	0.01	3.3	Low		
2.8		Public Liability - Injury or drowning if public at inlets , outfall, etc.	Localised health impact to one person.	0.01	210	2.1	Low	No assessment been made of risk items.	No	4	0.01	2.1	Low		
1.8		Public Liability	Localised health impact to one person.	0.01	150	1.5	Low	No assessment been made of risk items.	No	4	0.01	1.5	Low		
2.12(b)	Concrete Mains	Structure Failure - Concrete 45 - 80 years old, dia > 300mm	Flooding of adjoining properties. Minor H & S issues. Contamination from sewage system may occur.	0.2	190	38	Low	Monitor condition and performance, replace at risk assets.	Yes	1	0.01	0.7	Low		Continue upgrade and renewal programme
2.13(a)	All Pipes	Structure Failure All pipes (mainly concrete) >45 years old, dia < 300mm	Flooding of adjoining properties. Minor H & S issues. Contamination from sewage system may occur.	0.01	110	1.1	Low	Monitor condition and performance, replace at risk assets.	Yes	1	0.01	0.7	Low		Continue upgrade and renewal programme
2.13(b)		Structure Failure - All pipes (mainly concrete) >45 years old, dia > 300mm	Flooding of adjoining properties. Minor H & S issues. Contamination from sewage system may occur.	0.01	190	1.9	Low	Monitor condition and performance, replace at risk assets	Yes	1	0.01	0.7	Low		Continue upgrade and renewal programme

APPENDIX F: LEVELS OF SERVICE 2012, 2009, 2006 and 2003

The following detail the Levels of Service indicated in the 2012-2022 Long Term Plan, 2009-2019 Long Term Council Community Plan, 2006 – 2016 Long Term Council Community Plan and the 2003 Stormwater Asset Management Plan.

Appendix Table 5: Levels of Service: 2012 – 2022 Long Term Plan

	What Council will provide	Performance Measures
Stormwater	**Environmental Protection** **For the built and natural environment from flooding and stormwater discharges**	Level of compliance with resource consent conditions
		Ensure appropriate stormwater disposal options are available throughout the city
	Reliability **An operational stormwater network**	Number of blockages per 100 km of pipes on an annual basis
	Emergency response **Provide a prompt, reliable and timely response to service requests and system failures**	Time that contractors take to respond to emergencies
Flood Protection	**Protection for the urban built and natural environment from Q_{50} floods**	Damage to urban property from stream flooding is minimised
		Damage to urban property from Maitai River flooding is minimised
	Integration of ecological and stormwater requirements in urban sections of streams and rivers	Fish passage in streams is maximised and ecological impact of structures is minimised

Appendix Table 6: Levels of Service: 2009 – 2019 Long Term Council Community Plan

	What Council will provide	Performance Measures	Current Performance	Targets			Targets in Years 4-10
				Year 1	Year 2	Year 3	
Stormwater	**Environmental Protection** **For the built and natural environment from flooding and stormwater discharges**	Level of compliance with resource consent conditions	Achieved Water quality monitoring completed for first round of six city sites	100% compliance	Maintain	Maintain	Maintain
		Ensure appropriate stormwater disposal options are available throughout the city	Ongoing programme on track to improve network, targeting highest risk areas	Planned work programme completed to improve network, targeting highest risk areas	Maintain	Maintain	Maintain
	Reliability **An operational stormwater network**	Number of blockages per 100 km of pipes on an annual basis	Achieved 21 blockages per 100km	Less than 25 blockages per 100 km of pipes on an annual basis	Maintain	Maintain	Maintain
	Emergency response **Provide a prompt, reliable and timely response to service requests and system failures**	Time that contractors take to respond to emergencies	Not achieved – 98% response within 30 minutes Three events out of 138 did not meet target; two of these were just over target time, one was a delay of an hour due to a failure to recognise response urgency – change of call centre expected to improve this	Contractors respond to emergencies within 30 minutes	Maintain	Maintain	Maintain

	What Council will provide	Performance Measures	Current Performance	Targets			Targets in Years 4-10
				Year 1	Year 2	Year 3	
Flood Protection	**Protection for the urban built and natural environment from Q_{50} floods**	Damage to urban property from stream flooding is minimised	No base line data exists	Begin review of three urban streams Q_{50} capacity	Begin design works of three urban streams Q_{50} capacity	Begin construction works of three urban streams for Q_{50} capacity	Continue construction works of urban streams for Q_{50} capacity Carry out inventory of urban and rural streams for Q_{50} capacity
		Damage to urban property from Maitai River flooding is minimised	No base line data exists	Complete review of Maitai River Q_{50} capacity.	Begin review of Maitai River Q_{50} capacity	Begin design works for Maitai River Q_{50} capacity	Begin construction works for Maitai River Q_{50} capacity
	Integration of ecological and stormwater requirements in urban sections of streams and rivers	Fish passage in streams is maximised and ecological impact of structures is minimised	No base line data exists	Begin review of fish passage to Brook St channel, catchment management plan for the Maitai River and fresh water quality improvement initiatives	Complete catchment management plan for the Maitai River, design fresh water quality improvement initiative(s)	Begin construction of fresh water quality improvements to one urban stream channel and start catchment management plan for one urban stream	Begin design of fish passage to Brook St channel Continue freshwater quality improvements and catchment management plans for urban streams

Appendix Table 7: Levels of Service: 2009 – 2019 Long Term Council Community Plan

Customer Value	Level of Service	Performance Measures	Community Outcome	How the stormwater activity Contributes to Community Outcomes
Sustainability	All customers will be provided with an appropriate stormwater disposal method based on priority criteria	Identify all areas lacking adequate stormwater disposal and review prioritisation program Ongoing development of catchment management plans with city completed by 2013/14	– People-friendly places – A strong economy – Kind, healthy people	– Through reducing the likelihood of floods damaging homes, business or essential infrastructure
	Resource consent compliance for stormwater discharges from the reticulation	Comply with all resource consent conditions	– Healthy land, sea, air and water – People-friendly places	– Through the managing of the quality and quantity of stormwater discharged from the stormwater reticulation back to the environment
	Stormwater bylaw compliance	All industries with elevated pollution risk must have approved pollution prevention plan	– Healthy land, sea, air and water	– Through the efficient and sustainable operation and management of the stormwater network
	Reduction of Greenhouse gas emissions from electricity consumption	Stabilise at 2004 levels by 2012 Reduce emissions to 40% below 2004 levels by 2020	– Healthy land, sea, air and water – People-friendly places	– Through the sustainable operation and management of the stormwater network
Capacity	Managing stream floods	Design must meet Q_{50} floods for Nelson streams – Orphanage, Orchard, Poormans, Arapiki, Jenkins, York, Brook, Oldham and Todd Valley All streams to meet Q_{50} standard by 2018 No physical restrictions to fish passage from new works	– People-friendly places – Healthy land, sea, air and water	– Through reducing the likelihood of floods damaging homes, business or essential infrastructure – Through the reducing the effects of floods on the environment
	Managing the Maitai river	Design must meet Q_{50} for urban areas. River to be reviewed in stages with Q_{50} complete by 2018. No physical restrictions to fish passage from new works	– People-friendly places – Healthy land, sea, air and water	– Through reducing the likelihood of floods damaging homes, business or essential infrastructure – Through the reducing the effects of floods on the environment
	Overland flow paths clearly identified and communicated	All overland flow paths clearly identified and regularly inspected Affected residents are fully informed of their responsibilities for the operation and protection of overland flow paths	– People-friendly places	– Through reducing the likelihood of floods damaging homes, business or essential infrastructure – Through the reducing the effects of floods on the environment
Reliability	Minimise stormwater blockages within reticulation	Less than 25 blockages per 100 km of pipes on an annual basis	– Healthy land, sea, air and water – People-friendly places	– Through the efficient and sustainable operation and management of the stormwater network

Customer Value	Level of Service	Performance Measures	Community Outcome	How the stormwater activity Contributes to Community Outcomes
Responsiveness	Reliable and timely response to service requests and system failures	Response and investigation to comply with external contractor maintenance contract requirements	– Healthy land, sea, air and water	– Through the efficient and sustainable operation and management of the stormwater network

Appendix Table 8: Levels of Service: 2006 – 2016 Long Term Council Community Plan

Criteria	Service level	Performance measures and targets	Current results
Customer approval	Resident satisfaction	80% satisfied or very satisfied	☺ 89% (2004 residents' survey)
Efficiency	Response times	Blocked inlet structures during rain complete repair within one hour 90% of time	Data is not collected
Efficiency	Response times	Flooding and overtopping of streams and rivers, complete repair within 1 day 90% of the time	☺ 2002/03 (2005 annual report)
Efficiency		Clearance of obstructions from inlet structures, watercourses and outlet structures within 2 working days 90% of the time	☹ 2002/03 82% (2005 annual report)
Environmental quality	Resource consents	All resource consent conditions complied with	☺ (2005 annual report)
Effective planning	Asset Management Plan	This was planned for June 2006 but will now be December 2006.	n/a
Effectiveness	Managing floods	Activities meet Q15 or Q50 floods for Nelson rivers and streams	☺ No floods were experienced in 2004/05 (2005 annual report)

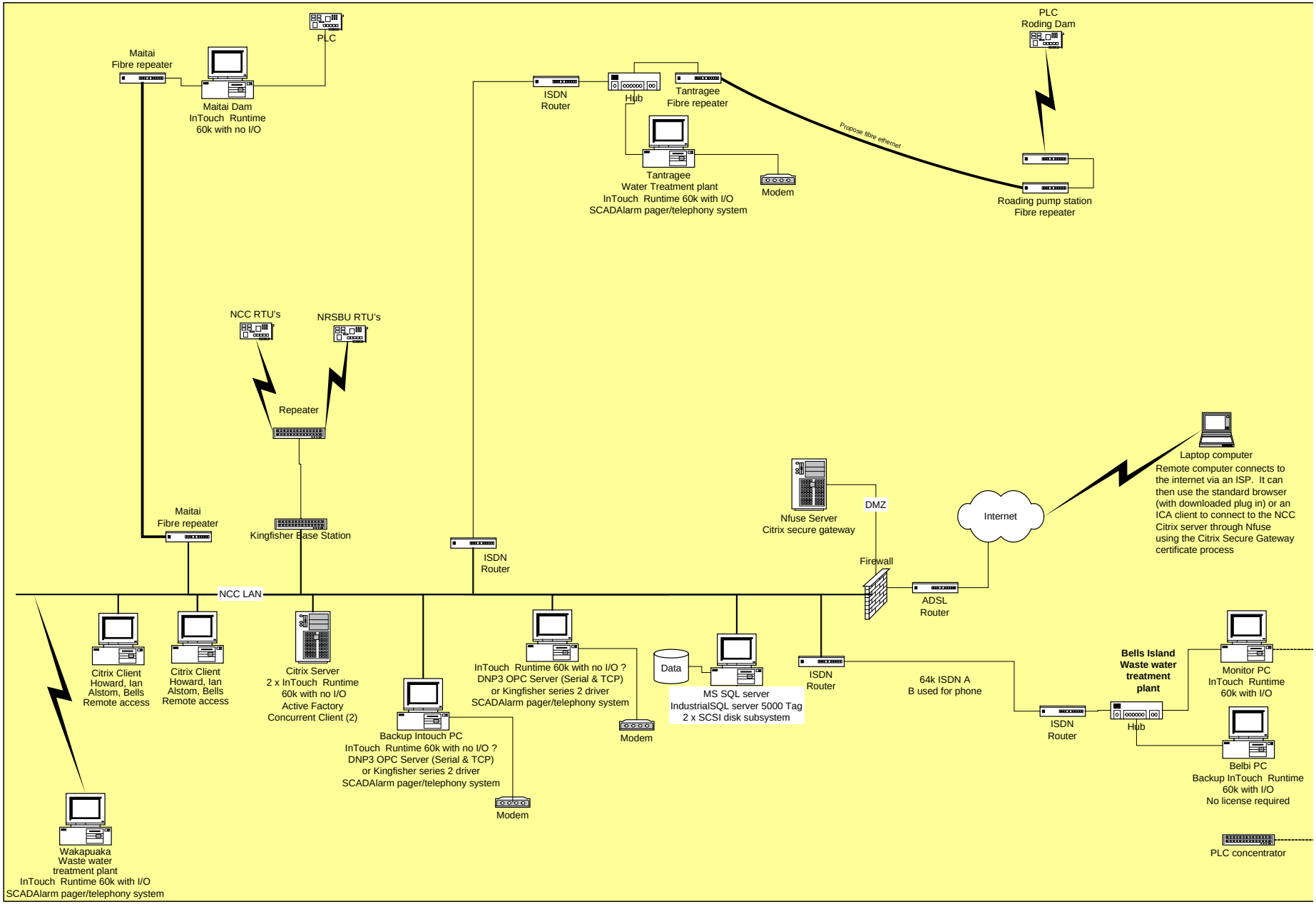
Appendix Table 9: Stormwater Levels of Service: 2003 Asset Management Plan

Area	Key Criteria	Current Level of Service	Target Level of Service	Performance Measure	Monitoring	Action
Summary of Environmental Level of Service						
Rivers and Streams	Quality / Contamination	Compliance with Nelson Resource Management Plan	To improve river and stream water quality standards to those identified in Appendix A	Set target classifications for river and stream water quality by June 2005	3 yearly rivers and streams sediment study	Commission report on causes and methods of improving river and stream quality Set up long term river and stream enhancement programme
	Fish Passage	None	To restore and enhance rivers and streams identified in Appendix B (attached) to ensure accessibility for fish habitat	Establish fish passage improvements programme of works by June 2005	Annual river and stream inspections	Identify where fish passage improvements required Implement improvements to programme in Appendix B
Reticulation System	Quality / Contamination	Compliance with current discharge consents	To ensure Nelson City Council discharges achieve a Class C water quality standard where appropriate	Set programme to improve reticulation discharge quality by June 2005	Yearly river and stream sediment study Any other monitoring proposed by discharge quality improvements report	Commission report on causes and methods of improving reticulation discharges quality Review current investigations results
Summary of Reliability and Capacity Level of Service						
Rivers and Streams	Q_{50} Upgrades - excluding Maitai River	All rivers and streams to be upgraded to Q_{50} standard by 2012 Less than 10 properties flooded per year, over area > 100m2	Upgrade rivers and streams identified in Appendix C (excluding Maitai) to Nelson City Council Engineering Standards by 2014	Upgrade rivers and streams as programme in Appendix C	Monitor progress against Appendix C upgrades	Implement Appendix C upgrade programme
	Q_{50} Maitai River upgrade	Less than 10 properties flooded per year, over area > 100m2	Provide system of protection to buildings in Maitai River floodplain from Q_{50} flood by 2014	Complete Maitai river floodplain management plan by December 2005 Upgrade river as programme in Appendix C	Monitor progress against Appendix C upgrades	Commission floodplain management plan Implement Appendix C upgrade programme
	River and Stream maintenance	None	Inspect and identify proactive maintenance programme for all rivers and streams regularly		Annual rivers and streams inspection	Prepare annual programme of works

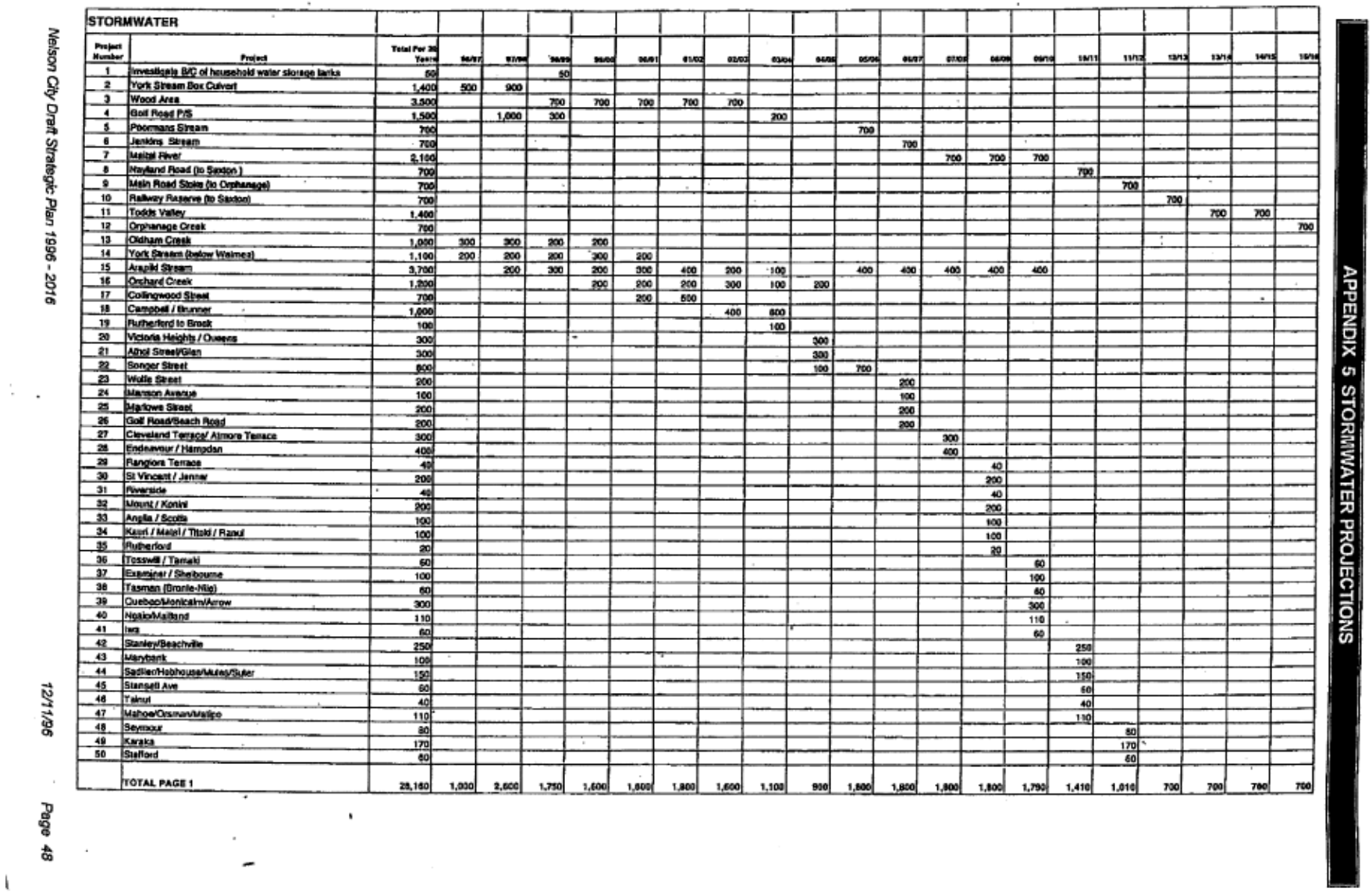
Area	Key Criteria	Current Level of Service	Target Level of Service	Performance Measure	Monitoring	Action
Reticulation System	Q15 Upgrades	Condition 700,800 and 801 areas to be reduced by 20% in 2006	Upgrade reticulation systems identified in Appendix D to Nelson City Council Engineering Standards by 2014	Upgrade reticulation system as programme in Appendix D	Monitor progress against Appendix D upgrades	Implement Appendix D upgrade programme
	Secondary flowpaths	To be kept clear of obstructions - through public education	Identify, map, and enter into property conditions book secondary flowpaths for reticulation systems >525mm diameter by 2014	Identify all secondary flow paths >525mm diameter by June 2005 Report on progress of mapping and recording of secondary flowpaths against programme		Draw up programme of mapping and recording secondary flowpaths
	Blockages	Less than 25 per 100km of reticulation system	Less than 25 per 100km of reticulation system each year		Record number of blockages	Identify cause of multiple blockage events Review maintenance programme annually

APPENDIX G: SCHEMATICS

Appendix Figure 1: Supervisory Control and Data Acquisition Schematic



APPENDIX H: 1996 SW STRATEGIC PLAN PROGRAMME



STORMWATER

Project Number	Project	Total For 30 Years	96/97	97/98	98/99	99/00	00/01	01/02	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16
1	Investigate B/C of household water storage tanks	50			50																	
2	York Stream Box Culvert	1,400	500	900																		
3	Wood Area	3,500			700	700	700	700	700													
4	Golf Road P/S	1,500		1,000	300					200												
5	Poormans Stream	700										700										
6	Jenkins Stream	700											700									
7	Maitai River	2,100												700	700	700						
8	Hayland Road (to Saxton)	700															700					
9	Main Road Stoke (to Orphanage)	700																700				
10	Railway Reserve (to Saxton)	700																	700			
11	Todds Valley	1,400																		700	700	
12	Orphanage Creek	700																				700
13	Oldham Creek	1,000	300	300	200	200																
14	York Stream (below Waimea)	1,100	200	200	200	300	200															
15	Arapiki Stream	3,700		200	300	200	300	400	200	100		400	400	400	400	400						
16	Orchard Creek	1,200				200	200	200	300	100	200											
17	Collingwood Street	700					200	500														
18	Campbell / Brunner	1,000							400	600												
19	Rutherford to Brook	100								100												
20	Victoria Heights / Queens	300									300											
21	Athol Street/Glen	300									300											
22	Songer Street	800									100	700										
23	Wolfe Street	200											200									
24	Manson Avenue	100											100									
25	Marlowe Street	200											200									
26	Golf Road/Beach Road	200											200									
27	Cleveland Terrace/ Atmore Terrace	300												300								
28	Endeavour / Hampden	400												400								
29	Rangiora Terrace	40													40							
30	St Vincent / Jenner	200													200							
31	Riverside	40													40							
32	Mount / Konini	200													200							
33	Anglia / Scotia	100													100							
34	Kauri / Matai / Titoki / Rauli	100													100							
35	Rutherford	20													20							
36	Tosswill / Tamaki	60														60						
37	Examiner / Sherbourne	100														100						
38	Tasman (Bronte-Nile)	60														60						
39	Quebec/Monica/m/Arrow	300														300						
40	Ngaio/Maitland	110														110						
41	Iwa	60														60						
42	Stanley/Beachville	250															250					
43	Marybank	100															100					
44	Sadlier/Hobhouse/Muter/Suter	150															150					
45	Stansell Ave	60															60					
46	Tainui	40															40					
47	Mahoe/Orsman/Matipo	110															110					
48	Seymour	80																80				
49	Karaka	170																170				
50	Stafford	60																60				
	TOTAL PAGE 1	28,160	1,000	2,600	1,750	1,600	1,800	1,800	1,600	1,100	900	1,800	1,800	1,800	1,800	1,790	1,410	1,010	700	700	700	700

APPENDIX 5 STORMWATER PROJECTIONS

Nelson City Draft Strategic Plan 1996 - 2016

12/11/96

Page 48

STORMWATER

Project Number	Project	Total For 20 Years	96/97	97/98	98/99	99/00	00/01	01/02	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16
51	Bledisloe/Lovisson/Newell	140																140				
52	Arlescale/Thompson	140																110				
53	Eckington/Alfred/Hampden	90																90				
54	Freyberg/Jellicoe/Maple	60																60				
55	Nile (Trafalgar Sq - Collingwood)	30																	30			
56	Bridge (Tasman-Collingwood)	30																	30			
57	Tasman (Hardy - Bridge)	40																	40			
58	Hardy (Tasman-Alton)	30																	30			
59	Neale/Kea/Kaka	140																	140			
60	Viewmount/Fidgeway	100																	100			
61	Dodson Valley	30																	30			
62	Tolara/Hutcheson	50																	50			
63	Cawthron	60																	60			
64	Kowhai	50																	50			
65	Morrison/Hope/Alma	60																	60			
66	Flieshire	50																	50			
67	Russell	30																	30			
68	North Esk/Beccles	60																		60		
69	Vanguard (Hardy, Rutherford)	50																		50		
70	Isel Plan	100																		100		
71	Tui Glen	90																		90		
72	Brooklands	40																		40		
73	Washkey	50																		50		
74	Kipling	30																		30		
75	Manuka	30																		30		
76	Shakespeare	40																		40		
77	Parere	30																		30		
78	Paru Paru	50																		50		
79	Beaker/Allsclair	80																		80		
80	Cherry	50																		50		
81	Rotoiti	20																			20	
82	Martin	20																			20	
83	Seaview	20																			20	
84	Black	50																			50	
85	Palake	50																			50	
	TOTAL PAGE 2	1,960	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	400	700	700	160	0
	TOTAL STORMWATER	30,120	1,000	2,500	1,750	1,500	1,500	1,500	1,500	1,100	900	1,500	1,500	1,500	1,500	1,750	1,410	1,410	1,400	1,400	860	700

APPENDIX 5 STORMWATER PROJECTIONS

APPENDIX I: SUMMARY FINANCIALS FROM LONG TERM PLAN

Stormwater

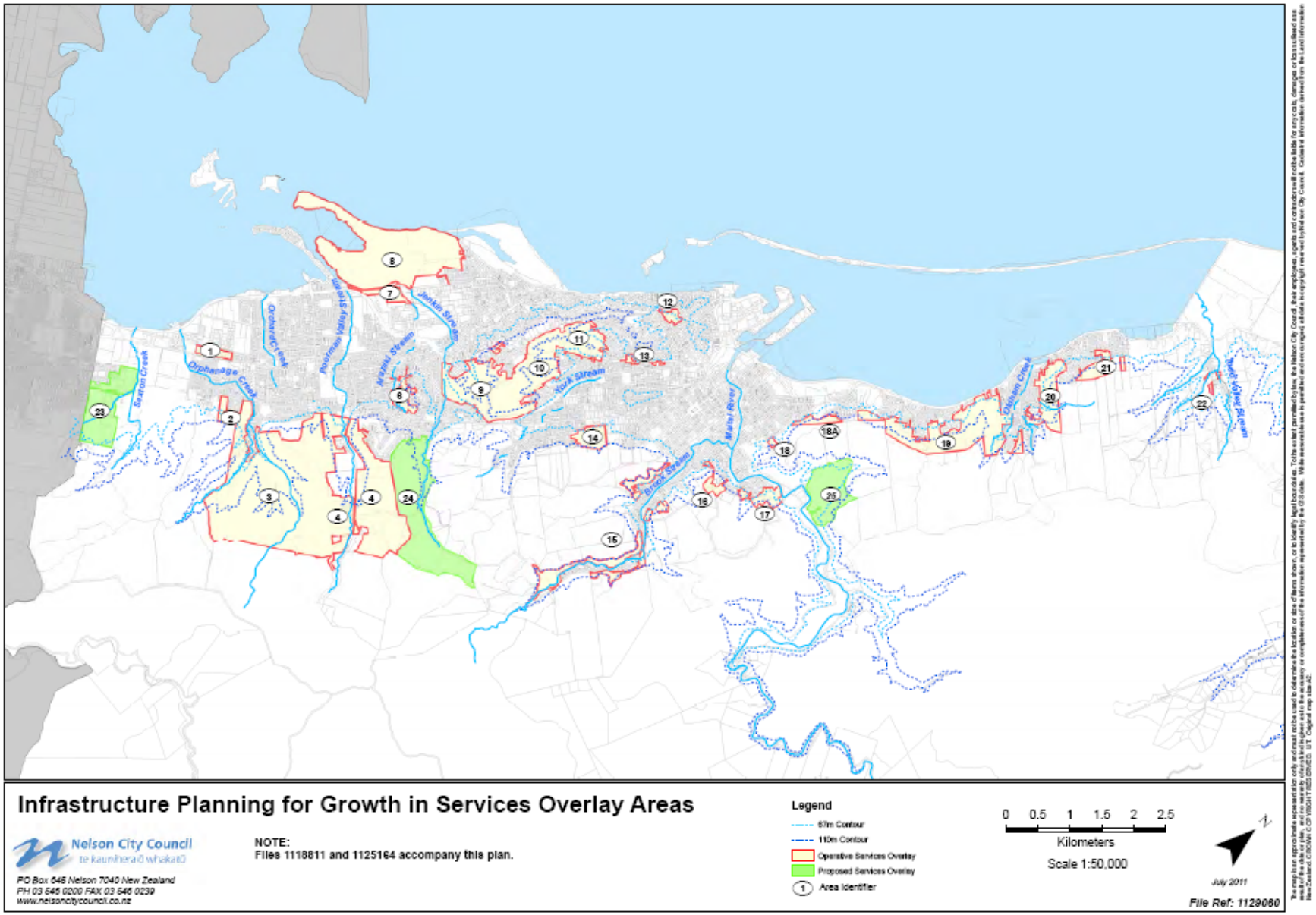
Project	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22
Airesdale/Thompson Terrace								214		
Airlie Street				278						
Alfred Street							25		474	
Anglia/Scotia Streets						179				
Arapiki Road			50		234					
Beach Road								194		
Black Street								97		
Brook Stream fish passage	79							65	68	354
Brooklands Road									81	
Brougham Street	29	312								
Catchment Management Plans	85	26	27							
Catchment/freshwater improvements	50								135	354
Cawthron Crescent								39	203	
Cherry								97		
Dodson Valley									61	
Examiner Street								65		354
Fifeshire Crescent									68	71
Halifax Street (Tasman-Milton)	45		215							
Hampden St/Wigzel Park						36		389		
Hardy Street (Tasman-Alton)									61	
Isel Place									68	
Jellicoe/Bledisloe/Kaka/Kea/ Freyberg/Maple					575					
Karaka Street										71
Kauri/Matai/Titoki/Rainui area										71
Kipling									61	
Kowhai								39	135	
Main Rd Stoke (Hays Corner)		23		392						
Main Rd Stoke (Louisson - Marsden)		23		725						
Manson Avenue										71
Manuka								58		
Marlowe Street	147									
Martin Street										43
Marybank area					115	60	621			
Milton Street (Grove-Cambria)		24		224						
Montcalm/Arrow/Washington Valley/Hastings	75		266	278						
Morrison/Hope/Alma								117		
Mount Street/Konini Street	45					537				
Neale/Kea/Kaka/Railway Reserve	245									
Newmans Link							123			
Ngaio/Maitland					190					
Nile Street (Trafalgar Sq - Collingwood)									61	
North Esk/Beccles	47	260								
Oldham Creek	22	26	107							
Parere								58		
Paru Paru Road								97		
Pateke									102	
Piping ditches	175	119	122	126	130	134	138	142	147	152
Poynters Crescent				17		179				
Public/private drains	126	119	213	219	226	233	239	247	255	264
Pump stations: renewals		62		22		119			27	
Queens Road stormwater	236									
Railway Reserve to Saxton					1,208					

Project	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22
Railway Reserve/ Newall/Bledisloe/ Louisson/Main Rd Stoke (West)		519								
Rangiora Terrace	88									
Riverside									81	
Rotoiti								39		
Rutherford								65		354
Sadlier/Hob/Mules/Suter					48		501			
Salt Water Creek/Haven Road culvert	140	83	744							
Seaton/Allisdair						60	25			
Seaview	47	208								
Shelbourne Street			54		288					
St Vincent/Hastings Street Culvert	140	79			3,173					
Stafford Avenue								39	203	
Stanley/Beachville Crescent	52	338								
Stormwater renewals	417	180	134	110	115	144	152	156	148	137
Sussex					58		311			
Tasman Street (Grove-Cambria)	5	208								
Tasman Street (Halifax-Grove)	20									
Tasman Street (Nile-Bronte)	57	286								
Tipahi/Eckington				278						
Totara/Hutcheson								97		
Tui Glen									183	
Upgrading private drains (50% share)	76	52	53	55	57	58	60	62	64	66
Vanguard Street (Victory to Gloucester)	131	338	268							
Viewmount/Ridgeway				28		179				
Staff time	246	2	4							
Total	**2,826**	**3,282**	**2,256**	**2,751**	**6,416**	**1,918**	**2,195**	**2,376**	**2,686**	**2,362**

Flood Protection

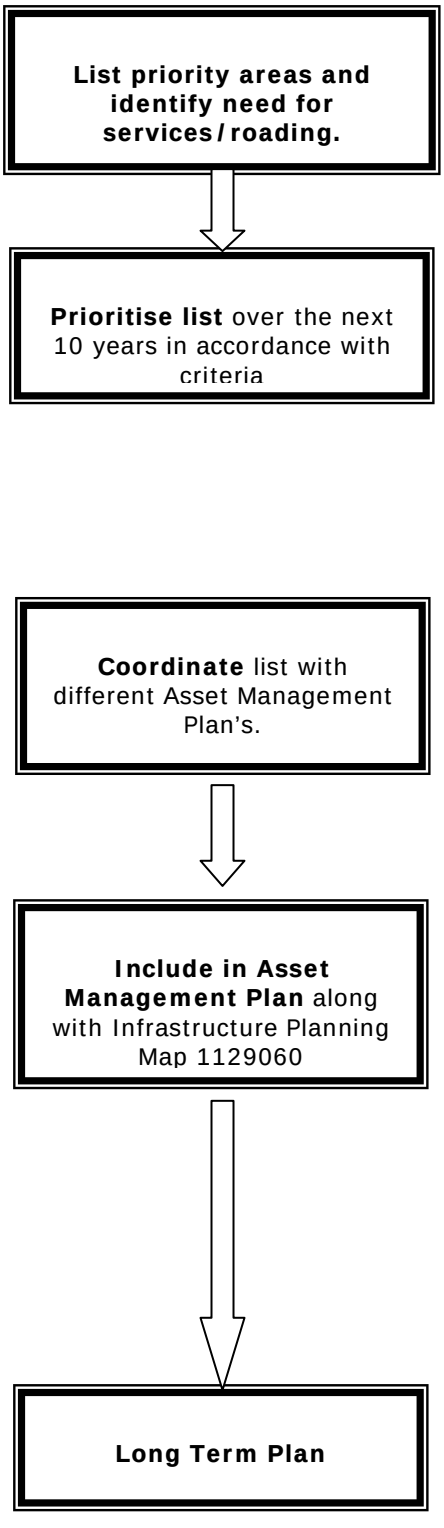
Project	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22
Arapiki Stream			54		288					
Hampden St East – Little Go Stream		83	53	822						
Inventory of rural streams				55	57	58				
Inventory of urban streams				55	57	58				
Jenkins Stream						1,254				
Main Rd Stoke/Poorman Valley Stream culvert			54	56	288					
Maire Stream	80				57	873				
Maitai River	100	104	762	788	817					
Oldham Creek							99	65		1,134
Todds Valley Stream	141	83	903	738						
York Stream channel	79	52	1,234							
Total	**399**	**321**	**3,060**	**2,513**	**1,562**	**2,243**	**99**	**65**	**0**	**1,134**

APPENDIX J: INFRASTRUCTURE PLANNING PROCESS FOR GROWTH PROJECTS



Infrastructure Planning Process for Growth Projects in Asset Management Plan's which inform the Long Term Plan

This document outlines the strategic planning process with respect to the prioritisation of projects going into Councils core Asset Management Plans (roading, wastewater, water and stormwater) to facilitate growth and therefore support their inclusion in the Long Term Plan.



These are areas zoned for development but located within the Services Overlay (including PC 13, 14, 17 & 18). Refer Map 1129060 and Document 1139245

Criteria (Weight for objectivity):

- Cost to service versus estimated Household Unit of Demand (HUD) or HUD equivalent yield (i.e. maximise development potential/$, including any extraordinary ongoing maintenance costs of future assets vested in Council).
- Risk and Hazards for utility development.
- Appropriateness of onsite mitigation for utilities.
- Indication of development timing and other Council projects in the same vicinity that can be brought together at the same time.
- Capital expenditure already identified in previous Annual Plan or Long Term Council Community Plan/Long Term Plan.

Coordinate

- Ensure projects identified and prioritised for inclusion in the Asset Management Plan's are coordinated with each other across Asset Management Plan's (i.e. funding servicing to eliminate constraints to areas in the Services Overlay one by one in an integrated manner – not in a piecemeal fashion).

Include in Asset Management Plans

Include map and standard paragraph in Asset Management Plans as follows:

Council is concentrating on providing services to areas that are zoned for development (Residential, Rural Zone High Density Small Holdings, Suburban Commercial, Industrial) but are covered by the Services Overlay because one or more servicing constraints have been identified as needing to be addressed prior to the development of that property/area. The projects to facilitate future growth identified in this Asset Management Plan therefore only consist of works required to eliminate servicing constraints on sites zoned for development and these have been prioritised in accordance with Council's strategic planning process. A Map of the areas zoned for growth but constrained by lack of services is attached in Appendix ##.

Inform Development Contributions policy and figures.

Alignment with the Sustainability Strategy– i.e. if supports intensification or development adjacent to services/reticulation as a priority.

Assist Council to assess merits or otherwise of proposals coming in as submissions to the Long Term Plan that seek to get projects funded by Council to service areas outside of the those listed in the Asset Management Plan. In the absence of the Strategic City

Prioritisation Analysis of Areas within the Services Overlay for Scheduling of Expenditure on Addressing Servicing Constraints through the Asset Management Plan's and Long Term Plan							
Area No.	Description	Reasons located in Services Overlay[2]	Criteria Rating [3]			Indication of development timing[4]	Prior approval through Annual Plan or Long Term Plan[5]
			Costs to Service versus anticipated Development HUD Yield[6]	Degree of risk / hazards[7]	Appropriateness of onsite mitigation for utilities[8]		
1	Main Road Stoke/ Saxton Road/ Railway Reserve	SW1					
2	Ballard Drive/ Ashdonleigh	W4 W5 T3					
3	Solitaire / Ngawhatu Valley	SW1 WW1 W1 W4 W5 T3					
4	Marsden Valley	SW1 WW1 W3 W5 T1 T3					
5	Enner Glynn	SW1 WW1 W3 W5 T1 T3					
6	Coster Street	SW3 W4					
7	Lower Quarantine	WW3 W2 T2					
8	Airport Land	D					
9	Tasman Heights	SW1 W3 W4 T1					

[2] Evaluated for each area and will change as utility services are installed
[3] Ratings are applied on a scale to be determined
[4] This reflects owners' plans for development and other Council projects in the same vicinity that can be brought together at the same time. This criteria is likely to be subject to change
[5] Approval for capital expenditure through an earlier Annual Plan or Long Term Plan is expected to have the highest priority for expenditure
[6] This is assessed on a case by case basis and reflects the permitted activity requirements of the NRMP
[7] Based on hazards identified in the NRMP planning maps
[8] Relates to the suitability of the area for onsite utility servicing

Prioritisation Analysis of Areas within the Services Overlay for Scheduling of Expenditure on Addressing Servicing Constraints through the Asset Management Plan's and Long Term Plan							
Area No.	Description	Reasons located in Services Overlay[2]	Criteria Rating [3]			Indication of development timing[4]	Prior approval through Annual Plan or Long Term Plan[5]
			Costs to Service versus anticipated Development HUD Yield[6]	Degree of risk / hazards[7]	Appropriateness of onsite mitigation for utilities[8]		
		T3					
10	Emano/Murphy	SW1 WW1 W3 T3					
11	Toi Toi St	W3 T3					
12	Washington Valley	T3					
13	St Vincent Street	Infrastructure constraints addressed, only in Services overlay now for roading connection purposes.					
14	Campbell/ Braemar	SW1					
15	Upper Brook	W3					
16	Atmore/ Cleveland	SW1					
17	Upper Nile St	SW1 W2 W4					
18	Upper Halifax St	SW1					
19	Davies Drive – Dodson Valley	SW1 WW2 WW5 W4 W5 T2 T3					
20	Werneth	SW1 W3 W4 T2 T3					
21	Wastney Terrace	SW1 W3 WW4					
22	Todd Valley	SW1					
23	Plan Change 18 Nelson South	SW1 SW2 SW6 WW1 WW2					

Prioritisation Analysis of Areas within the Services Overlay for Scheduling of Expenditure on Addressing Servicing Constraints through the Asset Management Plan's and Long Term Plan							
Area No.	**Description**	**Reasons located in Services Overlay[2]**	**Criteria Rating [3]**			**Indication of development timing[4]**	**Prior approval through Annual Plan or Long Term Plan[5]**
			Costs to Service versus anticipated Development HUD Yield[6]	**Degree of risk / hazards[7]**	**Appropriateness of onsite mitigation for utilities[8]**		
		WW5					
24	Plan Change 17 Enner Glynn	SW1 WW1 W3 W5 T1 T3					
25	Plan Change 14 Ralphine Way						

Services Overlay Infrastructure Upgrade Codes

Stormwater	
SW1	Adequacy of downstream system – capacity constraint
SW2	Upgrade of Saxton Creek
SW3	Upgrade of Arapiki Stream
SW4	Upgrade of Jenkins Stream
SW5	York Stream Pressure System
SW6	Provision of Services to adjoining land

Wastewater	
WW1	Adequacy of downstream system – capacity constraint
WW2	System not available
WW3	Provision of Pump Station
WW4	Adequacy of Pump Station
WW5	Provision of Services to adjoining land

Water	
W1	Adequacy of downstream system– capacity constraint
W2	System not available
W3	Source of supply dictated by elevation
W4	Above the water contour or landlocked if below
W5	Provision of Services to adjoining land
W6	Supplied by TDC

Transport	
T1	Adequacy of downstream system– capacity constraint
T2	System not available - landlocked
T3	Provision of Roads to adjoining land

Other	
D	Provision of integrated services will be necessary. Distance from existing services will need to be addressed

APPENDIX K: RELATIONSHIP WITH OTHER PLANS

Asset Management plans are a key component of the Council planning process, linking with the following plans and documents:

Long Term Council Community Plan: A plan required by the Local Government Act 2002 to cover a period of at least 10 years. This plan contains key information about the Council's activities, assets, levels of service and cost of providing services. It sets out the Council's funding and financial policies and also a financial forecast for the years covered by the plan. Levels of service and financial programmes as given in this document will be key information for this plan. The Asset Management plan provides the detail required to support the financial forecast.

Annual Plan: Detailed action plan on Council's projects and finances for each financial year. The works identified in the Asset Management plan form the basis on which annual plans are prepared. With the adoption of the Long Term Council Community Plan the Annual Plan mainly updates the budget and sources of funding for the year.

Water and Sanitary Services Assessment: A long-term assessment of the sanitary services provided by a local authority. These services include Wastewater Treatment, Stormwater, Public Toilet Facilities, Disposal from Wastewater Disposal Systems, Cemeteries and Crematoria and Landfills. The main focus of this assessment is to ensure that public health is maintained. Council prepared this assessment in 2005.

Resource Management Plan: The Resource Management Plan complies with the requirements of the Resource Management Act. It has implications for the Asset Management Plan in terms of discharge and land use policies and the control of environmental effects for new developments.

Bylaws, Standards and Policies: These tools for asset creation and subsequent management are needed to support Asset Management tactics and delivery of service.

Ngā Taonga Tuku Iho Ki Whakatū Management Plan: It is a collective initiative involving five of the six local iwi (Ngati Rarua, Ngati Toa, Te Atiawa, Ngati Koata and Ngati Tama) and gives a big picture approach to the management of ngā taonga tuku iho (the treasured resources).

Reticulated Stormwater Quality Improvement Plan: The Reticulated Stormwater Quality Improvement Plan 2006 is a requirement of the Nelson Resource Management Plan (Nelson RM Plan) if discharges from Council's stormwater infrastructure are to be considered as a controlled activity. This plan deals with the quality of stormwater discharged to the reticulated network and ultimately the streams, rivers and marine environments.

Sustainability Policy: Embeds a culture of sustainability into all areas of Council by having an overarching policy to be given effect through Council decisions, strategies, plans and actions and against which future Council actions will be evaluated.

Communities for Climate Protection Programme: The Council recognises the need to reduce greenhouse gas emissions and is prepared to take action on this alongside the other 27 local authorities who have also joined the "Communities for Climate Protection programme". The primary focus is "stabilisation of emissions to 2004 levels by 2012 and reduction to 40% below 2004 levels by 2020".

Biodiversity Strategy: The strategy provides principles for biodiversity management action. These underpin council wide actions and are recognised as inputs into the stormwater activity.

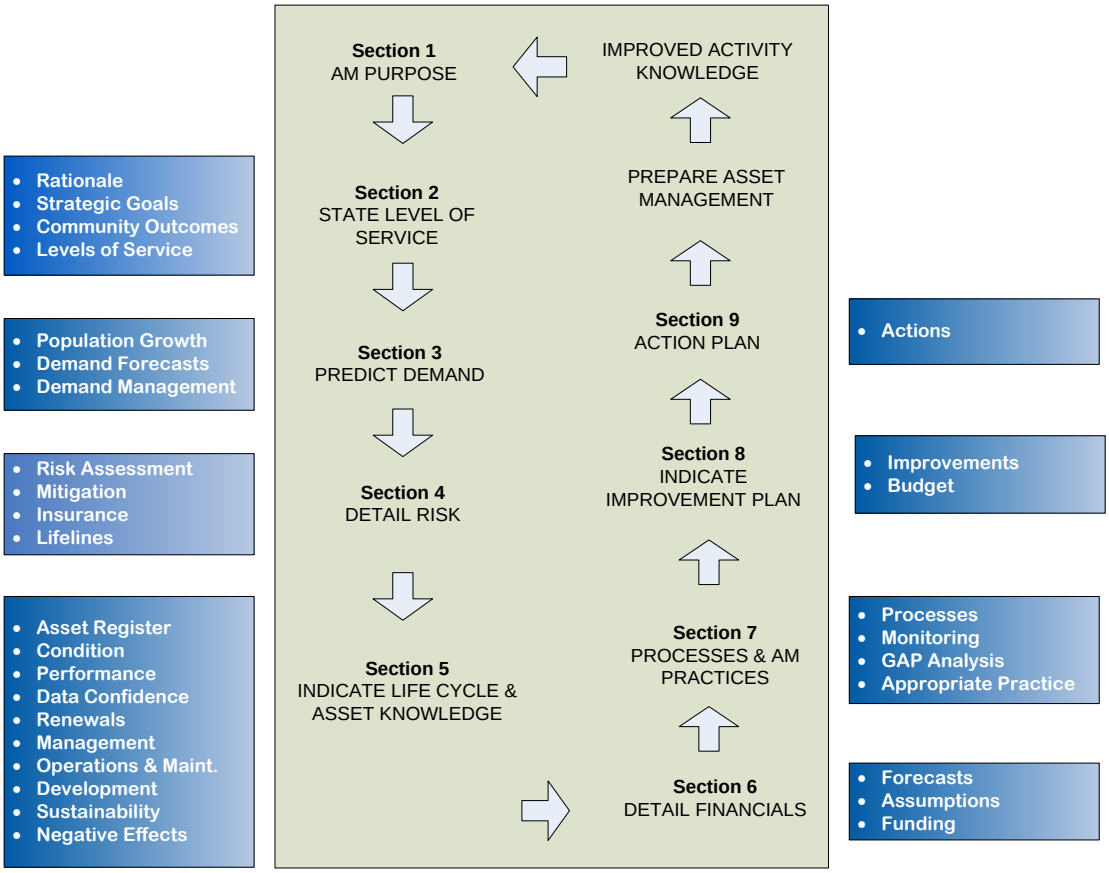
Esplanade and Foreshore Reserves Mgmt Plan: Identifies the issues relating to the management of reserves adjacent to water bodies. An important link to stormwater management.

Future Parks and Reserves Asset Management Plan(s): Recognises the shared interest in developing stormwater management wetlands throughout the city.

APPENDIX L: ASSET MANAGEMENT PLAN

A mixture of the top down and bottom up approaches have been taken to develop this Asset Management Plan, using existing data followed by data improvement. The structure of this plan mirrors the logical process followed for asset management planning as shown in Figure 2 below.

Figure 2 : Asset Management Process



Advanced Asset Management

Nationally Asset Management practices are defined as 'core' or 'advanced'. The purpose of defining the appropriate level of Asset Management is twofold:

- To recognise the requirements of the New Zealand Auditor General
- To identify appropriate practice for the size of the Council as measured against "Best Practice" so that asset management functions do not become to onerous for the resources available and equally financially justifiable for the level of asset management proposed

The associated GAP analysis identifies the current practice Council is performing, the GAP between Appropriate Practice and Current Practice forms the basis on an improvement programme to close the GAP.

Selection of the appropriate level of Asset Management for the stormwater activity included the following factors:

- The costs and benefits to the organisation
- Legislative requirements
- The size and complexity of the assets
- The risk associated with failures
- The skills and resources available to the organisation
- Customer expectations

Core to "Core Plus" Approach

Asset Management plans evolve in a continuous cycle of review and improvement so the quality of outputs matches the changing business and legislative needs. The **International Infrastructural Management Manual 2006** details criteria for assessing conformity to "core" and "advanced" levels of Asset Management in New Zealand.

Features of Core Asset Management are:

- A lifecycle approach is taken;
- Core Asset Management plans are developed based on;
  - best available current information and random condition sampling,
  - simple risk assessment,
  - existing levels of service,
  - contrasting existing management strategies with opportunities for improvement;
- Capital works are prioritised using a simple ranking criteria;
- Long term cash flow predictions for maintenance, rehabilitation and replacement are calculated based on local knowledge of assets and options for meeting current levels of service;
- Financial and critical service performance measures against which trends and Asset Management plan implementation and improvements can be monitored are provided.

Features of Advanced Asset Management are:

- Asset Management strategy is clearly derived from corporate strategic plan;
- Long term, whole life plans and cost/risk/benefit optimisation;
- Objectives and performance measures are aligned and complementary;
- IT systems are integrated, used, and understood;
- Competencies and training is aligned to roles, responsibilities and collaborative requirements;
- Strategies are risk based, with appropriate use of predictive methods, optimised decision making;
- Iterative continuous improvement.

Core to "Core Plus" Gap Analysis

In recent years it has been recognised that a new rating level of "Core Plus" is the most appropriate rating for cities of Nelson's size. This rating reflects that parts of the asset can be managed at a Core level and parts at an Advanced level. The resultant provides an effective asset management tool without becoming un-necessarily expensive.

The next asset management plan review will look at the impact of "Core Plus" on the content and structure of the plan.

APPENDIX M: 30 year Infrastructure Strategy

The requirement for an infrastructure strategy arose from advice provided by Better Local Government programme advisory groups. The strategy is intended to improve local authorities' delivery of core infrastructure and management of physical assets. It should identify strategic issues facing the council and the future implications and is intended to add transparency for residents and ratepayers about these issues and their consequences.

The strategy is included in the LGA 2002 Amendment Bill (No 3) which is expected to be passed in current form in June 2014.

This Asset Management Plan contains the information that would form the basis of the Stormwater and Flood Protection utility section of an integrated strategy, in particular the following are addressed in the sub sections of the plan either directly or as areas that will require future work:

a) What level of infrastructure investment, if any, is necessary to provide for growth in the community. See section 3.2 -Demand Forecast and section 6.5- Capital Programme;

b) Managing the timing of investment for growth, to avoid constraints on growth from limited infrastructure capacity while minimising the costs to the community of underutilised infrastructure capacity. See section 3.2 -Demand Forecast and section 6.5- Capital Programme;

c) What level of investment is needed to maintain, renew and replace existing assets.

See section 6.4-Renewal Strategy;

d) Balancing service level expectations with affordability in the context of demographic changes such as depopulation and aging. See section 2- Levels of Service;

e) What level of investment, if any, is needed to improve the level of service provided by those assets. See section 2- Levels of Service;

f) Planning for maintenance, growth and possible increases or decreases in levels of service provided. See section 2- Levels of Service, section 3- Future Demand, section 6.3 -Operations and Maintenance Plan;

g) Managing or improving public health and environmental outcomes, or mitigating adverse effects on them. See section 2 -Levels of Service;

h) Managing the risks to and resilience of, infrastructure assets from natural disasters. See section 4- Emergency and Risk Management;

i) Managing the financial provision for risks to infrastructure assets from natural disasters. See section 4- Emergency and Risk Management ;

j) Indicative estimates of the projected operating expenditure and capital requirements for each year. See section 6.3- Operations and Maintenance Plan, section 6.4- Renewal Strategy, section 6.5 -Capital Programme;

k) Assumptions about service levels and asset lives on which the projections are based.

See section 2- Levels of Service and section 6.2- Asset Valuation and Depreciation;

l) Assumptions involving significant uncertainty- the nature of that uncertainty and its potential impacts. See section 4- Emergency and Risk Management .

Table M1: Stormwater 30 Year Operations and Maintenance Projections ($,000).

Year		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Long Term Plan		**2015/25 LTP**			**2018/28 LTP**			**2021/31 LTP**			**2024/34 LTP**			**2027/37 LTP**			**2030/40 LTP**			**2033/43 LTP**			**2036/46 LTP**			**2039/49 LTP**			**2042/52 LTP**		
O&M Expense	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34	2034/35	2035/36	2036/37	2037/38	2038/39	2039/40	2040/41	2041/42	2042/43	2043/44	2044/45
Administration	1,972	858	865	857	865	857	865	857	865	857	865	865	865	865	865	865	865	865	865	865	865	865	865	865	865	865	865	865	865	865	865
Depreciation	1,883	2,005	2,027	2,044	2,076	2,109	2,160	2,238	2,302	2,349	2,397	2,397	2,397	2,397	2,397	2,397	2,397	2,397	2,397	2,397	2,397	2,397	2,397	2,397	2,397	2,397	2,397	2,397	2,397	2,397	2,397
Electricity	10	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
Mtce: Physical Works - Programmed Reticulation	16	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Mtce: Physical Works - Reactive Reticulation	206	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250
Mtce: St Vincent culvert		2	2																												
Mtce: Monitor Streams Cawthron	21	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Building Act: Dams		120	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Mtce: Wakapuaka Land Drainage	6	6	6	6	6	6	6	6	6	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Freshwater Bylaw Compliance	5																														
Update NIWA rainfall/ Natural Hazards Risk Assessment		70		50																											
Network Capacity for Growth		50	50																												
Port Hills S/W Strategy					150																										
Stoke S/W Strategy							150																								
Tahuna S/W Strategy									150																						

Stream Maintenance Code of Practice		75																												
Prelim Capex Investigations		10	10	10	10	10	10	10	10	10	10																			
Total [(a)] ($,000s)		3,497	3,281	3,288	3,428	3,303	3,512	3,432	3,654	3,543	3,593	3,583	3,583	3,583	3,583	3,583	3,583	3,583	3,583	3,583	3,583	3,583	3,583	3,583	3,583	3,583	3,583	3,583	3,583	3,583

Table M2: 30 Year Renewal Plan ($,000).

Year		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Long Term Plan		**2015/25 LTP**			**2018/28 LTP**			**2021/31 LTP**			**2024/34 LTP**			**2027/37 LTP**			**2030/40 LTP**			**2033/43 LTP**			**2036/46 LTP**			**2039/49 LTP**			**2042/52 LTP**		
Renewals Project Area	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34	2034/35	2035/36	2036/37	2037/38	2038/39	2039/40	2040/41	2041/42	2042/43	2043/44	2044/45
Pipe Renewals		96	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Pump Station Renewals		20	0	40	0	200		0	460	80	130			700					40												
Tide Gate Renewals			25					15						5	25					25											
Total ($,000s)		116	75	90	50	250	50	65	510	130	180	50	50	755	75	50	50	50	90	75	50	50	50	50	50	50	50	50	50	50	50

Table M3: Stormwater Capital Expenditure ($,000).

Year		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Long Term Plan		**2015/25 LTP**			**2018/28 LTP**			**2021/31 LTP**			**2024/34 LTP**			**2027/37 LTP**			**2030/40 LTP**			**2033/43 LTP**			**2036/46 LTP**			**2039/49 LTP**			**2042/52 LTP**		
Capital Projects	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34	2034/35	2035/36	2036/37	2037/38	2038/39	2039/40	2040/41	2041/42	2042/43	2043/44	2044/45
Airlie St			50	50	300																										
Anglia/Scotia									50	150																					
Arapiki Rd					100	50	200	300																							
Ariesdale/Thompson Tce				40	165																										
Beach Road							35	20	150																						
Beatson Road									50	50	300																				
Bisley Avenue		20	70																												
Black						10	10	100																							
Brooklands							35	10		135																					
Brougham Street								30	300																						
Buxton Carpark N-W Cnr		10	60																												
Catchment Management Plans																															
Catchment/Freshwater Improvements							100	250																							

Year		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Long Term Plan		**2015/25 LTP**			**2018/28 LTP**			**2021/31 LTP**			**2024/34 LTP**			**2027/37 LTP**			**2030/40 LTP**			**2033/43 LTP**			**2036/46 LTP**			**2039/49 LTP**			**2042/52 LTP**		
Capital Projects	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34	2034/35	2035/36	2036/37	2037/38	2038/39	2039/40	2040/41	2041/42	2042/43	2043/44	2044/45
Cawthron Crescent						30	20	150																							
Chamberlain Street (16 - 22)																															
Cherry/Baigent/Ridgeway									75	30	500																				
Coleridge Pl Secondary flow path			20	20	50																										
Collingwood Street									80	50	20	550	600																		
Dodson Valley							45	20	100																						
Examiner						50	20	250																							
Fifeshire		100	250																												
Fountain Place																															
Golf/ Parkers					35	15		400																							
Halifax (Maitai-Milton-Halifax St East)		50	25	850																											
Hampden/ Wigzell / Alfred / Tipahi / Eckington					250		600		300																						
Hardy (Tasman-Alton)										45	20	500																			
Harford Court Secondary Flow Path									20	20	80																				
Hill Street North					50		500																								
Isel Place							50	20	150																						
Jellicoe/Bledisloe/Kaka/Kea/Freyberg/Maple					50			500																							
Karaka				50	20	250																									
Kauri Street			10	50																											
Matai/Titoki/Ranui				50	20	150																									
Kipling											45	20	200																		
Kowhai						30	10	100																							
Mahoe/Orsman/Matipo					50	100		35	50		400																				
Main Road Stoke (Hays cnr - Louisson)							25		350																						
Main Road Stoke (Louisson - Marsden)							25		650																						
Manson Ave						50		250																							
Manuka											45	20	500																		
Marlowe Street																															
Marsden Valley Cemetery diversion						20	10	175																							
Martin								50	20	250																					

Year		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Long Term Plan		**2015/25 LTP**			**2018/28 LTP**			**2021/31 LTP**			**2024/34 LTP**			**2027/37 LTP**			**2030/40 LTP**			**2033/43 LTP**			**2036/46 LTP**			**2039/49 LTP**			**2042/52 LTP**		
Capital Projects	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34	2034/35	2035/36	2036/37	2037/38	2038/39	2039/40	2040/41	2041/42	2042/43	2043/44	2044/45
Marybank / Tresillian Ave						100	50	500																							
Milton (Cambria - Grove)					25		200																								
Montcalm St/Arrow St/Washington Valley Rd/Hastings		180	150		1,000	1,000	700																								
Morrison/Hope/Alma/Buxton/Bridge													90	30	800																
Mount/Konini				50			500			500																					
Nayland Road / Galway		50	70																												
Neale/Kea/Kaka/Railway Reserve																															
Newmans Link					10				10	100																					
Ngaio/Maitland						65	20	200																							
Nile Street East / Clouston Terrace		50	500																												
North Esk/Beccles		2																													
Orakei/Tamaki/Rangiora intersection							30																								
Paru Paru											10	10	100																		
Pateke							10	10	100																						
Poynters Crs & Albert Road								15	20	150																					
Public/Private Drains & Open Chanel Upgrade Programme							500	500	500	500	500	500	500	500	500																
Railway Reserve - Saxton Rd West - Dryden Street		80	750			270																									
Railway Reserve/Newall/Bledisloe/Louisson/Main Rd Stoke (West)							500																								
Rangiora Tce					100																										
Renwick / Wellington Street/Waimea Rd				50	50		100	100	100																						
Riverside							30	10	100																						
Rotoiti						30		100																							
Russell Street Reserve					25	25	100																								
Rutherford - Stage 1 - Girls College		80	50	250																											
Rutherford - Stage 2 - Review of box culvert					150			250	100		1,000	1,000																			
Sadlier/Hobhouse/Mules/Suter													50	20	200	200															

Year		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Long Term Plan		**2015/25 LTP**			**2018/28 LTP**			**2021/31 LTP**			**2024/34 LTP**			**2027/37 LTP**			**2030/40 LTP**			**2033/43 LTP**			**2036/46 LTP**			**2039/49 LTP**			**2042/52 LTP**		
Capital Projects	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34	2034/35	2035/36	2036/37	2037/38	2038/39	2039/40	2040/41	2041/42	2042/43	2043/44	2044/45
Salt Water Creek/Haven Rd Culvert		5																													
Seaton/Allisdair								50	200																						
Shelbourne St (Bronte - #42)							50	150																							
St Vincent St/Hastings St culvert		100	150	1,500	1,500																										
Stafford Ave						30	20	150																							
Stanley/Beachville		263																													
Stansell (Pvte/Public)		138																													
Suburban Club		34																													
Tahuna Slope Risk Area		100	100	100	500	500	500																								
Tasman (Bronte-Nile-Manuka)																															
Tasman (Cambria - Grove)																															
Tasman (Halifax-grove)																															
Tidal Gates																				50											
Totara/Hutcheson						10	10	100																							
Trafalgar Square (Betts Carpark & up to 353 T/Sq)						70	100	750																							
Tui Glen							35			135																					
Vanguard Street Stormwater		50	50	300					50	250																					
Viewmount/Ridgeway									25		150																				
Wastney Terrace - South		881																													
York Terrace									30		300																				
Natural Hazards Risk Remediation						100	100	100																							
Network Capacity Confirmation for Growth Areas									100	100	100	1,250						100	100	100	1,250						100	100	100	1,250	
Network Upgrades Nelson North																		500	500	500	500	500	500	500	500	500	500	500	500	500	500
Network Upgrades Nelson Central												800	800	800	800	800	800	800	800	800	800	800	800	800	800	800	800	800	800	800	800
Network Upgrades Nelson South														800	800	800	800	800	800	800	800	800	800	800	800	800	800	800	800	800	800
Year		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
Long Term Plan		**2015/25 LTP**			**2018/28 LTP**			**2021/31 LTP**			**2024/34 LTP**			**2027/37 LTP**			**2030/40 LTP**			**2033/43 LTP**			**2036/46 LTP**			**2039/49 LTP**			**2042/52 LTP**		
Capital Projects	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34	2034/35	2035/36	2036/37	2037/38	2038/39	2039/40	2040/41	2041/42	2042/43	2043/44	2044/45

Piping Ditches		50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Public/Private Drains		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Private Drains / Subdvn (50% share)			50		50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Total ($,000s)		2,346	2,505	3,510	4,650	3,155	5,440	5,845	3,880	2,665	3,670	4,850	3,040	1,850	2,800	2,000	1,800	2,400	2,400	2,450	3,550	2,300	2,300	2,300	2,300	2,300	2,400	2,400	2,400	3,550	2,300

Table M4: Flood Protection Operations and Maintenance.

Year		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
Long Term Plan		**2015/25 LTP**			**2018/28 LTP**			**2021/31 LTP**			**2024/34 LTP**			**2027/37 LTP**			**2030/40 LTP**			**2033/43 LTP**			**2036/46 LTP**			**2039/49 LTP**			**2042/52 LTP**		
O&M Expense	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34	2034/35	2035/36	2036/37	2037/38	2038/39	2039/40	2040/41	2041/42	2042/43	2043/44	2044/45
Administration		264	264	264	264	264	264	264	264	264	264	264	264	264	264	264	264	264	264	264	264	264	264	264	264	264	264	264	264	264	264
Mtce: Open Channel Programmed		2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Mtce: Open Channel Reactive		200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
Depreciation		139	171	245	309	326	327	328	329	367	419	419	419	419	419	419	419	419	419	419	419	419	419	419	419	419	419	419	419	419	419
Total ($,000s)		605	637	711	775	792	793	794	795	833	885	885	885	885	885	885	885	885	885	885	885	885	885	885	885	885	885	885	885	885	885

Table M5: Flood Protection Capital Expenditure ($,000)

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Long Term Plan	**2015/25 LTP**			**2018/28 LTP**			**2021/31 LTP**			**2024/34 LTP**			**2027/37 LTP**			**2030/40 LTP**			**2033/43 LTP**			**2036/46 LTP**			**2039/49 LTP**			**2042/52 LTP**		
Capital Projects	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34	2034/35	2035/36	2036/37	2037/38	2038/39	2039/40	2040/41	2041/42	2042/43	2043/44	2044/45
Inventory of Rural Streams												100	150	50	50	150	50														
Inventory of Urban Streams		600													50	150	50														
Secondary Flow Paths												50	50	50																	
Maitai River		100	100	100	2,000	2,000	1,000	1,000																							
York Catchment Evaluation																															
York Stream (below Waimea)		750	750	500	500																										
York Stream - Lower												100	100	500	500	500															
Fish Passage upper Brook St channel		50	50	250																											
Brook Stream Outlet Low flow		50	50	250																											
The Brook		85					100	100	500	500	500																				
Hampden St East - Little Go Stream - Stage 1																															
Hampden St East - Little Go Stream - Stage 2		4,000	700																												
Flood mitigation		748	150	150	100	100	100	100	100	100	100																				
Saxton Creek Upgrade		2,873	2,000	1,500																											
Saxton Creek Culvert Upgrade		100	80					3,000	3,500																						
Minor Flood Improvement Programme																															
Main Rd Stoke/Poormans Stream/Culvert opp. Fire Station											50	250																			
Whakatu Drive (Storage World)		50	50	500																											
Emano St channel (8may2014)								150	50	50	1,000																				
Murphy Street(27June2014)											150	50	50			1,000														
Global RC		50																													
Programme of Stream Upgrades																															
Urban Sections of **Urban** Streams																															
Orphanage Stream upgrade																															

Orphanage Stream Upgrade - Stage 1		608	150	750	750	750																								
Orphanage Stream Upgrade - Stage 2											100	100	1000	750	1,000															
Orphanage Stream/ Sunningdale(May 2014)			50	50	200																									
Orchard Stream												100	100	500	500	500														
Review of Jenkins & Arapiki (airport)					200	50	500																							
Jenkins Stream												100	100			100	100	500	500	500										
Arapiki Stream								50			250																			
Maire Stream stg 1		50	50	250																										
Maire Stream stg 2												50	50			750														
Poormans Stream (27 June 2014)												100	100	50	50	1,000	1,000													
Year		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
Long Term Plan		**2015/25 LTP**			**2018/28 LTP**			**2021/31 LTP**			**2024/34 LTP**			**2027/37 LTP**			**2030/40 LTP**			**2033/43 LTP**			**2036/46 LTP**			**2039/49 LTP**			**2042/52 LTP**		
Capital Projects	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34	2034/35	2035/36	2036/37	2037/38	2038/39	2039/40	2040/41	2041/42	2042/43	2043/44	2044/45
Urban Sections of **Rural** Streams																														
Oldham Creek												80	50	20	800															
Todd Valley Stream		20										100	80		850	650														
Lud River																														
Teal River																														
Wakapuaka Flats Drainage (June 2014)												50	100																	
Rural Sections of **Urban** Streams		***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***250***	***250***	***250***	***750***	***750***	***750***	***750***	***750***	***750***	***0***	***0***	***0***	***0***	***0***	***0***
Rural Sections of **Rural** Streams		***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***500***	***500***	***500***	***500***	***500***	***500***
Total ($,000s)		**10,134**	**4,180**	**4,300**	**3,750**	**2,900**	**1,700**	**1,250**	**3,750**	**4,150**	**1,000**	**2,130**	**2,180**	**1,970**	**3,800**	**3,800**	**2,450**	**750**	**750**	**1,250**	**750**	**750**	**750**	**750**	**750**	**500**	**500**	**500**	**500**	**500**	**500**

See A891704