CARTERTON
DISTRICT COUNCIL

Asset Management Plan – Municipal Water Supply

March 2015

Contents

Quality assurance information

Plan Version and Control		
Date	Version No.	Checked by:
20th March 2015	Version1	?
Approved for release by		
Colin Wright		
Prepared by		
Andrew Duncan, EQOnz ltd		

1. Introduction

The purpose of this Asset Management Plan is to outline and summarise the Council's long-term asset management approach for the provision and intergenerational management of the municipal water supply system.

The plan describes the strategies and programmes for the Carterton municipal water supply adopted to meet the required level of service to existing and future users in the most sustainable and cost effective way.

The plan informs the Councils Long term Plan (LTP) and contributes to meeting the identified community outcomes. It is intended that this plan will be a live document, and that through its life it will be modified to include information and policies that improve or enhance the Council's ability to effectively manage assets on behalf of the community.

Table 1 Purpose of Plan

Items	Detail
Services provided – extent and quality both demanded or required now and in the future	Demanded = Level of service driven by community wants and needs Required = Level of Service generally driven by legislation
Linkage between agreed community outcomes and Levels of Service	Translates higher level aspirations into meaningful service level items
Prudent acquisition, operation, maintenance, renewal and disposal of assets	Optimisation of asset use in delivering a service to the community throughout its lifecycle
Risk Management – assessment and mitigation against failure to deliver levels of service, with mitigation measures provided e.g. projects	Funding and associated justification. Clearly presented funding requirements, linked directly to delivering levels of service
Knowledge improvement	Improvement in data collection & application, clear lines of responsibility, and creation of a practical working document.

Plan format

The plan format is summarised in figure 1.

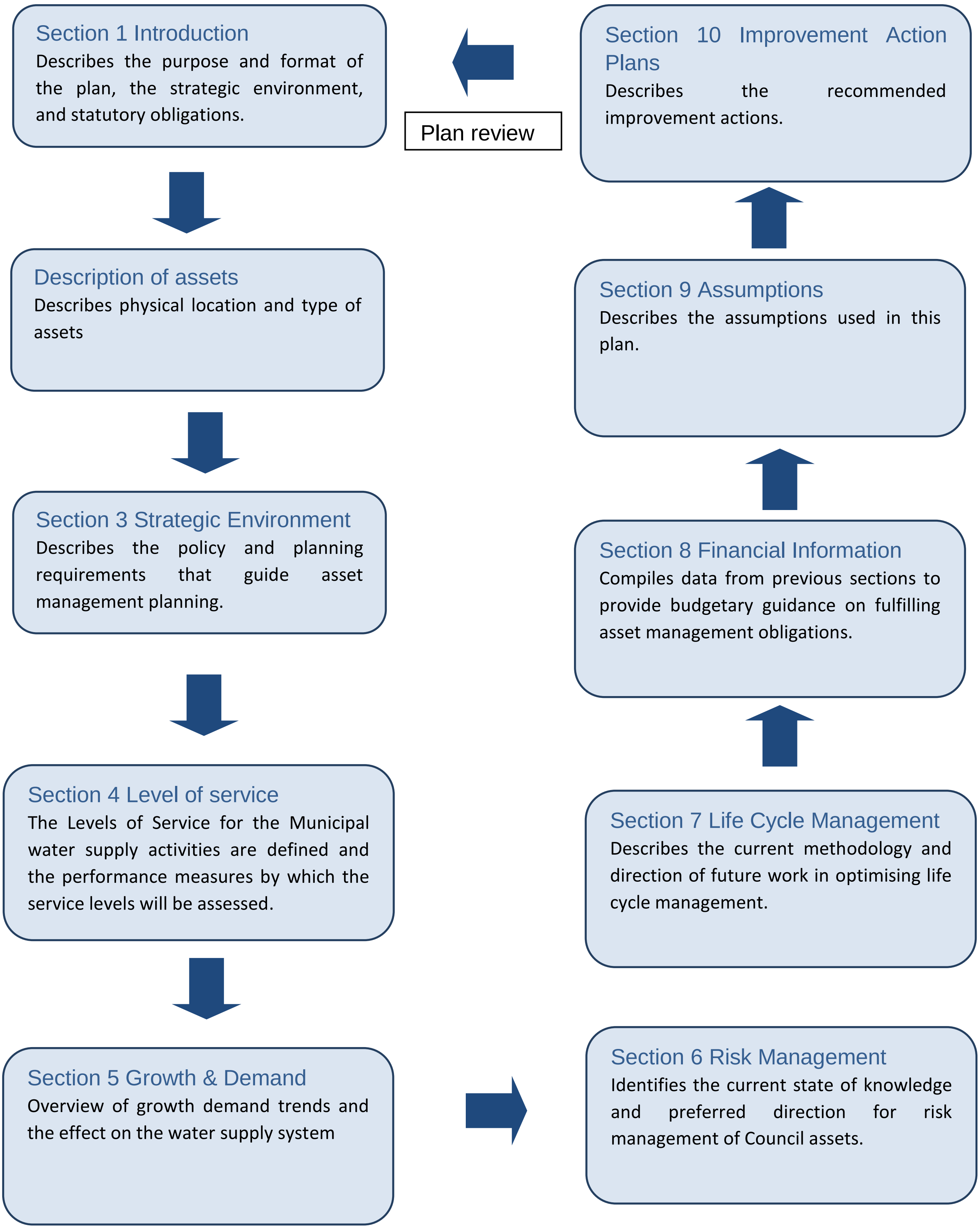


Figure 1 Plan Format

The AMP aims to put in place systems and processes that will improve the transparency and efficiency of the way that Council assets are created, maintained, and funded to meet the level of service desired by the community. This asset plan will be reviewed and revised every three years. It is recognised that enhancement of the Asset Management Plan is required over time.

The 2015 revision is focussed on:

- improving linkages between the implications of the level of service and the physical management of assets
- defining who is responsible for each aspect of the Asset Management Plan implementation
- Setting the framework for improved asset budgeting in the future by refinement of asset data.
- Introducing asset vulnerability and resilience as a fundamental level of service requirement, and strengthening assessment of climate change influences on infrastructure assets.

Whilst work on asset spatial identification (and unique identifiers in the asset register) has started and is largely complete for wastewater assets, this work is only beginning for the water assets at time of writing. Given the predicted renewal requirements for the water supply assets, this work should be treated as priority.

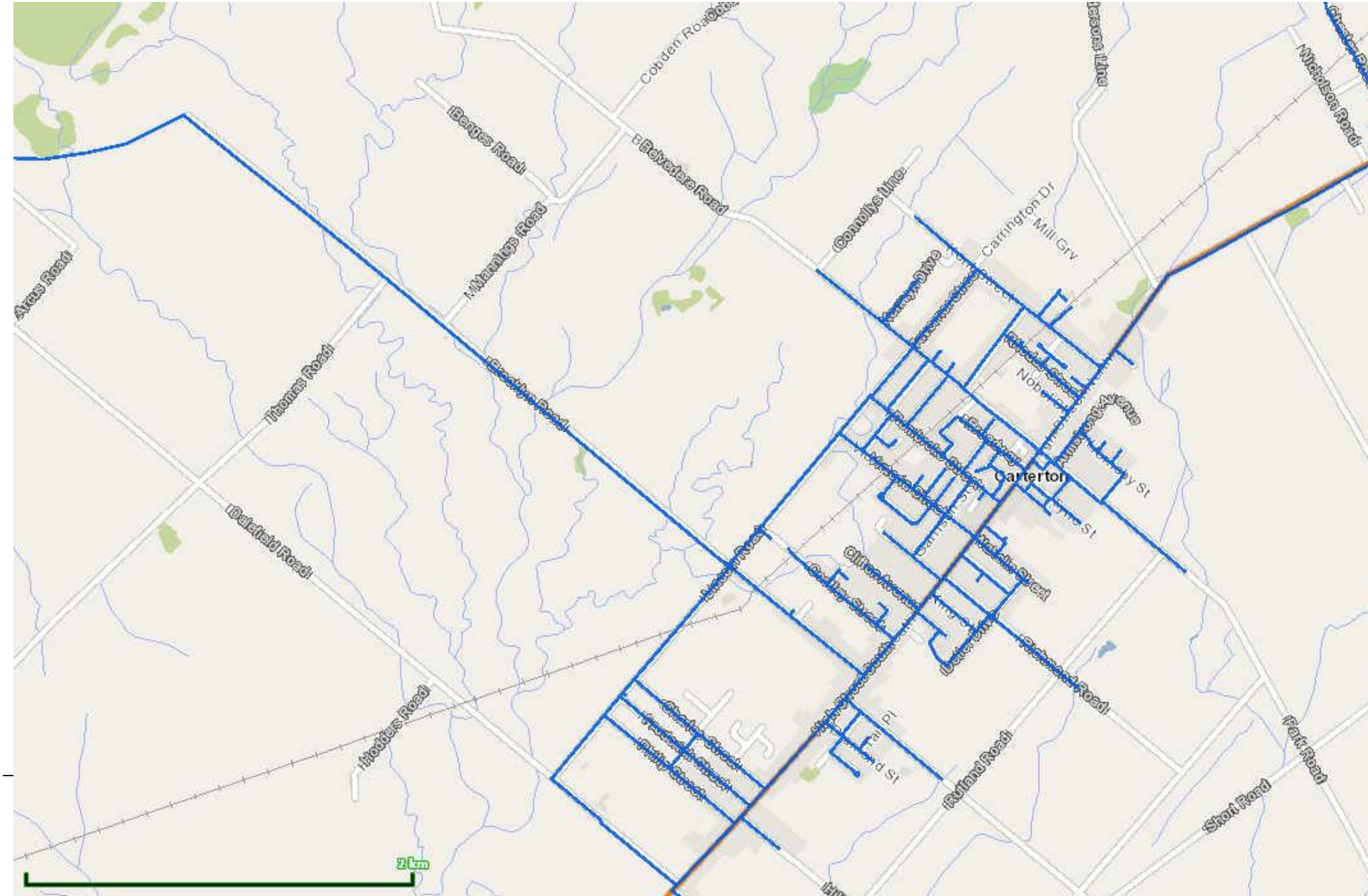
The Activity

The purpose of the water supply activity is to provide a safe and reliable supply to residential, industrial and commercial properties. The activity also includes the development of planning and policy to cater for the differing consumer needs and requirements and advocacy for water conservation.

The Council's water supply services the Carterton urban community and various extra-ordinary consumers within and external to the town urban boundaries. There are approximately 2,300 properties currently connected to the municipal water supply.

2. Description of assets

The town is primarily serviced by a gravity supply sourced from the Kaipaitangata Stream some 10 kilometres to the west of the Carterton. However, the supply can be provided instead from the bore-field supply situated in Lincoln road near Frederick Street according to need i.e. in the event of a shut-down due to turbidity conditions or conservation needs on the Kaipaitangata supply (Fig. 2).



Cobden Road
Benges Road
Belvedere Road
Connollys Line
Carrington Dr
Arcus Road
Thomas Road
Dalefield Road
Hodders Road
Carterton
Richmond Road
Rutland Road
Short Road
Park Road
Nicholson Road
2 km

Figure 2 Water supply network

1. Headworks and main delivery line

a) Kaipaitangata Intake

The Kaipaitangata Stream Intake and falling main to the treatment plant was constructed in the early 1960's and its condition can be described as average based upon the minimal maintenance required during the intervening period

b) Lincoln Road Bore Resource

These production bores and associated infrastructure have been gradually implemented since 1998. Three of the four supply bores can be described as being in good operable condition. The fourth requires redevelopment, but its operation is not currently required with current consumption levels.

c) Delivery Main

The town is supplied by a delivery main from the Kaipaitangata intake; this is 380 mm diameter pipeline of composite materials, concrete lined steel and asbestos –cement pipe. The pipeline is of a similar age to the intake and little condition information is available although the low maintenance history would suggest that that the pipeline is in good average condition for age. A condition assessment for the asbestos cement component should be undertaken within the timeframe of this plan given that the theoretical useful life of the AC component will conclude around 2020 (useful life of 60 - 65 years).

2. Treatment and Pumping

Treatment facilities for the two systems consist of pH correction and chlorination with primary and secondary filtration also being provided at the Kaipaitangata gravity supply.

Both sets of treatment infrastructure are relatively modern (1996 Kaipaitangata) and (2002-2006 Lincoln Road Supplementary) and in good average condition.

Pressure booster pumping infrastructure at Plimsoll St / High St North is new and in good condition.

3. Storage

Some 1500 cubic metres of treated water storage is available at the Kaipaitangata plant via a 1000 cubic metre timber reservoir constructed in 2008/09 and an older reinforced concrete reservoir of 500 cubic metres. Remedial relining work was undertaken on this older reservoir in 2008/09 to address leakage from the joints.

There are two relatively new timber reservoirs of 200 and 300 cubic metres capacity at the Lincoln Road supplementary plant.

4. Reticulation

A copy of the asset register information is available electronically and shows the age of the reticulation ranges from about 70 years old to current and hence aged based condition varies throughout the network. Older pipeline types include asbestos cement, with some older steel reticulation pipeline in Chester Road. Newer pipelines are of uPVC materials and service connections are typically copper, plastic and galvanized iron. Work is expected to start in April 2015 to identify assets by location and unique identifiers on the GIS and asset register.

5. Waingawa

The Waingawa industrial area, in the northern extreme of the Carterton District has a water supply fed by the Masterton District Council system, and has wastewater disposed of by Masterton District Council. There are however Carterton District Council assets that reticulate these services within the Council boundary.

For the water supply, this is limited to a small pipe network and water meters.

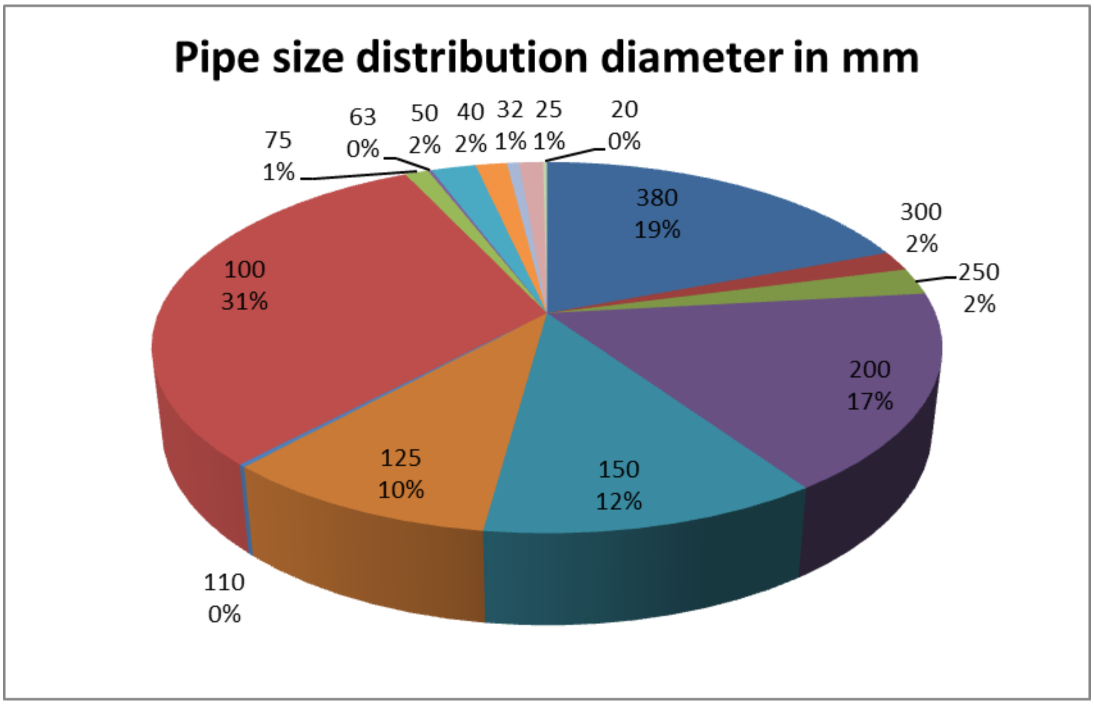


Figure 3 Pipe size distribution in the water supply system

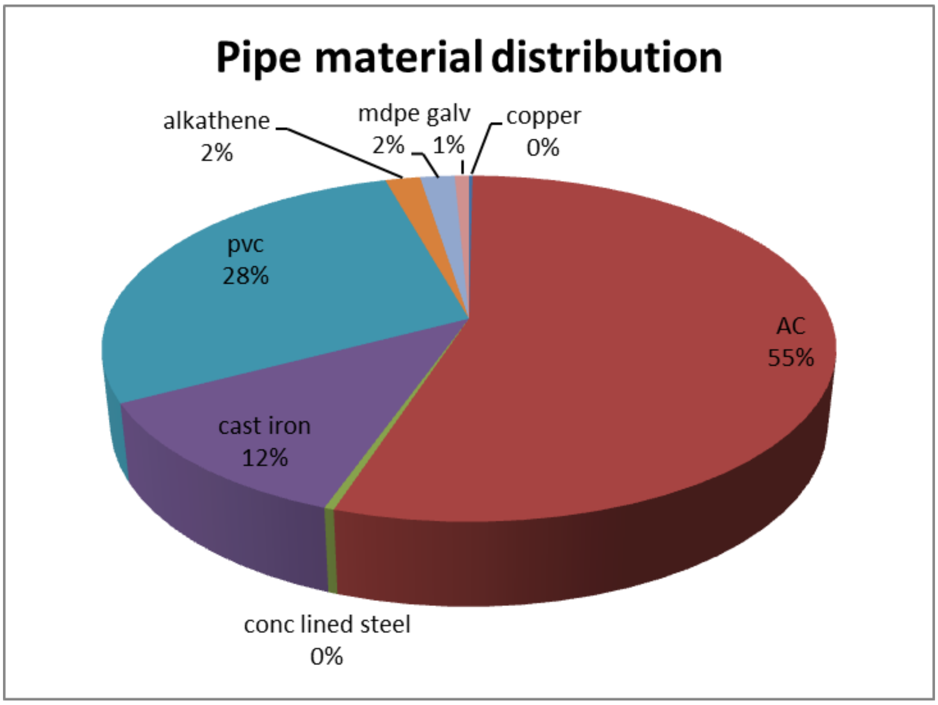


Figure 4 Pipe material proportions for the water supply system

Figure 4 indicates the significant amount of asbestos cement pipework in the system. Of note is that over the next 30 years, all of the AC pipe will need replacing. In addition AC pipe is arguably the weak link in terms of susceptibility to damage from earthquake or ground movement.

Improvement Actions:

a) Use the GIS in coordination with a system for recording physical faults/works/repairs/replacements, the aim being to increase confidence in the data for asset condition and subsequent renewal programs. This will enhance the renewal program confidence levels.
b) Apply unique identifiers to assets on the asset register
c) Specifically identify pipe material by location in terms of risk rating.

3. Strategic Environment

This section sets out the framework from which water assets are managed in terms of:

- Council's Vision
- Statutory requirements
- Asset Management Plan Strategy
- Future Demand Drivers
- Risk Issues

Corporate goals

Carterton District—a welcoming and vibrant community, where people enjoy living.

The community outcomes (in order of priority) are:

- strong and positive leadership
- a vibrant and prosperous economy
- a safe district
- a healthy district
- a district that enjoys creativity and recreation
- a district that encourages lifelong learning
- a district that values and protects its natural environment
- a district that promotes sustainable infrastructure and services

The Council in addition has an expectation for Carterton that infill and other development as regulated by finalised structure plans and the Combined District Plan in spite of standard population increase projections to the contrary, generally will result in growth over the timeframe of the LTP. This plan seeks to cater for that expectation by providing a programme of initiatives aimed at maintaining the required level of service over the required time frame.

Statutory obligations

The Carterton public water supply aims to provide water suitable for drinking for the general wellbeing and health of its community. It also supports community and property safety through the fire fighting capability of the water supply system.

Council's continued involvement in the water supply activity and ownership of assets is required by:

- The Local Government Act 2002 (Section130), which requires Council to continue to provide water services and maintain its capacity to do so.

- Local Government Act 2002. This act 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. To assist exercising this power of general competence, the Act requires that significant consultation takes place with the community including:

- Council must every six years carry out a process to identify community outcomes for its district

- Council is required to consult with the community on a range of specific issues including changes to service delivery and transfer to or from Councils assets

- The Health Act 1956 and subsequent amendments which requires Council to provide adequate sanitary works; the definition of which includes "water works".

- Resource Management Act 1991 requires Council to:

  - Sustain the potential of natural and physical resources to meet the reasonable foreseeable needs of the next generation
  - Comply with the Combined District and Regional Plans
  - To avoid , remedy or mitigate any adverse effect on the environment
  - Comply with resource consents issued by Greater Wellington Regional Council for water abstractions
  - Take into account the principles of the Treaty of Waitangi in exercising functions and powers under the act relating to the use, development and protection of natural and physical resources

- Health and safety in Employment Act 1992
- Construction Contracts Act 2002
- The Local Government Official Information and Meetings Act 1987

4. Levels of service

This section defines the Levels of Service or the qualities of the service that Council intends to deliver and the measures to monitor if this is achieved. The adopted levels of service will support Council strategic goals and are based on user expectations, statutory requirements and tailored to the scale and relative simplicity of Council's asset.

The adopted levels of service also reflect the level of funding that is required to maintain, renew and upgrade the water infrastructure to provide the users with the adopted levels of service.

Levels of Service have been based on:

- User Consultation and Survey
- Strategic and Corporate Goals
- Statutory requirements and Environmental Standards
- Community Outcomes

User Consultation and Survey

The latest community survey summary, released August 2014 by Communitrak. It indicates a very/fairly satisfied level of performance was perceived by the residents for the water supply.

OVERALL SATISFACTION WITH COUNCIL SERVICES/FACILITIES

	Very / fairly satisfied %	Not very satisfied %	Don't know / Unable to say %
Wastewater system*†	97	4	-
Town water supply*†	95	5	-
Roads (excluding State Highway 2)	93	7	-
Parks and reserves	92	2	6
Refuse collection (excl Kerbside Recycling)*†	90	5	6
Kerbside recycling*	89	10	1
Street trees*†	81	19	1
Events Centre (excluding the library)†	77	6	16
Public toilets†	74	1	26
Public library	74	1	25
Stormwater drainage system*	73	22	5
Dog control†	72	11	16
Footpaths	69	23	8
Public swimming baths	63	3	34
Business promotion	61	12	27
Transfer station	50	21	29

* NB: asked of Urban Area residents only
† does not add to 100% due to rounding

Figure 5 Satisfaction survey for water supply

Target Levels of Service

a. Community Outcomes

Council's relevant community outcomes to the activity are tabulated as below and were identified earlier in Appendix 1 "Strategic environment". These outcomes drive the delivery goals and subsequent detailed levels of service and performance measures.

Community Outcomes	Asset Contribution
1. A safe District	**The fire fighting capability of the water supply supports a safe community**
2.A vibrant and prosperous economy	**Reliable water supply is a requirement for the efficient operation of existing and new business infrastructure**
3. A healthy District	**High quality water supply is fundamental to community health**
4. A District which promotes sustainable infrastructure and services	**A sustainably derived community supply managed to protect and enhance where achievable, other Council owned assets and the environment.**
5. A District which values and protects its natural environment	**The adoption of conservation based strategies to encourage appropriate usage of the water resource**

The water activity delivery goals in the following table link to the prescribed community outcomes as shown below. These are measures of the overall activity covering the aspects of service that are of most interest to the community and community survey satisfaction indicators at an appropriate level enabling external survey and internal feed back for reporting purposes.

No	Delivery Goals	Community Outcomes
1.	A cost effective water supply to customers in reticulated areas within the District.	1, 2, 3,
2.	Safe quality and reliable quantity of reticulated water.	1, 2, 3
3.	Community awareness of water conservation practices.	2, 3,4
4.	Sustainable water supply services with a programmed flexibility to cater for change and growth.	2,3,4,5

b. Detailed Target Levels of Service(LOS)

Monitoring of performance standards is an integral part of service management. Regulatory changes to performance standards (2013) has required realignment of Councils monitoring and reporting in order to meet regulatory requirements. The first set of performance data under these new measures will be not be available until post July 2015.

The service broken down into measurable components	Performance measure	Target for year ending June					Measuring system
		2015 Annual Plan	2016	2017	2018	2019 to 2025	
The urban water service is managed at the best possible cost for the required level of service	Expenditure is within approved budget	100%	100%	100%	100%	100%	Regular financial reporting to the Council
~~Water is safe to drink~~	~~Compliance with NZ Drinking Water Standards bacteriological requirements~~	~~100%~~	~~100%~~	~~100%~~	~~100%~~	~~100%~~	~~Environmental Laboratory Services reports~~
Safety of drinking water	Compliance with NZ DW Standards[1] bacteriological requirements	Yes	Yes	Yes	Yes	Yes	National Water Information NZ database
	Compliance with NZ DW Standards protozoal requirements	na	Yes	Yes	Yes	Yes	National Water Information NZ database
Maintenance of the reticulation network	Real water loss from networked reticulation system	na	≤15%	≤15%	≤15%	≤15%	?? [2]
Fault response times	Median time to attend[3] urgent[4] call-outs	na	≤2 hours	≤2 hours	≤2 hours	≤2 hours	Operational records
	Median time to resolve[5] urgent call-outs	na	≤4 hours	≤4 hours	≤4 hours	≤4 hours	Operational records
	Median time to attend non-urgent[6] call-outs	na	≤12 hours	≤12 hours	≤12 hours	≤12 hours	Operational records
	Median time to resolve non-urgent call-outs	na	≤24 hours	≤24 hours	≤24 hours	≤24 hours	Operational records

[1] New Zealand Drinking Water Standards
[2] ?? Describe methodology here ??
[3] from the time that the Council receives notification to the time that service personnel reach the site
[4] an urgent call-out is one that leads to a complete loss of supply of drinking water
[5] from the time that the Council receives notification to the time that service personnel confirm resolution of the fault or interruption
[6] a non-urgent call-out is one where there is still a supply of drinking water

The service broken down into measurable components	Performance measure	Target for year ending June					Measuring system
		2015 Annual Plan	2016	2017	2018	2019 to 2025	
Customer satisfaction	Number of complaints[7] received per 1000 connections	na	≤15	≤15	≤15	≤15	Operational records
Demand management	Average consumption of drinking water per day per resident within the district	na	≤400 litres	≤400 litres	≤400 litres	≤400 litres	Operational records
~~Response to reticulated water system failures and service requests~~	~~Significant repairs and system failures resolved within 4 hours of notification~~	~~na~~	~~100%~~	~~100%~~	~~100%~~	~~100%~~	~~Operations records~~
Urban water system of a satisfactory standard	Urban residents are satisfied with the urban water service	≥90%	≥90%	≥90%	≥90%	≥90%	Survey of residents every three years[8]
Water resources are used sustainably	Reduction in community water consumption	na	≥2.5% per annum	≥2.5% per annum	≥2.5% per annum	≥2.5% per annum	Operational records
	Compliance with water resource consent conditions	100%	100%	100%	100%	100%	Resource consent

[7] complaints received about any of the following: drinking water clarity; drinking water taste; drinking water odour; drinking water pressure or flow; continuity of supply; or the Council's response to any of these issues

[8] *NRB Communitrak™ Survey*—every 3 years. The next survey is planned for 2017.

Ministry of Health gradings in December 2014 in terms of the NZDWS 2005 assessed the Carterton Public Water Supply as E and D for the source and treatment (Kaipaitangata and Frederick St/Lincoln Road respectively). [9]

There is however some ongoing correspondence and site investigation work that may change the water grading. See Appendices.

5. Growth and demand

Historic demand

Water demand records indicate that demand management measures outweighed demand growth 2005 to 2011. Subsequently the demand has increased marginally faster than demand management measures.

The Carterton district, usually resident, population increased from 6,849 in 2001 to 8,235 in 2013, an overall increase of 20%, and an average annual increase of 1.7% per annum. At the current rate of uptake of zoned residential land, it is estimated that within the planning timeframe (2030) there will be a capacity shortfall for future greenfield development. To grow the town, Council will therefore need to develop strategies to overcome this shortfall, either by re-zoning of surrounding land, or by promoting more intensive development within the current town boundaries. Either option will have implications in terms of the water supply assets.

[9] http://www.drinkingwater.esr.cri.nz/supplies/supplycomplyforcy.asp?ccode=CAR001

Population Demand Growth projections

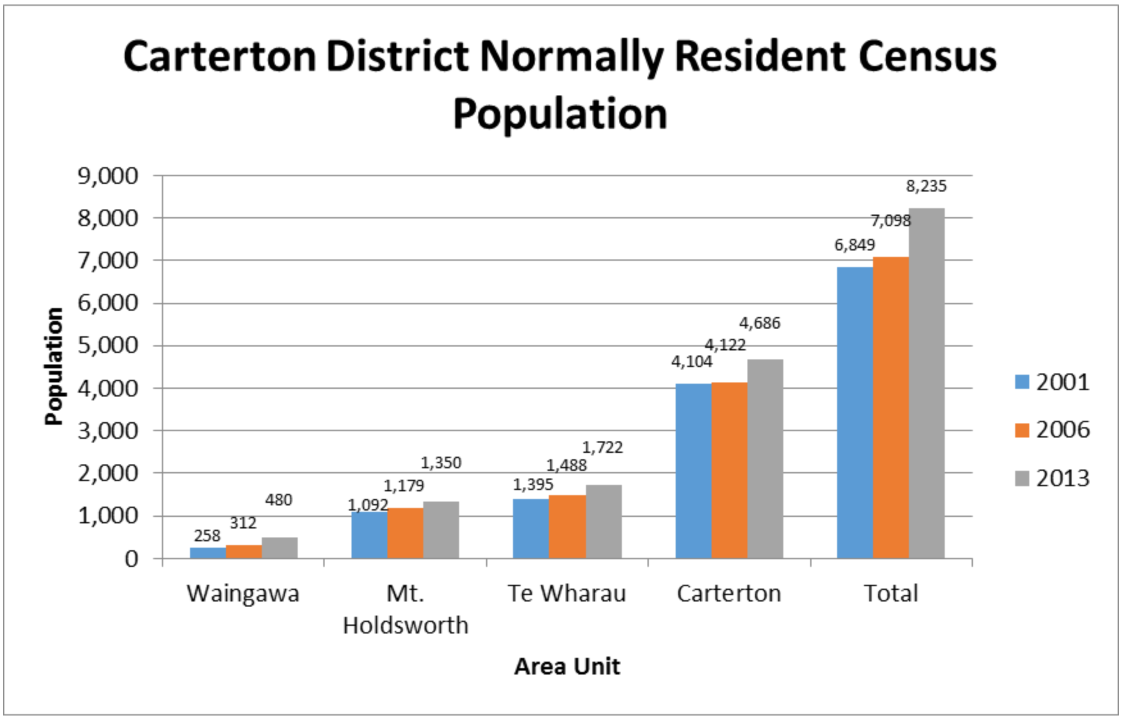


Figure 6 Carterton population statistics

No significant demand changes are planned in terms of type of use or significant commercial/industrial additions.

Demand management actions

Rural connections

In 2008, Council passed a resolution regarding connection of rural properties to the town water supply system as follows:

a) That there shall be no further extensions to the water reticulation network in rural areas surrounding the town unless exceptional circumstances agreed by Council apply.

b) That all new connections in the rural area are required to be fitted with a restricted constant flow rate connection allowing one cubic metre per day.

The first item means that the existing pipelines will not be extended further in rural areas unless Council agrees that exceptional circumstance apply. The second that new connections are permitted where the pipes already exist, but they are to be restricted constant flow rate type rather than ‘on demand’ connections as has been the case up to now.

Council made these decisions as it was concerned about the gradual expansion of the town water supply in to rural areas when there are many undeveloped areas zoned urban within the town that will have to be supplied eventually. The other aspect is to lessen the peak flow rate demand during the day by effectively requiring each new rural connection to have its own storage tank.

Leak detection & repair

Council is actively engaged in a programme of leak detection and repair following the earlier reporting and conclusions arising from the development of a network distribution model in 2007.

Significant levels of Unaccounted for Water (UFW) or leakage were detected during the model construction and calibration (estimated at 18% of daily usage). Leak detection and repair works have been carried out, leading to a significant reduction in water demand.

In addition to leak detection work on the reticulation network, the installation of universal water metering has enabled the detection of scores of leaks on the private property side of the water meters. Many of these leaks were not obvious and property owners have been required to repair these leaks.

Water charging mechanism

In addition to a standard annual charge, Council has introduced universal metering for its supply customers effective 01 July 2008.

The current policy provides for a user pay charge per cubic metre for annual usage in excess of 300 cubic metres per property. The initial 300 cubic metres is covered by the annual water rate charge. This charging policy applies to all users including commercial and industrial entities.

The adoption of universal metering has assisted in the reduction of peak demand and overall water consumption by about 30% and is encouraging high water users to make efforts to conserve water.

Pressure reduction

The northern section of the water supply network in the Clareville rural area is significantly elevated above the town. This has led to low pressure supply problems and a restraint on undertaking pressure reduction work in the town. The town supply pressure exceeds the optimum level for municipal water supplies when supplied direct from the Kaipaitangata source, and excessive pressure results in a greater risk of pipe burst and is also linked to excessive water use.

Discussions were held with residents on the northern rural section with the aim of agreeing on a new level of service and associated costs. Disparate opinions within this group stalled talks and no agreement was reached. In 2011, a new solution was developed and implemented. This involved installation of a booster pump close to the town boundary to retain the existing level of service for the northern branch. This has enabled pressure reduction throughout the town reticulation by the installation of a pressure reducing valve on the Kaipaitangata feed. The booster pump system has the ability to provide an increased level of service to the northern line if this should be required in the future.

Recycled water use

Prior to 2011, the wastewater treatment plant used approximately 100m³/day for washing inlet screens etc. Work was carried out to develop and install a recycled water use system for this activity, using water from the wastewater treatment process. This was installed in December 2011, and is thought to have led to a 5% reduction in overall water demand.

Water demand patterns

The demand from both population and use changes appear to be starting to outweigh demand management options adopted since 2005 (fig. 6).

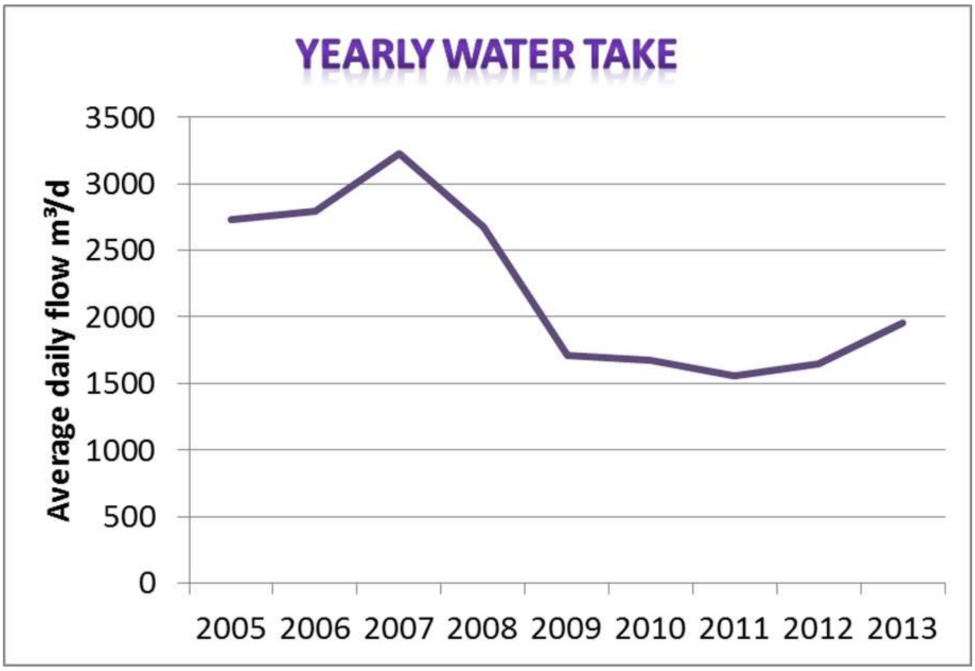


Figure 6 Yearly water take

Combined with the requirements imposed by the water take consent, this data suggests that improvement action is required to reduce consumption habits. A water demand management plan would provide a coordinated and systematic approach to managing the supply constraint against the demand.

Improvement Actions:

a) Instigate a water demand management plan, to be coordinated with a 3-waters approach.
b) Engage with the public at an early date to provide further education on water conservancy, value, and environmental effects of water abstraction.

6. Risk Assessment

Risk Management processes aim to be generally consistent with the intentions of AS/NZS 4360: 2004 "Risk Management" Standard however of a scale appropriate to the asset.

Risk type

Risk is divided into two broad categories:

- level of service or supply risks, and
- statutory, financial, and management risk

Risks to reduction of level of service or supply

It has been identified that risk management in this Asset Management Plan needs improvement. The plan identifies 'grass roots' level risks and risk management approaches that have been adopted to date, but only informally described or detailed. Renewal strategies are addressed in Section 7.

Key risks	Service/asset related impact of changes	Risk mitigation strategies
Asset vulnerability to natural hazards	Flood, fire, high wind, earthquake, lightning, liquefaction and landslide can all negatively impact infrastructural assets. Whilst relatively low probability, asset failure due to natural hazards is potentially catastrophic, with potential loss of supply.	The vulnerability of components of the water supply system has been assessed by the Wairarapa Engineering Lifelines Association (Wairarapa Engineering Lifelines Association, 2003). It assess the significance, vulnerability, and overall risk to assets. This Asset Management Plan instigates the incorporation of asset vulnerability into renewal and upgrade

		planning with the aim to enhance resilience. Methodologies for integration of vulnerability data is immature at this stage, and it is envisaged that this will develop as feedback is received from early planning decisions.
Consent renewal for Kaipaitangata surface water abstraction	Greater Wellington Regional Council has indicated that future consents for abstraction may have reduced allowances in order to maintain base flow levels in the Kaipaitangata Stream and Mangatarere River. This poses a risk to the continuity and quantity of water available for municipal water supply.	Since installation of water meters in 2007/8 Council has embarked on a continuous programme of works aimed at water conservation and efficient use. These are described in section 4. Further measures are required to manage the water take.
Consent renewal for Lincoln Road bore water abstraction	Greater Wellington Regional Council is currently engaged in reviewing groundwater allocation arrangements for the Wairarapa valley. This could potentially lead to restrictions on bore abstraction consents.	As for the surface water take.
Climate variability	Climate change induced variability in rainfall patterns and hence surface water flows, is clearly a potential risk for surface water takes. It is becoming increasingly clear that climate variability is becoming reality sooner than notionally anticipated.	Climate change induced risks need to be more fully understood, and more detailed work in this area is required during the term of this plan. In the meantime, demand management work constitutes a prudent risk management action.
Identification of critical assets	Decision making in terms of asset renewal needs prioritisation to optimise the process. Whilst asset vulnerability is a key part, the relative criticality of assets throughout the network is also important.	An initial estimate of asset criticality is made in this 2015 revision, to be refined over time.

Statutory, financial, and management risk

In the context of statutory, financial, and management risk, Carterton's risk management mitigation criteria are based around goals of:

- The fulfilment of legal and statutory obligations

- The safeguarding of public and employee's Health and Safety requirements
- Asset, 3rd Party Property Damage & Losses Insurances
- Contingency Planning for foreseeable emergency situations

Hence appropriate to the scale of Carterton's activity, probability and impact management of these risks are tabulated as follows;

Risk Type	Typical Events	Risk Probability	Impact	How Managed
Legal and Statutory	Extraction Consent breach Environmental Damage	Moderate Low	Med Med	Regular monitoring and reporting. Complete and implement water demand management strategy.
Health and Safety	Product Quality Non compliance Infectious Disease outbreak	Moderate Low	Low High	Manage utilizing in house Standard Operating and QA procedures. Notification to relevant authorities
3rd Party Property Damage Liability	Inundation, damage from failed pipelines	Low	Med	Routine procedures and insurance cover
Service Delivery Failure	Service Restoration, failure to meet KPI's Asset condition failure Unforeseen natural disaster resulting in loss of infrastructure	 Moderate Moderate Low	 Low/Med Low High	 Manage by routine procedures Active Replacement Programme based on acquired knowledge Regional Civil Defence and in house emergency management plans
Financial	Un-planned loss or cost to reinstate infrastructure	Low	High	Adequate Disaster Insurance in place
Contingency Planning	Supplementary measures/ actions to ensure continuity of supply e.g. due to drought/ supply constraints	Moderate	Medium	Well maintained supplementary supply Infrastructure Demand Management Strategies and methodologies in place and approved by Council

Supply and level of service risk mitigation actions

The risk mitigation actions taken to ensure supply continuity and quantity are detailed in section 5. It should be noted that there has been no substantive work on the effects of climate on the water supply system.

In addition the consent currently under negotiation with Greater Wellington Regional Council places stress on the supply capability during a dry summer. It is critical to develop an overarching strategy that compiles and makes sense of the 3 waters information as they affect Council. It appears that the balance of probability is that over coming years unless a water demand management strategy is developed, the demand will at some point overtake the supply capability (be it physical or consent governed) for one or potentially both of the supply sources.

7. Life cycle management

An asset's useful life cycle is finite in time terms and depending on type can range from ten to one hundred years depending on the nature of the asset.

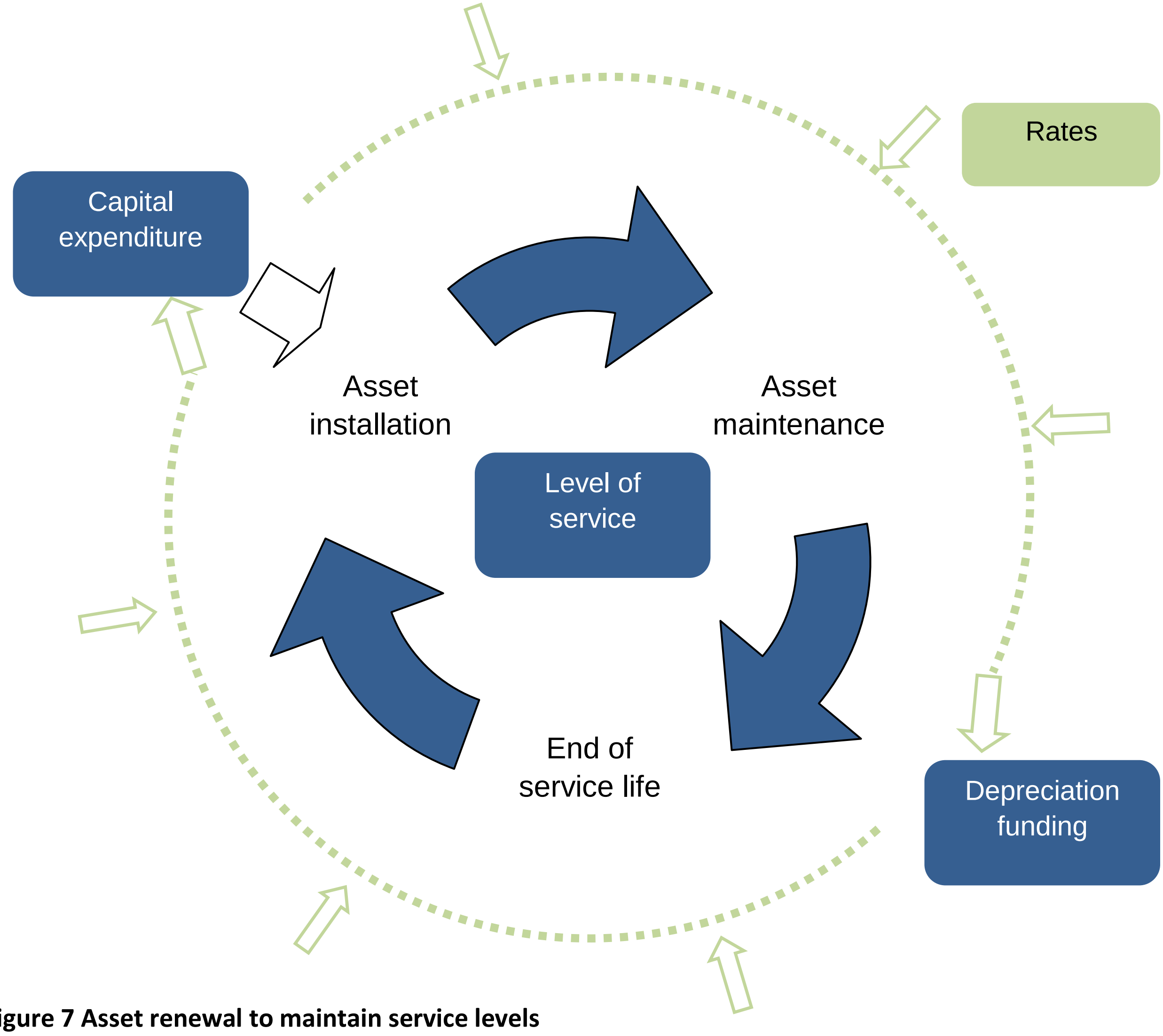


Figure 7 Asset renewal to maintain service levels

Successful life cycle management encompasses the adoption of appropriate:

- Target Levels of Service
- Risk Management systems
- Demand Management Regimes
- Routine operations and maintenance plan
- Asset renewal programmes
- Asset Improvement Programmes
- Levels of Funding

Operations and Maintenance (O&M)

The O&M strategy aims to generally retain the current levels of service by implementing a balanced programme of planned and reactive works for reticulation and headwork's operations. Leak detection and repairs now forms an integral and on going component of the O&M activity which is performed largely by Council staff.

Asset Renewal

It is proposed to, during the currency of this AMP and beyond, to obtain condition information so that a rolling programme of renewal work can be devised and funded.
Whilst assets have a notional life expectancy, the actual life can vary significantly. Council has adopted a condition rating and life expectancy that reflects this uncertainty by assigning an estimated life expectancy range (fig. 6). Thus, the shorter life expectancy scale leads to a most conservative funding strategy, and the greater life expectancy to a least conservative funding strategy. By understanding the variability inherent in asset life, appropriate funding and risk scenarios can be adopted.

There is a need to strengthen the causal links between asset condition, planning, and funding mechanisms. Water supply pipelines are more difficult to rate in terms of condition compared to sewer pipes, which can be photographed with relative ease. There is a balance between the cost of investigative work and variability inherent in assessments that are based on information that is more anecdotal. It is envisaged that it will take some time to optimise this balance. As better data is collected, more refined life expectancies may be achievable, which would in turn increase the accuracy of the renewal predictions.

Theoretical asset renewal dates have been colour coded to give a visual indication of relative end-of–service for each asset.

This information is then distilled into financial budget information in section 7.

WATER SUPPLY

Year of Valuation	2014

Legend
2011 Additions
2012 Additions
2014 Additions

Note raw residual life adjusted to exclude negative asset life by assigning a minimum 5 years residual life. These items require immediate assessment of condition, criticality and/or if they have been maintained or replaced.

Asset	Component	Size	Quantity (Length or Metre)	Base Life	2014 Unit Cost	Construction Date	Age	Raw Residual Life	Residual Life	Optimised Replacement Cost	Depreciated Replacement Cost	Annual Depreciation
Reticulation	Conc Lined Steel	380	200	70	$497	1950	64	6	6	$ 99,304	$ 8,512	$ 1,419
Reticulation	Cast Iron	150	90	70	$130	1940	74	-4	5	$ 11,657	$ 738	$ 148
Reticulation (see note 2)	Cast Iron	125	5000	70	$130	1940	74	-4	5	$ 647,637	$ 40,990	$ 8,198
Reticulation	Cast Iron	75	600	70	$97	1940	74	-4	5	$ 58,287	$ 3,689	$ 738
Reticulation	Cast Iron	40	700	70	$76	1940	74	-4	5	$ 52,890	$ 3,347	$ 669
Reticulation	A/C	380	9800	70	$497	1963	51	19	19	$ 4,865,909	$ 1,320,747	$ 69,513
Reticulation	A/C	300	900	70	$330	1963	51	19	19	$ 296,674	$ 80,526	$ 4,238
Reticulation	A/C	250	1200	70	$410	1963	51	19	19	$ 492,204	$ 133,598	$ 7,031
Reticulation	A/C	200	1000	70	$237	1950	64	6	6	$ 237,467	$ 20,354	$ 3,392
Reticulation	A/C	200	1000	70	$237	1960	54	16	16	$ 237,467	$ 54,278	$ 3,392
Reticulation	A/C	200	500	70	$237	1970	44	26	26	$ 118,733	$ 44,101	$ 1,696
Reticulation	A/C	150	1100	70	$130	1970	44	26	26	$ 142,480	$ 52,921	$ 2,035
Reticulation	A/C	150	900	70	$130	1980	34	36	36	$ 116,575	$ 59,953	$ 1,665
Reticulation	A/C	100	2100	70	$78	1950	64	6	6	$ 164,819	$ 14,127	$ 2,355
Reticulation	A/C	100	5300	70	$78	1960	54	16	16	$ 415,971	$ 95,079	$ 5,942
Reticulation	A/C	100	3700	70	$78	1970	44	26	26	$ 290,395	$ 107,861	$ 4,148
Reticulation	A/C	100	1500	70	$78	1980	34	36	36	$ 117,728	$ 60,546	$ 1,682
Reticulation	A/C	50	500	70	$97	1950	64	6	6	$ 48,573	$ 4,163	$ 694
Reticulation	PVC	200	1300	80	$237	1989	25	55	55	$ 308,707	$ 212,236	$ 3,859
Reticulation	PVC	200	2750	80	$237	2000	14	66	66	$ 653,034	$ 538,753	$ 8,163
Reticulation	PVC	150	350	80	$130	2001	13	67	67	$ 45,335	$ 37,968	$ 567
Reticulation	PVC	150	500	80	$130	1991	23	57	57	$ 64,764	$ 46,144	$ 810
Reticulation	PVC	150	400	80	$130	1992	22	58	58	$ 51,811	$ 37,563	$ 648
Reticulation	PVC	150	400	80	$130	1993	21	59	59	$ 51,811	$ 38,211	$ 648

Figure 8 Asset life expectancy range – excerpt from main renewal spreadsheet

Asset Development

Details of the planned capital expenditure are outlined in Appendix 3.

Renewal Strategy

The renewals approach has been refined to incorporate consideration of criticality and vulnerability in decision making, and utilises asset maintenance history and condition. *In practice, with a relatively small infrastructure such as Carterton's, decision making has historically been straightforward, and has not required detailed assessment.* However if, and when, multiple renewals are necessary and compete against budget constraints, a more formal process is required to prioritise the renewal choices.

Criticality and vulnerability should underpin the renewal decision making process. Criticality or the consequence of failure is a practical assessment of the economic, social, cultural and environmental drivers related to asset components. Vulnerability incorporates the probability of failure due to naturally occurring conditions.

Asset renewal and capital works overlap

Whilst capital works to improve level of service, and renewal of assets are normally separate in terms of funding and investigation, there are some circumstances where both need simultaneous consideration. This occurs when the deterioration of an asset affects its structural capability and hence vulnerability to damage from natural hazards, and where an improvement in the asset capability would improve the resilience of the network system. For example, AC pipeline joints at bridge crossings on the main supply line.

Asset renewal prioritisation is therefore divided into two categories:

- **Lifeline assets**
- **Non-lifeline assets**

To recognise the overall value to the supply service, lifeline assets assessed under the WELA study as being high or extreme risk are assigned automatic priority in terms of renewal so that failure risks can be mitigated by new design/material/construction.

Lifeline assets

The methodology used in the WELA study for lifeline assets is as follows:

- Divide the network into components and network segments
- Assess the importance and redundancy
- Assess their vulnerability to damage or failure due to specific natural hazards, and
- The impact of such damage or failure

A matrix relating vulnerability and impact is then used to determine the risk to service provision, and hence priority of competing renewal options.

A specific improvement action is to identify assets with a high level of risk of failure, and to instigate procedures to more closely identify risks and mitigation procedures.

All water supply asset components have been allocated specific importance rating – rated from 1 (least critical) to 5 (most critical).

Table 2 Importance of component or network segment

Importance rating	Description
1	Not important.
2	Assets of some importance.
3	Important assets.
4	Very important assets.
5	Essential or extremely important assets.

Probability of damage occurring: This section takes into account the design, materials, age, construction, and condition. Hence, an asset nearing the end of its service life that has reduced structural capability would have increased likelihood of failure compared to one that suffers no loss of structural capability.

Table 3 Qualitative vulnerability assessment – the likelihood of damage or failure

Likelihood rating	Description
A	Almost certain (once /year or more)
B	Likely (1:50 years)
C	Possible (1:150 years)
D	Unlikely (1:500 years)
E	Rare (1:3000 years)
N	Almost impossible (probability negligible to nil)

Qualitative assessment of impact of loss of service: this incorporates a number of factors in a sequence of consideration:

- The importance ranking of the component
- The degree of disruption caused by loss of the asset
- The resources and effort required to reinstate the asset
- The time required and priority for restoring the service
- The inter-relationship with other parts of the network
- The social disruption
- The economic disruption

Table 4 Qualitative assessment of impact of loss of service

Level	Measure	Description
5	Catastrophic	Extreme impact of damage or failure
4	Major	High impact of failure
3	Moderate	Medium impact of failure
2	Minor	Low impact of failure
1	Insignificant	Very little impact
N	Negligible or nil	No impact

These are combined in a matrix to evaluate overall service supply risk, and hence priority for renewal:

Table 5 Qualitative risk analysis matrix-level of risk.

	Impact/consequences					
Likelihood	**N**	**1**	**2**	**3**	**4**	**5**
A	N	L	M	H	E	E
B	N	L	M	M	H	E
C	N	L	L	M	M	H

D	N	L	L	L	M	H
E	N	L	L	L	L	M
N	N	N	N	N	N	N

Legend:

E Extreme risk

H High risk

M Moderate risk

L Low risk

N Negligible risk

Importance:	5 Extremely Important 4 Very Important 3 Important 2 Some Importance 1 Not Important	Vulnerability:	A Almost Certain B Likely C Possible D Unlikely E Rare N Almost Impossible	*WAIRARAPA ENGINEERING LIFELINES ASSOCIATION* **Network: Carterton water supply**

QUALITATIVE VULNERABILITY ASSESSMENT CHART (AS/NZS 4360:1999)

COMPONENT/ SEGMENT	Imp. Ranking 1 - 5	Vulnerability: Ground Shaking	Lique-faction	Fault Displace-ment	Land- slide	Ground Settle- men	Flood	Local Wind Effect	Tsu- nami	Volcanic Ash	Wind Storm	Severe Storm	Wild Fire	Comments/Description
Kaipatangata headworks & treatment plant														
Upstream Intake	3	C	C	E	B	C	A	N	N	E	N	N	D	Perforated Steel Pipe
Weir	2	C	D	E	B	C	A	N	N	N	N	N	N	
Dam	4	C	D	E	B	C	A	N	N	N	N	N	N	
Rose Inlet	4	C	D	E	B	C	A	N	N	E	N	N	D	
Impounding Area	4	C	D	E	B	C	A	N	N	E	N	N	D	
A.C. Pipe (intake)	3	C	D	E	C	C	A	N	N	N	N	N	N	AC 350 RR 1950
AC Pipeline Impounding	4	C	D	E	C	C	A	N	N	N	N	N	N	
Filtration Plant	3	C	D	E	B	C	B	D	N	E	D	N	B	
Power Supply	3	C	D	E	B	B	B	B	N	E	B	B	B	Overhead Supply
Concrete Reservoir	3	C	D	E	B	C	B	N	N	E	N	N	D	
Reservoir Sensor	3	C	D	E	B	C	B	B	N	N	B	N	B	
Bypass Line	5	C	D	E	B	C	B	N	N	N	N	N	N	
Main to Brooklyn Rd	5	C	B	D	B	B	B	N	N	N	N	N	N	AC 350 RR 1950
Maori Creek Crsg	5	C	B	D	N	B	B	N	N	N	N	N	N	Steel Spiral 350 Gib
Enaki Stm Crsg	5	C	B	D	N	B	B	N	N	N	N	N	N	Steel Spiral 350 Gib
Mangaterere Crsg	5	C	B	D	N	B	B	N	N	N	N	N	N	Steel Spiral 350 Gib
Beef Creek Crsg	5	C	B	D	N	B	B	N	N	N	N	N	N	Steel Spiral 350 Gib
Supplementary Supply														
Bore 1 27 metres	4	C	C	E	N	C	D	N	N	N	N	E	N	Frederick Street
Bore 2 11 metres	4	C	C	E	N	C	D	N	N	N	N	E	N	Charles Street
Bore Pump 1	4	C	C	E	N	C	D	N	N	N	N	E	N	} 2 Bores 2 Pumps 43l/sec
Bore Pump 2	5	C	C	E	N	C	D	N	N	N	N	E	N	}
Pipe Bore 1 to Res	4	D	D	E	N	C	N	N	N	N	N	N	N	PVC 150 RR
Pipe Bore 2 to Res	4	D	D	E	N	C	N	N	N	N	N	N	N	PVC 150
Timber Reservoir	4	C	C	E	N	C	C	C	N	E	C	N	N	Pump into mains
Pump Building	4	C	D	E	N	C	D	C	N	E	C	C	N	Reinforced Concrete Masonary
Power Supply	4	C	C	E	N	D	C	B	N	E	B	E	B	Overhead Supply
Potable Water Mains														
Brooklyn Road	5	C	D	E	N	C	C	N	N	N	N	N	N	Conclined Steel 380 1964 Gib & Lead Jts
Lincoln Road	3	B	D	E	N	C	C	N	N	N	N	C	N	AC 200 1963 RR Collar
Lincoln Road	3	D	E	E	N	E	C	N	N	N	N	C	N	PVC 200 1989 RR Collar
Taverner Street	3	B	D	E	N	C	D	N	N	N	N	N	N	AC 200 1970 RR Collar
Kent Street	3	B	D	E	N	C	D	N	N	N	N	N	N	AC 200/100 1950 & 1963 RR Collar
Belvedere Road	3	B	D	E	N	C	D	N	N	N	N	N	N	AC 150 1955 RR Collar
Belvedere Road	3	D	E	E	N	E	D	N	N	N	N	N	N	PVC 150 1991 & 1992 RR Collar
Pembroke Street	3	C	D	E	N	D	D	N	N	N	N	N	N	Steel 100 1965 Gib Joints
Pembroke Street	3	B	E	E	N	E	D	N	N	N	N	N	N	PVC 150 1996 RR Collar
Victoria Street	3	B	D	E	N	C	D	N	N	N	N	N	N	AC 100/150 1950 & 1965 RR Collar
Victoria Street	3	C	D	E	N	D	D	N	N	N	N	N	N	Steel 100 1950 Gib Joint
Brooklyn Road	3	B	D	E	N	C	D	N	N	N	N	N	N	AC 305 1963 RR Joint
Charles Street	3	D	E	E	N	E	D	N	N	N	N	N	N	PVC 100/200 1989 & 1993 RR Joint
High Street SH2	3	B	D	E	N	C	D	N	N	N	N	N	N	AC 150/200/250 1950, 1963, RR Collar
High Street SH2	3	C	D	E	N	C	D	N	N	N	N	N	N	Steel 100 1963 Gib & Lead Joints
High Street SH2	3	B	E	E	N	C	D	N	N	N	N	N	N	AC 150 1965 RR Collars
Lateral service connections														
GI 30%	3	B	B	N	N	B	D	N	N	N	N	N	N	
Copper 60%	3	C	C	N	N	C	D	N	N	N	N	N	N	
Pushlok 10%	3	E	E	N	N	E	E	N	N	N	N	N	N	

Figure 9 Excerpt from Wairarapa Engineering Lifelines Association Study report - vulnerability

Impact of Damage:	5 Catastrophic 4 Major 3 Moderate 2 Minor 1 Insignificant N Nil	Level of Risk:	E Extreme H High M Moderate L Low N Negligible

WAIRARAPA ENGINEERING LIFELINES ASSOCIATION

Network: Carterton water supply

QUALITATIVE IMPACT OF DAMAGE & LEVEL OF RISK CHART

(AS/NZS 4360:1999)

COMPONENT/ SEGMENT	Impact of Damage												Level of Risk											
	Ground Shaking	Lique-faction	Fault Displace ment	Land-slide	Ground Settle-ment	Flood	Local Wind Effect	Tsu-nami	Volcanic Ash	Wind Storm	Severe Storm	Wild Fire	Ground Shaking	Lique-faction	Fault Displace ment	Land-slide	Ground Settle-ment	Flood	Local Wind Effect	Tsu-nami	Volcanic Ash	Wind Storm	Severe Storm	Wild Fire
Kaipatangata Headworks and Treatment Plant																								
Upstream Intake	4	1	1	4	3	4	N	N	2	N	N	2	M	L	L	H	M	E	N	N	L	N	N	L
Weir	4	1	1	3	3	4	N	N	N	N	N	N	M	L	L	M	M	E	N	N	N	N	N	N
Dam	4	1	1	3	3	4	N	N	N	N	N	N	M	L	L	M	M	E	N	N	N	N	N	N
Rose Inlet	4	1	1	4	3	4	N	N	2	N	N	2	M	L	L	H	M	E	N	N	L	N	N	L
Impounding Area	4	1	1	4	3	4	N	N	2	N	N	2	M	L	L	H	M	E	N	N	L	N	N	L
Pipeline - Intake	4	1	1	2	2	4	N	N	N	N	N	N	M	L	L	L	L	E	N	N	N	N	N	N
Pipeline - Impound	4	1	1	2	2	4	N	N	1	N	N	1	M	L	L	L	L	E	N	N	N	N	N	N
Filtration Plant	4	1	1	2	2	3	2	N	2	3	3	3	M	L	L	M	L	M	L	N	L	L	N	M
Power Supply	2	2	3	3	2	3	3	N	2	3	3	3	L	M	L	M	M	M	M	N	L	M	M	M
Concrete Reservior	4	1	1	4	2	4	N	N	1	N	N	2	M	L	L	H	L	H	L	N	L	N	N	N
Reservoir Sensor	2	1	1	3	1	3	3	N	N	N	N	3	L	L	L	M	L	M	M	N	N	M	N	M
Bypass Line	2	1	1	2	2	4	N	N	N	N	N	N	L	L	L	M	L	H	N	N	N	N	N	N
Main to Brooklyn Rd	4	4	4	3	3	4	N	N	N	N	N	N	H	H	M	M	M	H	N	N	N	N	N	N
Maori Creek Crossing	4	4	4	N	2	4	N	N	N	N	N	N	M	H	M	N	M	H	N	N	N	N	N	N
Enaki Stream Crossing	4	4	4	N	2	4	N	N	N	N	N	N	M	H	M	N	M	H	N	N	N	N	N	N
Mangaterere Crossing	4	4	4	N	2	4	N	N	N	N	N	N	M	H	M	N	M	H	N	N	N	N	N	N
Beef Creek Crossing	4	4	4	N	2	4	N	N	N	N	N	N	M	H	M	N	M	H	N	N	N	N	N	N
Supplementary Supply																								
Bore 1	4	2	1	N	3	2	N	N	N	N	N	N	M	L	L	N	M	L	N	N	N	N	N	N
Bore 2	4	2	1	N	3	2	N	N	N	N	N	N	M	L	L	N	M	L	N	N	N	N	N	N
Bore Pump 1	4	2	1	N	3	2	N	N	N	N	N	N	M	L	L	N	M	L	N	N	N	N	N	N
Bore Pump 2	4	2	1	N	3	2	N	N	N	N	N	N	M	L	L	N	M	L	N	N	N	N	N	N
Pipe Bore 1 to Res	3	2	1	N	2	N	N	N	N	N	N	N	L	L	L	N	L	N	N	N	N	N	N	N
Pipe Bore 2 to Res	3	2	1	N	2	N	N	N	N	N	N	N	L	L	L	N	L	N	N	N	N	N	N	N
Timber Reservior	4	2	1	N	2	2	1	N	E	E	N	N	M	L	L	N	L	L	L	N	L	L	N	N
Pump Building	3	2	1	N	2	2	2	N	E	E	2	N	M	L	L	N	L	L	L	N	L	L	L	N
Power Supply	2	3	1	N	2	3	3	N	2	3	3	3	L	L	L	N	L	M	M	N	L	M	L	M
Potable Water Mains																								
Brooklyn Road	4	4	4	N	3	4	N	N	N	N	N	N	M	M	M	N	L	M	N	N	N	N	N	N
Lincoln Road	4	4	N	N	3	2	N	N	N	N	N	N	H	M	N	N	M	M	N	N	N	N	N	N
Lincoln Road	2	2	N	N	2	2	N	N	N	N	N	N	L	L	N	N	L	L	N	N	N	N	N	N
Taverner Street	4	4	N	N	3	2	N	N	N	N	N	N	H	M	N	N	M	L	N	N	N	N	N	N
Kent Street	4	4	N	N	3	2	N	N	N	N	N	N	H	M	N	N	M	L	N	N	N	N	N	N
Belvedere Road	4	4	N	N	3	2	N	N	N	N	N	N	H	M	N	N	M	L	N	N	N	N	N	N
Belvedere Road	2	2	N	N	2	2	N	N	N	N	N	N	L	L	N	N	L	L	N	N	N	N	N	N
Pembroke Street	3	3	N	N	2	2	N	N	N	N	N	N	L	L	N	N	L	L	N	N	N	N	N	N
Pembroke Street	2	2	N	N	2	2	N	N	N	N	N	N	L	L	N	N	L	L	N	N	N	N	N	N
Victoria Street	4	3	1	N	3	2	N	N	N	N	N	N	H	L	L	N	M	L	N	N	N	N	N	N
Victoria Street	3	2	1	N	2	2	N	N	N	N	N	N	M	L	L	N	L	L	N	N	N	N	N	N
Brooklyn Road	4	3	1	N	3	2	N	N	N	N	N	N	H	L	L	N	M	L	N	N	N	N	N	N
Charles Street	2	2	1	N	2	2	N	N	N	N	N	N	L	L	L	N	L	L	N	N	N	N	N	N
High Street SH2	4	3	1	N	3	2	N	N	N	N	N	N	H	L	L	N	M	L	N	N	N	N	N	N
High Street SH2	3	2	1	N	2	2	N	N	N	N	N	N	M	L	L	N	L	L	N	N	N	N	N	N
High Street SH2	4	3	1	N	3	2	N	N	N	N	N	N	H	L	L	N	M	L	N	N	N	N	N	N
Lateral service connenctions																								
GI	4	4	1	N	4	3	N	N	N	N	N	N	H	H	L	N	H	L	N	N	N	N	N	N
Copper	3	3	1	N	3	2	N	N	N	N	N	N	M	M	L	N	M	L	N	N	N	N	N	N
Pushlock	2	2	1	N	2	2	N	N	N	N	N	N	L	H	L	N	L	L	N	N	N	N	N	N

Appendix *Page 15*

Figure 10 Damage & risk level from WELA report

Non-lifeline assets

For non-lifeline assets, renewal prioritisation, when required, will follow a similar format by combining the importance rating and condition rating as follows:

Table 6 Non-lifeline asset importance rating

Importance rating	Description
1	Not important. Assets for which no specific criticality assessment has been carried out. Assets servicing minor demand areas, with multiple redundancy or service options.
2	Assets of some importance. Assets servicing moderate demand areas with redundancy or multiple service options.
3	Important assets. Assets servicing moderate demand areas with difficult or costly alternative service options.
4	Very important assets. Assets servicing significant areas with difficult or costly alternative service options.
5	Essential or extremely important assets. Assets servicing significant areas with no redundancy or alternative service options.

Table 7 Non-lifeline asset condition rating in terms of likelihood of failure

Condition rating	Description
A	Failure very unlikely to occur within a year
B	Failure unlikely to occur within a year
C	Failure possible within a year
D	Failure likely to occur within a year
E	Failure has occurred/almost certain to occur within a year

Table 8 Non-lifeline asset priority matrix for renewal

	Importance rating				
Condition rating	**1**	**2**	**3**	**4**	**5**
E	L	M	H	VH	VH
D	L	M	M	H	VH
C	L	L	M	M	H
B	L	L	L	M	H
A	L	L	L	L	M

Legend:

VH Very high priority
H High priority
M Moderate priority
L Low priority

Provisional critical assets

There has been no formal identification of critical assets to date other than the work carried out by WELA. A brief overview of the assets has identified possible critical assets additional to those identified in the WELA report – namely the Brooklyn road main across town, and the Lincoln road between Victoria and Frederick streets. These pipe mains provide redundancy and distribution options in case of the failure of one of the others (fig. 10). The key message is that this work needs further resourcing.

Improvement Actions:

a) Identify any assets installed wince the WELA work was carried out.
b) Review and confirm the WELA work.
c) Develop emergency scenarios in order to develop a more refined critical asset database.
d) Review critical asset condition and report on remedial works to provide greater resilience.

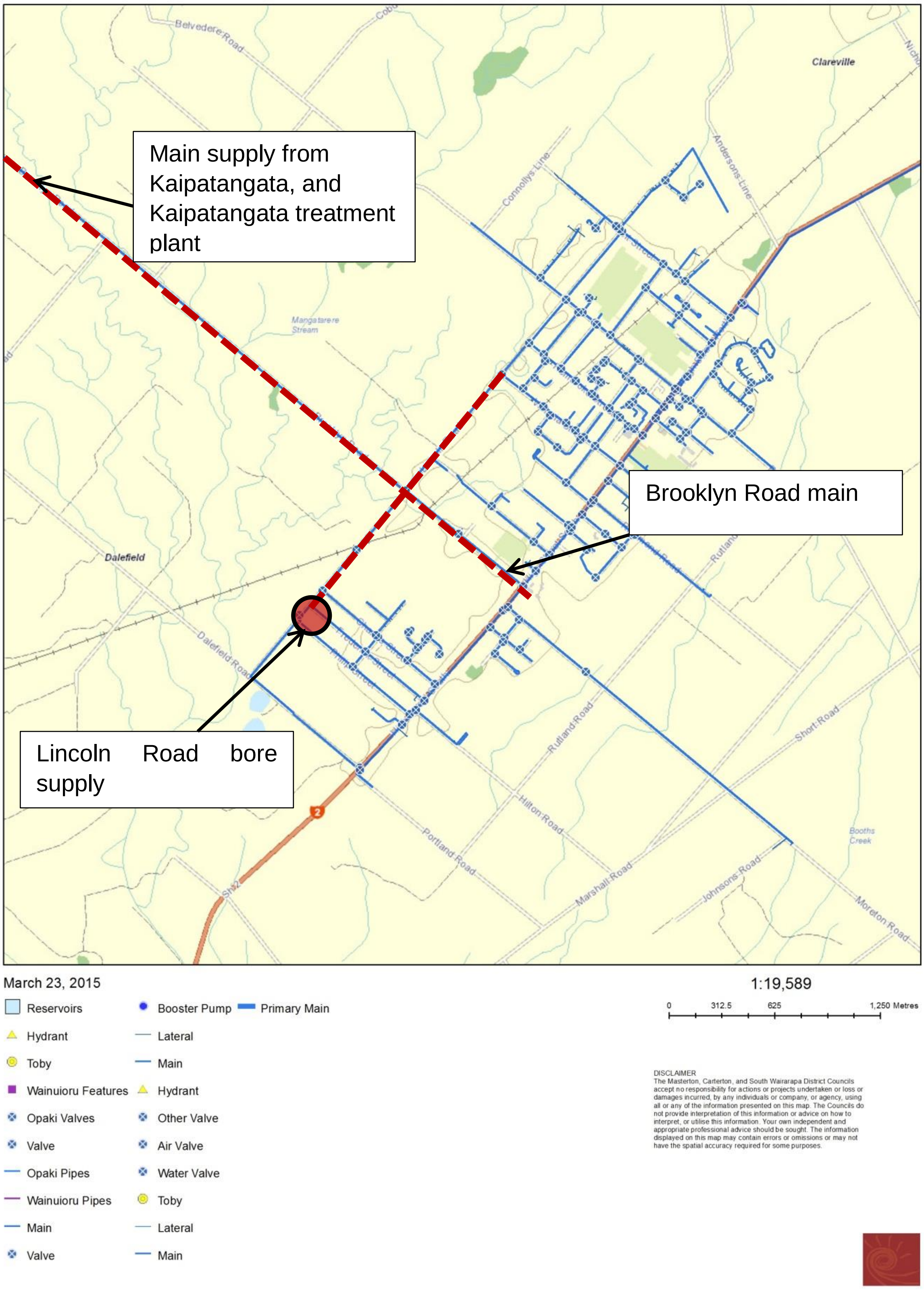


Figure 11 Provisional critical assets in red (requires further investigation)

8. Financial Information

Summary of asset value

Re-valuation of the infrastructural assets relevant to this activity was undertaken in June 2013 by Opus International Consultants Ltd, Strategic Management Services.

Replacement cost is the cost of re-building the existing asset to an equivalent level of service. The assets have been depreciated on a straight line basis over the economic life of the asset.

Table 9 Summary of network value

Urban water supply

Network component	Optimised replacement cost ($)	Optimised depreciated replacement cost ($)	Annual depreciation ($)
Reticulation	11,484,864	4,811,809	158,012
Reticulation fittings	3,487,607	1,046,616	240,574
Supplementary supply	902,963	432,464	31,227
Kaipatangata headworks	544,739	160,721	6,796
Treatment plant	2,617,219	1,598,004	74,278
Total	**$19,037,393**	**$8,049,615**	**$510,886**

Financial Forecast

Information from Section 7 has been used to identify renewal costs based on theoretical asset life (fig. 12).

However, water supply assets may need renewal sooner, or later than the theoretical renewal date, presenting a range of possible renewals dates and therefore a range of yearly budgets.

Greater certainty would be achieved by instigating an asset condition rating programme.

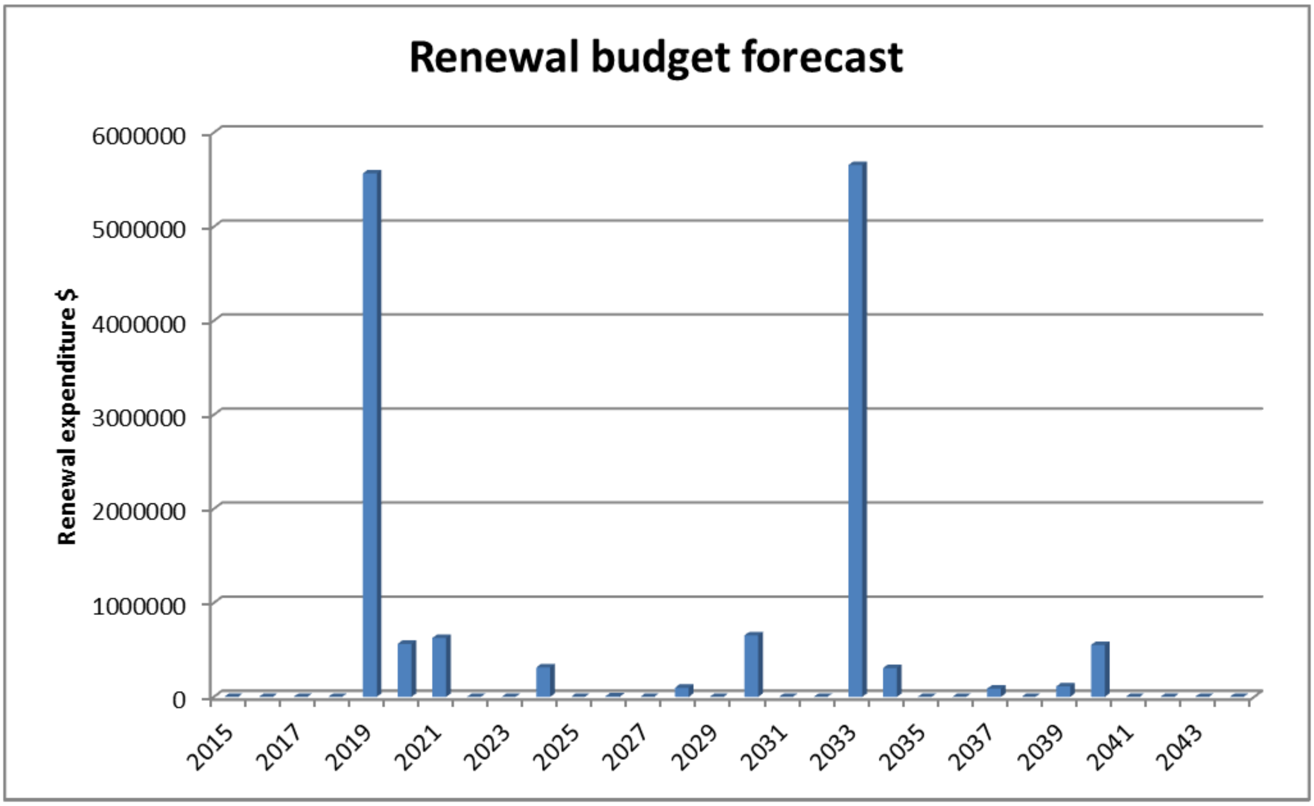


Figure 12 Budget based on base asset life renewal

Figure 12 indicates an average required renewal budget of $485,000 per year. There are however significant peaks. Notably the asset register removes theoretically negative asset lives (i.e. should have already been replaced) by assuming a minimum remaining life of 5 years. It would therefore be prudent to allow for immediate funding resources to be allocated towards water supply asset renewals immediately for the next five years.

The capital expenditure programme for the next ten years indicates a significant discrepancy between expected renewals required and planned capital works expenditure (fig. 13).

On a more positive note, the depreciation funding exceeds the predicted renewal expenditure over the 30 year period analysed.

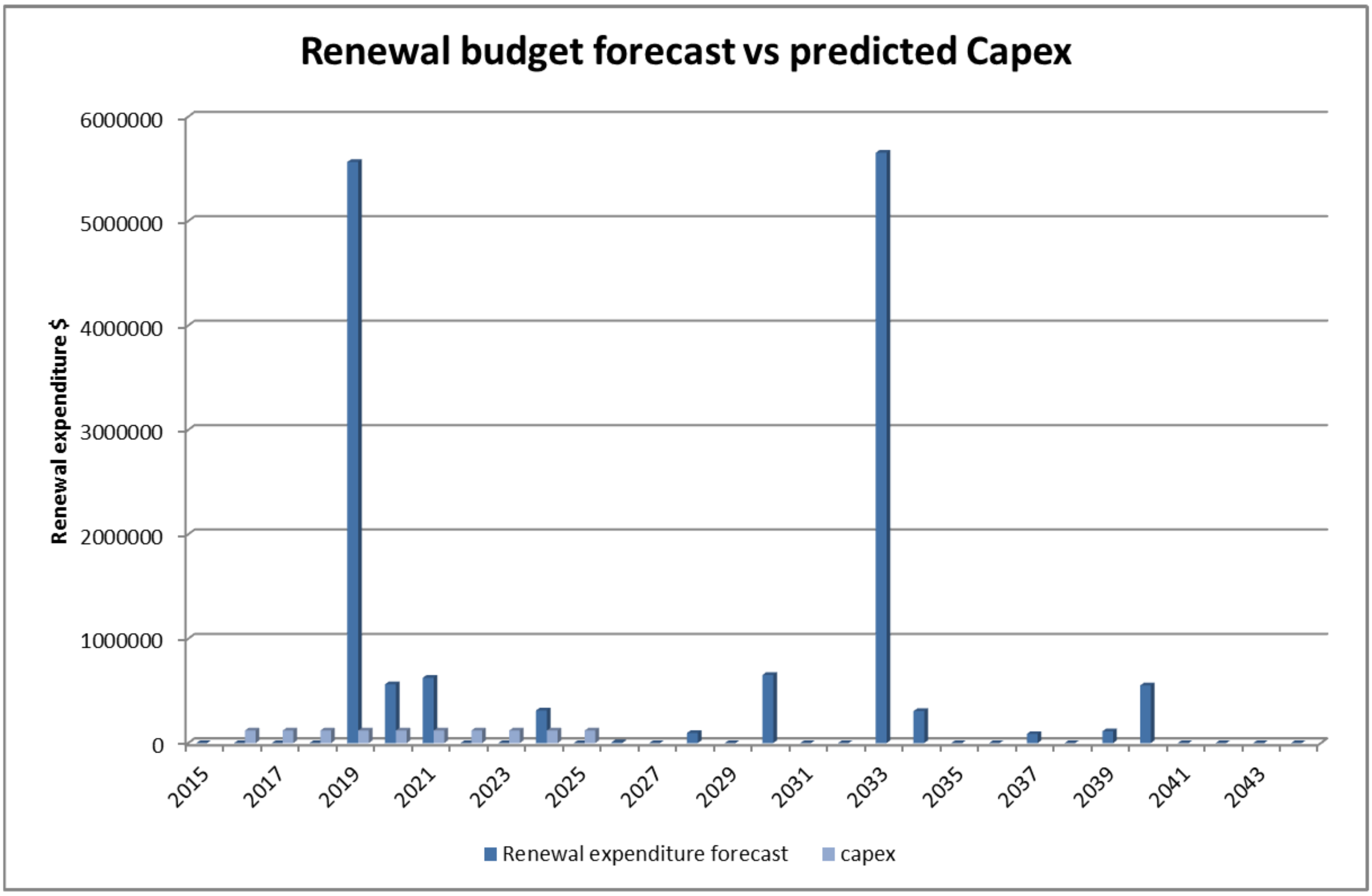


Figure 13 Capital works programme vs renewal budget forecast (base life)

Financial conclusions

- The base life asset renewal budget ($485,000/year) suggests that the current depreciation funding ($511,000/year) adequately covers budget risks for this 30 year period.
- Significant budget risk exists depending on actual asset life, and it is recommended to investigate the condition of the major assets posing this risk (notably the large asbestos cement pipes).
- The renewal expenditure forecast significantly exceeds the proposed capital expenditure over the next ten years, suggesting that there is a potentially significant budget risk depending on actual asset life.

9. Assumptions

Assumptions in the preparation of this Water Asset Management Plan include:

That water assets will remain in Council ownership throughout the planning period (10 years) and that there will be an ongoing requirement for this activity.

All new subdivision applications are assessed in accordance with the current District Plan and the New Zealand Standard NZS 4404:2010, "Land Development and Subdivision Engineering". All designs are in accordance with the standards, they are checked and agreed to by Council's engineers before construction commences and are inspected during construction, including witnessing of the relevant tests. The developer is expected to meet all costs of the works including the connection to Council's existing network

Whilst the demand upon this activity will increase due to anticipated growth (which cannot be quantified) the operational requirements for this activity will remain similar for the next ten years.

Maintenance works will continue to be delivered by Council's Works Department staff, while renewal, upgrade and new works will normally be completed by contractors selected by competitive tender or day work rates.

Funding will be required to provide for renewal as described elsewhere in this Asset Management Plan. That funding of maintenance and renewal works will be by annual rates charges and depreciation, while funding for capital works will generally be from loans and development contributions as appropriate.

Asset values will be re-adjusted at each plan revision to give a current overall asset value.

Financial and future work forecasts are based on the currently available knowledge of asset condition and performance, to the levels of service that have been undertaken to be delivered. More detailed evaluation of asset renewal requirements will be undertaken in the near future to identify programmes of work.

The following basic assumptions have been made in preparing 30 year funding requirement forecasts:

- All expenditure is stated in dollar values as at 30 June 2014 with no allowance made for inflation over each subsequent year of the 30 year planning period.
- No significant increase in overhead costs will occur during the 2015-2045 planning period.

- Operational cost will increase with upgrades at plants required to meet higher levels of final effluent quality required
- It is anticipated that there will be a gradual but continual increase in operation and maintenance expenditure in real terms over the planned period due to ever more stringent compliance requirements leading to higher compliance costs and the continued ageing of the asset. A small part may be offset by improved asset management decision making made possible by enhanced information used in asset management systems
- Improved asset renewal decision making is expected to reduce maintenance needs made possible by enhanced information used in the asset management system which should help to slow the rise in operating cost. As this reduction is difficult to quantify, it has been assumed that the net effect will be neutral and has not been provided for in the financial forecast.
- There will be no additional assets vested in Council from subdivisional development over the term of the AMP. This assumption will be reviewed in the next 3 year planning cycle
- Programmed renewal works are expected to result in reduced cost of maintenance over time. As this possible reduction is difficult to quantify it has not been allowed for in the financial forecasts.
- Maintenance allocations are based on maintaining current levels of service including compliance with current resource consents.
- Significant increases in the renewal funding may result from more detailed evaluation of assets.
- Changes in the district population will not have material impact on the expenditure forecasts for the water schemes over the 2015-44 period
- Significant increases in the funding requirement may result from more detailed evaluation of asset renewal requirements and the need to meet higher resource consent standards

These assumptions and the AMP will be reviewed in 2017 in light of improved asset information that will be collected and recorded over the next 3 years ahead of the 2018-28 LTP.

The system is comprised of components ranging in age from 1 to 40 years, with differing levels of confidence in the material type, age, and condition. The NAMS confidence grades are used:

Data Confidence		
Grade	Description	Accuracy
1	Accurate	100%
2	Minor inaccuracies	+/- 5%
3	50% estimated	+/- 20%
4	Significant data estimated	+/- 30%
5	All data estimated	+/- 40%

These are then applied to the water assets as follows:

Asset Type	Carterton District Council Data Confidence grade
Reticulation pipe age	2
Reticulation pipe material	2
Reticulation pipe condition	5

Asset Type	Forecast confidence rating
Pipe reticulation	C
Fittings	D

Forecast confidence rating	
Confidence Grade	General meaning
A Highly reliable	Data based on sound records, procedure, investigations and analysis, documented properly and recognized as the best method of assessment.
B Reliable	Data based on sound records, procedures, investigations and analysis, documented properly but has minor shortcomings, for example the data are old, some documentation is missing, and reliance is placed on unconfirmed reports or some extrapolation.
C Uncertain	Data based on sound records, procedures, investigations and analysis which is incomplete or unsupported, or extrapolated from a limited sample for which grade A or B data is available.
D Very uncertain	Data based on unconfirmed verbal reports and/or cursory inspection and analysis.

10. Improvement Action Plan

Recommendations

Action	Responsibility	Completion Date
Adoption of the asset management policy noted in this document or variation thereof. Appoint or delegate a position of asset manager.	Senior management	July 2015
Put systems in place to ensure that assets that have been replaced are removed from the asset register. Similarly maintenance work should be reflected by a change in asset condition on the asset register.	Asset manager	October 2015
Put systems in place to ensure that the construction date used for assets is updated on the asset register as renewals are made. This will largely be achieved by having unique identifiers for all water assets.	Asset manager	July 2015
Put systems in place to ensure the effective capture of renewal/maintenance/condition data.	Senior management/Asset manager/ Operations staff	October 2015
Ensure that assets that have both capital and maintenance aspects are adequately reflected in the asset register. Each item needs its own register inclusion or minor assets that are more realistically operational items should be removed from the register.	Asset manager and operations staff	Dec 2015
Review/update GIS data to include the pipe location by street: this is how pipe assets are replaced, and so should be reflected on the asset register.	GIS operator/Asset manager	May 2015
The methodology adopted in section 6 should be applied in the near future to develop a critical asset register, and investigations	Asset manager	October 2015

undertaken to report on the condition, possible risk mitigation measures, and alternative service/redundancy strategies in case of damage from significant natural events.		
Further work on identification of climate change risks specific to the area should be undertaken. This would largely be sourced through existing government research, but applied to the Carterton District. For example low Kaipatangata river flows or low aquifer water levels could be caused by climate variations.	Project team	July 2016
Instigate a coordinated approach to the 3 waters, acknowledging the interconnectedness between them, and developing a cohesive strategy to mitigate potential physical and legislative risks in order to provide greater resilience to the water supply system.	Project Team	July 2016

APPENDICES

Appendix 1 Water Supply Grading

Appendix 2 Water abstraction consent

Appendix 3 Overview of water Assets

This section presents a summary of asset information, general condition, performance valuation and inventory information.

Asset Overview

a) Headworks Assets

Carterton District Council owns and operates two Water Treatment Plants. The primary plant is a gravity plant situated on the Kaipatangata Stream to the west of the town. A supplementary plant supplied by an underground bore field complete with booster pumps and storage reservoirs is situated in Lincoln Road. The normal mode of operation is to supply all service requirements from the gravity system. However during rainfall events when turbidity is too high and/or during low flow in the stream, the supplementary plant is then automatically activated and has the added facility of standby power generation to maintain a service during power outages. The gravity system is treated with lime and chlorine, while the bore supplied system is treated with caustic soda and chlorine.

i) The primary source, the Kaipatangata asset (some 9 kilometres to the west) consists of the water source (Kaipatangata Stream) including some 100 hectares of forestry catchment, all weather access to a run of river intake, supplementary raw water dam storage, screening, treatment and treated water storage prior to distribution to the reticulation.

ii) Production bores in Lincoln Road (situated within the town supply area) supplement the primary source in times of outage due to low flow, turbidity constraints and non-serviceability of the primary source and consists of three operable supply bores and one additional current out of service, pumping, storage, treatment and boosting infrastructure to the network.

b) The Network

The gravity supply pressure used to operate between 600 to 700 KPa across the town, while the supplementary groundwater bores operate at a lesser working pressure of some 500 to 600 KPa. The town reticulation is now operating at the same as the groundwater bores at all times following the installation of a pressure reduction valve on the Kaipaitangata supply and the booster pump for the Clareville line.

The network consists of 9.0 km of trunk supply main and 39.5 km of reticulation piping. Reticulation piping varies in diameter from 15 mm to 380 mm. The current network has more than adequate service capacity.

A computer model of the network has been developed. The purpose of the model is to identify any deficiencies in the network and to more properly assess the impacts of infill and green field's development by targeting where appropriate, required capacity improvements. The modelling will require reviewing on a regular basis and will be additionally used as a reference point to assess the efficacy of leak and loss reduction measures.

b) Asset Performance and Capacity

River Intakes, Production Bores, Dams and Formal Storage

Raw water storage capacity at the Kaipatangata facility is some 4500 m3 when available. In run of the river configuration the maximum daily consented take is 5000 cubic metres indexed to the natural flow in the stream. Maximum instantaneous rate of net take is also indexed to the natural stream flow. This consent was granted in 2003 and remains in effect until March 2013. It is limited to this time frame reflecting the opposition from several parties and interests e.g. DoC, Fish and Game and GWRC and in the longer term there remains the prospect of a potential limitation to the future of this source due to RMA issues. In order to mitigate this limitation, Council plans to allocate sufficient time to undertake the necessary pre-application consultation with affected parties prior to consent expiry.

There is 500 cubic metres of treated water storage at the Lincoln Road site associated with the three production bores. The cumulative consented extraction rate from these bores is 75 litres/ sec. with a maximum daily extracted volume in place for each bore, with a total volume of 6500 cubic metres on a daily basis. Operationally the management regime seeks to use lower extraction rates allowing for some redundancy in the event of bore failure. These consents remain in effect until September 2014.

c) Asset Condition

The Kaipaitangata intake and basic infrastructure is some 35 years old and in average condition. A significant treatment upgrade was undertaken in 1996 incorporating sand and bag filtration. Associated underground infrastructure is understood to be in reasonable condition for age.

The supplementary supply system at Lincoln Road, bores and storage are relatively new having been provided in 1998 with an upgrade in 2001/2002 and 2006 providing additional treatment reliability and yield. The condition of this asset is above average; however one of the four production bores requires reinstatement and re-commissioning works.

2. Treatment Facilities and Booster Stations

- Asset Attributes

The purpose of treatment facilities is to reliably produce water to the Drinking Water Standards in sufficient quantities to meet actual and projected demands.

Each plant has its treatment processes relevant and particular to the water source (surface and sub-surface aquifer).

The supplementary plant in Lincoln Road incorporates pressure boosting by way of three variable speed drive pumps configured in parallel designed to maintain the required pressure and availability levels of service.

- Asset Performance and Capacity

Treatment at the Kaipaitangata Intake consists of sand and bag filtration, pH correction and chlorination. Post treatment the processed water is then lifted to the storage reservoir and gravitates to the distribution network via the 380mm dia. falling main.

Bore field treatment for the supplementary supply consist of pH correction and chlorination prior to pumped distribution to the network. The variable speed drive high lift pressure booster pumps are pressured controlled and configured in parallel to maintain a constant head upon the reticulated system.

The rated production capacity of the Kaipatangata Intake is 4800 cubic metres daily (subject to raw water availability and appropriate turbidity tolerances) and the Supplementary supply capacity is 5100 cubic metres daily subject to optimum bore(s) performance and conservative management. Actual peak summer-time demand is now 50 to 70 % of these flows following water conservation moves as described elsewhere in this plan.

- Asset Condition

Asset condition is a reflection of age and the level of routine and preventative maintenance that has been applied since new.

All routine maintenance and replacement regimes for pumping, filtration, and chemical dosing and disinfection equipment have been applied by Council's trained operators and external resources where appropriate.

- Asset Attributes, Condition and Performance

Pipelines

The purpose of water supply pipelines is to distribute water from storage reservoirs to customer supply points in a sufficient quantity to meet peak demand and fire fighting needs.

Collection Mains

The main supply main runs from the Kaipaitangata Intake and treatment plant to Lincoln Road and is 380 mm diameter and some 9 kilometres in length. The Kaipaitangata's operation is governed by conditions at the point of extraction. An automatic actuating valve isolates the two systems when the supplementary supply is activated. The pipeline was commissioned in the late 1960's and remains in reasonable condition for age and appears to carry close to its design flow.

Reticulation

Reticulation comprises a mix of asbestos cement, uPVC, cast iron, alkathene, copper and galvanized pipe with appropriate valving and fire hydrant capabilities and vary in diameter from 300mm dia to 15mm dia., inclusive of service connections The reticulation hydraulics are enhanced by numerous ring feed connections within the network thereby minimising working pressure losses. Reticulation varies in age from 70 years for the cast iron to current.

Condition is variable according to age, in particular copper service connections need to be replaced on a regular basis. Mains renewal has largely taken place on an as required basis. Because detailed condition information is not available, a substantive renewal programme is not yet in place. However, condition is generally relative to age and the pipeline material. Excessive repairs have usually determined the replacement priority up till now.

3. Planned Improvements and Initiatives

Headworks

The need to retain the raw water storage dam on the Kaipaitangata Stream is being reviewed as part of the resource consent renewal process. Initial thinking is that this dam should be removed as the quality of water behind this dam is often poor in low flow conditions, thus requiring substantial treatment before use.