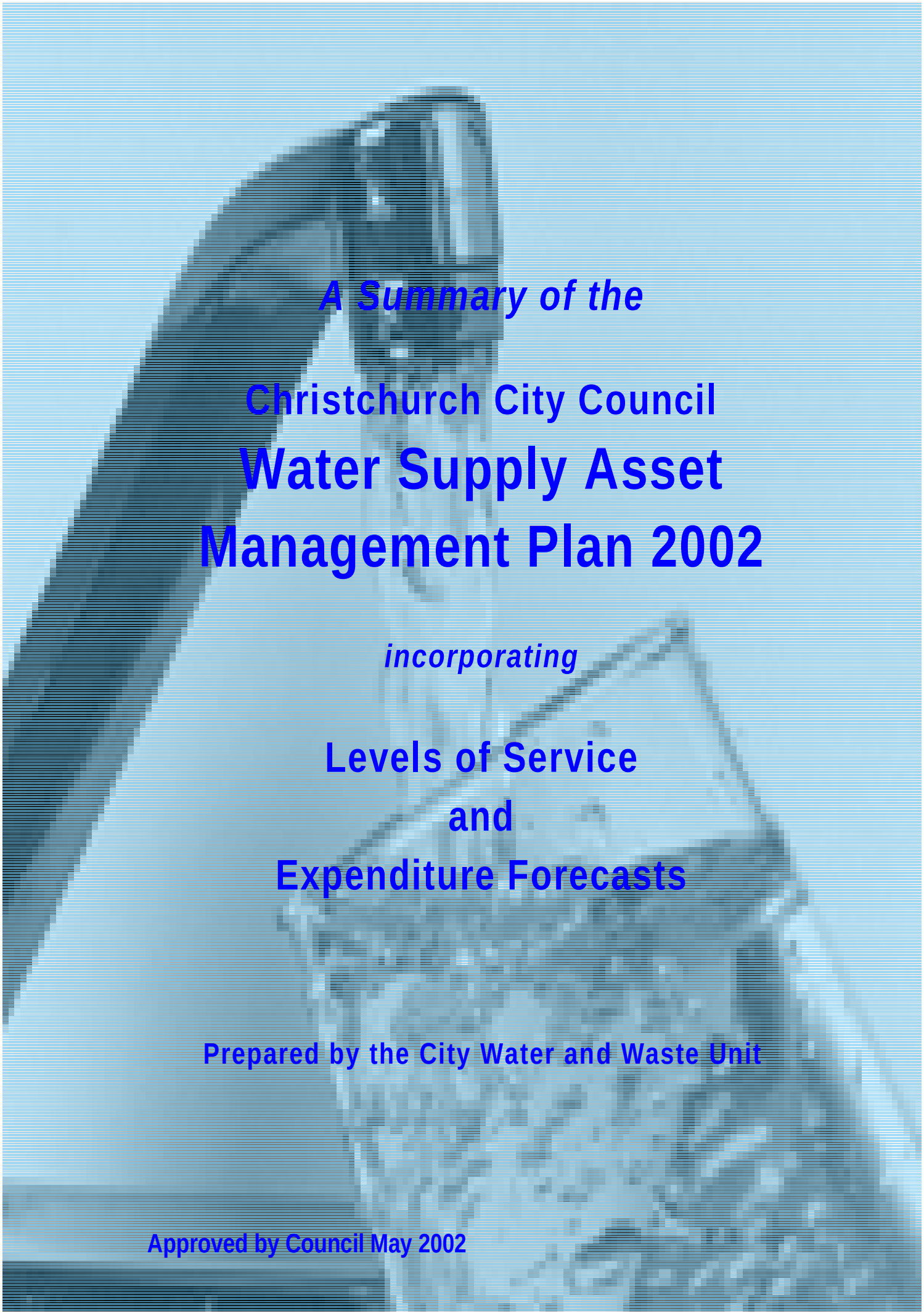


A Summary of the

Christchurch City Council

Water Supply Asset Management Plan 2002

incorporating

Levels of Service and Expenditure Forecasts

Prepared by the City Water and Waste Unit

Approved by Council May 2002

Contents

An Introduction to Water Supply Assets

Christchurch Water Supply

The Christchurch City Council provides high quality drinking water to more than 100,000 customers via some 2,600 km of water pipelines, 80 pump stations plus connections, meters and other assets, whose current replacement value is over $300 million.

The cost to supply water to the average Christchurch household (800 litres daily) is 22 cents per day, equivalent to the cost of a single glass of milk.

The Asset Management Plan

The Asset Management Plan is a cornerstone document which guides the work of the City Water and Waste Unit. It is reviewed regularly to provide assurance to Council, customers and other stakeholders that the assets are being managed efficiently and sustainably.

The full Plan has recently been reviewed. It is detailed and comprehensive, and is used on a day to day basis by staff. It forms the basis for this summary plan.

The Plan delivers a considered and planned approach to the long term management of water supply assets. By optimising current and future expenditure to match the community's desired levels of service, the Plan enables the most efficient allocation of resources. This has two key benefits:

- Firstly, the right service is provided at the lowest long term cost, and
- Secondly, the Plan provides a business planning tool to maximise efficiency

The Asset Management Plan is intended to:

- Following consultation with consumers, define the levels of service that the Council is purchasing on behalf of the community
- Match competing water needs with an adequate reliable network
- Link operations and renewals strategies to risk management
- Identify growth issues, demand trends and demand management strategies
- Define the long term financial requirements
- Define a continuous improvement programme

In 2005, the Asset Management Plan will again be reviewed, and the community will be consulted on the appropriate levels of service for water supply assets.

Purpose of this Summary Plan

The purpose of this summary plan is to provide an overview, so that the Council can consider and adopt the 2002 review of the Asset Management Plan. It is also intended that it provide the basis for expenditure levels in the Annual Plan for the next 3 years

It has been written to provide a simple, easy to understand overview of water supply assets, the levels of service delivered by those assets, and the medium to long term financial requirements.

An important objective is to provide sufficient information to enable Council and the community to fully understand the value of water supply services. This document will therefore form an important basis for ongoing consultation and information sharing.

Mike Stockwell
Water and Waste Manager

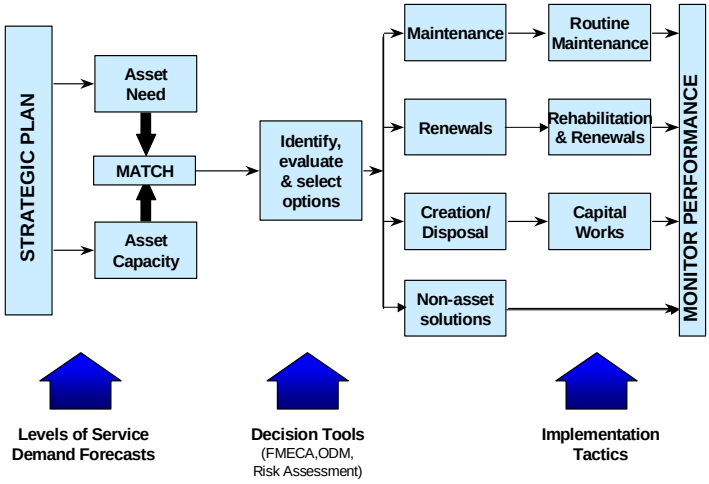
In Summary

This Plan

This Plan links Council's strategic plans to the implementation of works programmes.

It includes a summary of water supply assets, and highlights the key issues, such as growth, demand, and asset age and condition trends.

It identifies the key levels of service being provided to business and residential customers, current and future financial costs, asset valuation, and the key performance measures by which the Council can assess the sustainability of the assets and water supply services.

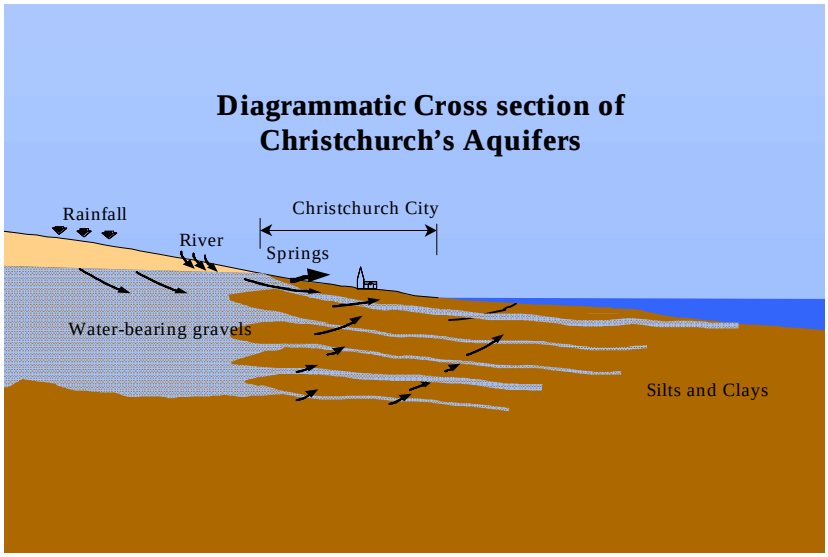


Water Supply Services

Water is a necessity of life. The supply of water enables key social, economic and environmental goals, such as community health and well-being, to be achieved.

Public water supply began later than in most other NZ cities, because an adequate supply could be obtained relatively easily from private sources. Even today, about half of the city's water consumption is extracted from private wells for industrial and agricultural purposes.

Christchurch water is supplied from a series of underground aquifers which extend under the city and the Canterbury Plains. The water is pumped directly into supply pipelines, or into reservoirs, to meet actual and projected demand on an hourly and daily basis. Because of its purity, the water does not need to be treated to meet national Drinking Water Standards, and is highly regarded.



The Assets Involved

The assets described in this Plan work together as a complete system to efficiently and reliably deliver water for residential, business, and firefighting purposes.

The network is complex and consists of separate yet connectable "pressure zones".

The assets include pipes, valves, large mains, sub-mains, pumping stations, wells, reservoirs, meters, and electronic communication equipment.

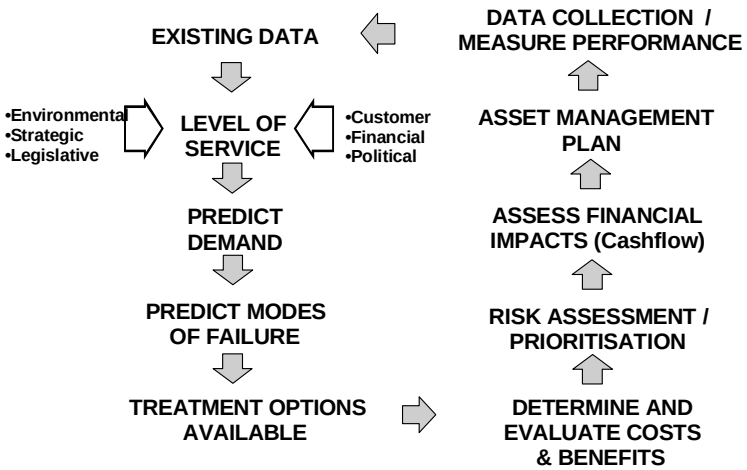
Our Overall Strategy

The asset management planning process begins with such things as data, customer needs, and strategic goals. Data provides information on the type, size, age and condition of assets.

The Council regards community consultation as extremely important, and this is a key feature of the Plan.

Together, these inputs define the levels of service, the cornerstone of the Plan.

The planning process is a cycle, and incorporates a number of key tasks, the outcome being an Asset Management Plan with financial projections to at least 20 years in the future. Ongoing improvement and monitoring is an important step in completing this cycle.



Water Supply Business Issues

Goals and Objectives

The 2002 CCC Strategic Statement defines the Council's Mission Statement as:

"Providing leadership to achieve the vision for Christchurch through effective local governance and the delivery of high quality services."

The "Triple Bottom Line" is a key planning process for creating a sustainable future city, and it applies to the Annual Plan and reporting process.

The Asset Management Plan is a key tool enabling the sustainable and cost effective management of infrastructural assets such as water supply assets, and whose primary goal is :

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

The key "triple bottom line" key objectives include:

<u>"Serving the Community By</u>
- Supplying water in a manner that will achieve agreed and understood levels of service

<u>Providing Economic Value By</u>
- Managing water activities in accordance with sound accounting and financial practices
- Planning and operating activities on the basis of lowest total life costs
- Conducting regular reviews of our activities to ensure efficiency and cost effectiveness while maintaining levels of service

<u>Sustaining the Environment By</u>
- Ensuring everything we do is based on sustainable best practices including conforming with the Natural Step principles."

Significant Issues and Business Drivers

The water resource is finite, and sensitive to several key environmental risks. These risks are mitigated through measure such as land-use controls and supply system management – eg controlling the draw-off of water from key wells. These potential risks are:

- The risk of contamination and pollution of groundwater in the recharge area, particularly Yaldhurst/West Melton.
- High localised abstraction, which reduces aquifer pressure resulting in the intrusion of low quality, contaminated or estuarine water into the confined aquifers (eg Woolston/Heathcote area).
- Salt-water intrusion, which could occur if aquifer pressures diminished to such an extent as to allow underground sea-water to flow into the supply aquifers

In addition, issues which may have a significant impact on customers include:

- **Pressure and flow** – the supply of water to individual customers is closely related to the capacity of the infrastructure as well as the way it is operated, and the total demands being placed on it.

- **Water quality** – the water supply is not chlorinated, yet highly regarded for its purity and taste. Because of the risk of contamination, no matter how small, the best grading it can receive is Ba, where "B" relates to source and treatment, and "a" the distribution system. Christchurch water currently meets this grading, but improvements are likely to be needed to maintain the grading as the rules are to become tougher.

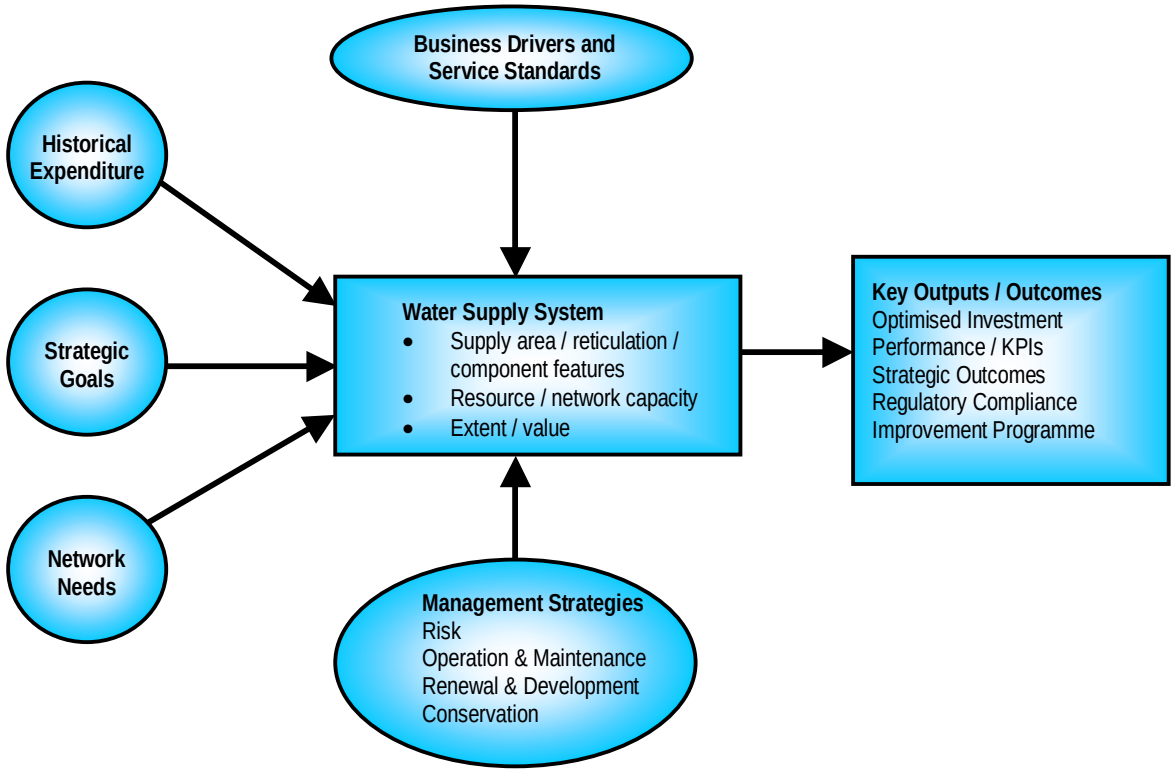
- **Continuity of supply** – supply can be interrupted or restricted for a variety of reasons, for example, for repair work, because of infrastructure failures, or because of water supply shortages. The need for restrictions for environmental reasons will be driven by consent conditions that arise from ECan's Natural Resources Regional Plan. One of the objectives of ECan's Plan is to ensure that stream flows, primarily in the Heathcote and Avon Rivers, do not fall below sustainable levels.

Therefore, water conservation and demand management are important elements of the Asset Management Plan.

An Integrated Management Approach

The Asset Management Plan is developed using an integrated approach, as shown in the diagram below.

Strategic goals are considered, along with historical trends and infrastructural needs. These are integrated with key business drivers and service levels. Management strategies are defined, covering new investment, day to day programmes, and risk. All of these are applied to knowledge of the assets, both physical and financial. Key outputs and outcomes are defined to enable ongoing monitoring of the Plan's effectiveness.

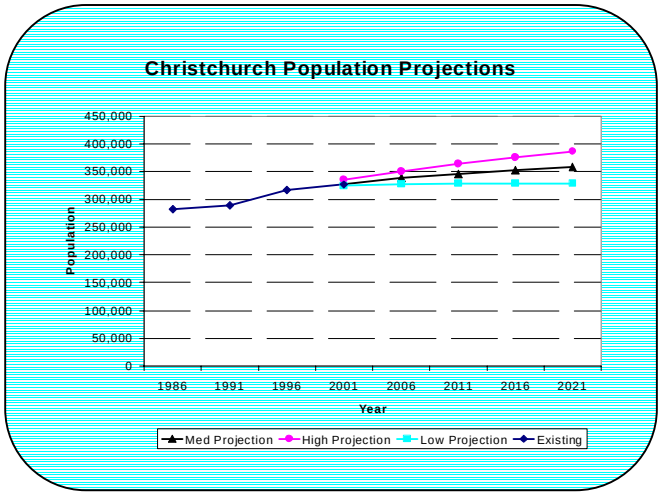


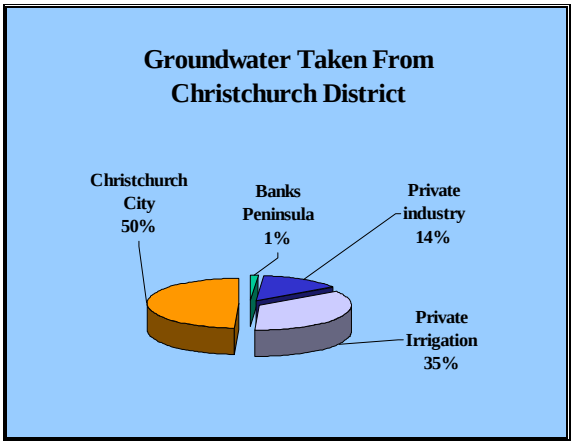
Demand Trends

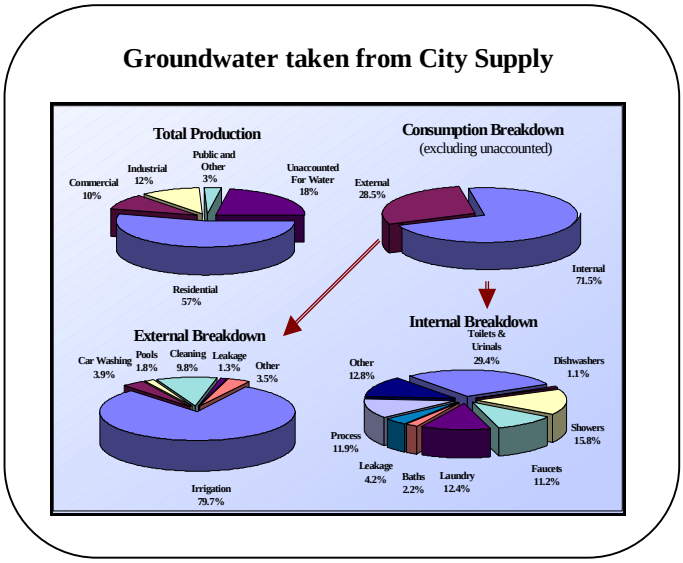
The amount of water required is very dependent on climate, with garden irrigation being a major component of summer demand.

Population naturally has an impact on water demand, and current predictions are for ongoing steady growth in population over the next 20 years, with the "medium" projection being the most likely.

Around half of the water abstracted from the aquifers which supply the city area is distributed through the Council's system.



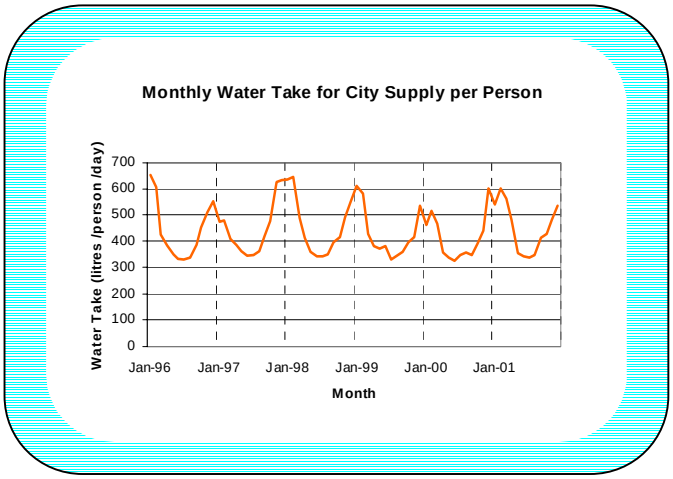




Residential use accounts for 57% of the water abstracted by the Council. Internal demand accounts for over 70% of the water consumed. Less than 1 percent of the City's supply is used directly for human consumption. Of all the water used outside buildings, around 80% is used for irrigation.

The impact of water conservation strategies has reduced per capita demand over the past 10 years. The current water take is just over 50 million cubic metres per year.

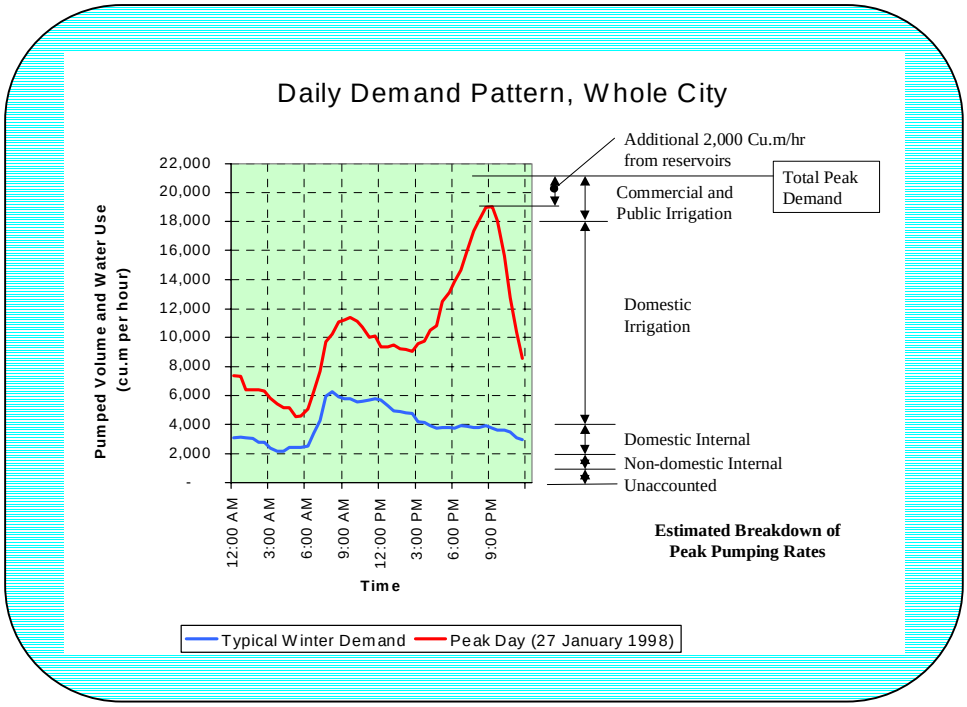
Demand is monitored regularly and compared to forecasts from a complex mathematical model. The pumped volumes for monthly demand over the last 5-6 years are shown on the right, indicating variable peak summer use and stable winter consumption. Monthly demand affects the amount of water that can be drawn from the underground resource.



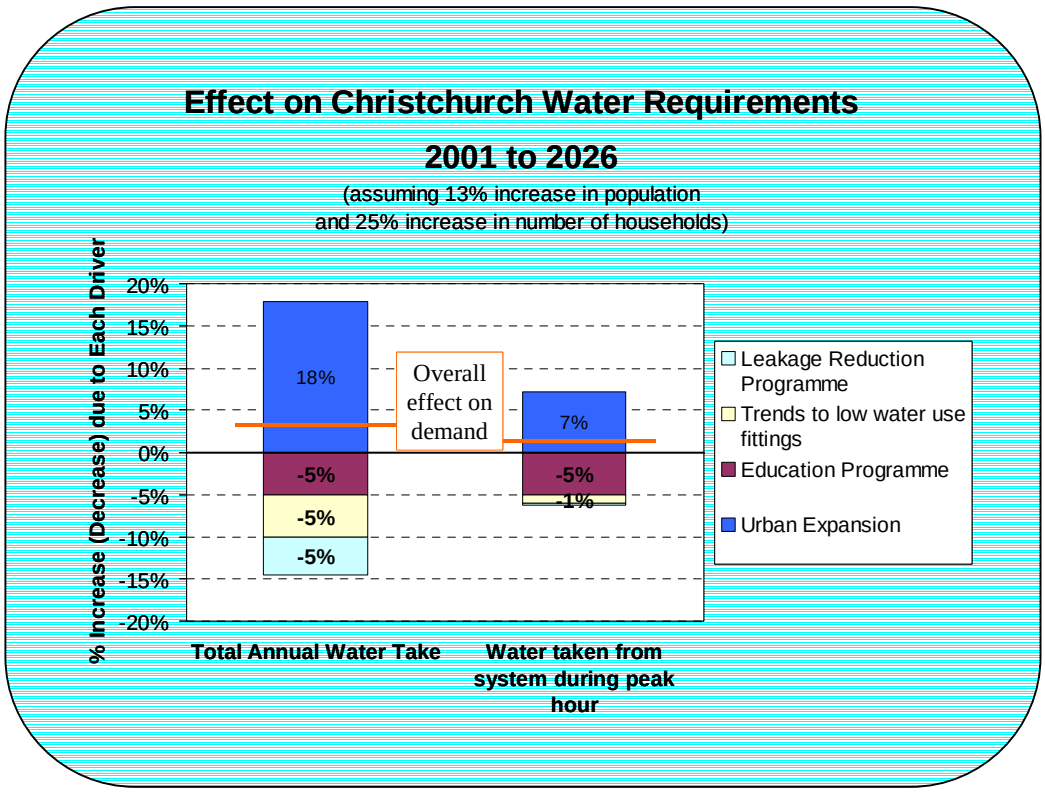
Asset capacity requirements are driven by over a comparatively short period, and the measure, "peak demand", is used. This measure influences the size and capacity of wells, pumps, mains and reservoirs, and is therefore critical to the Asset Management Plan. The pumped volume in cubic metres per hour is monitored to allow demand analysis and the prediction of trends.

The diagram shows a typical daily pattern for pumped volume with a morning peak around 9am, followed by a steady build up from 3pm to around 9pm in the summer (red line). In comparison, the winter line (blue) shows no evening peak at all.

The diagram also shows the approximate split by consumption type, and the contribution made by reservoir storage.

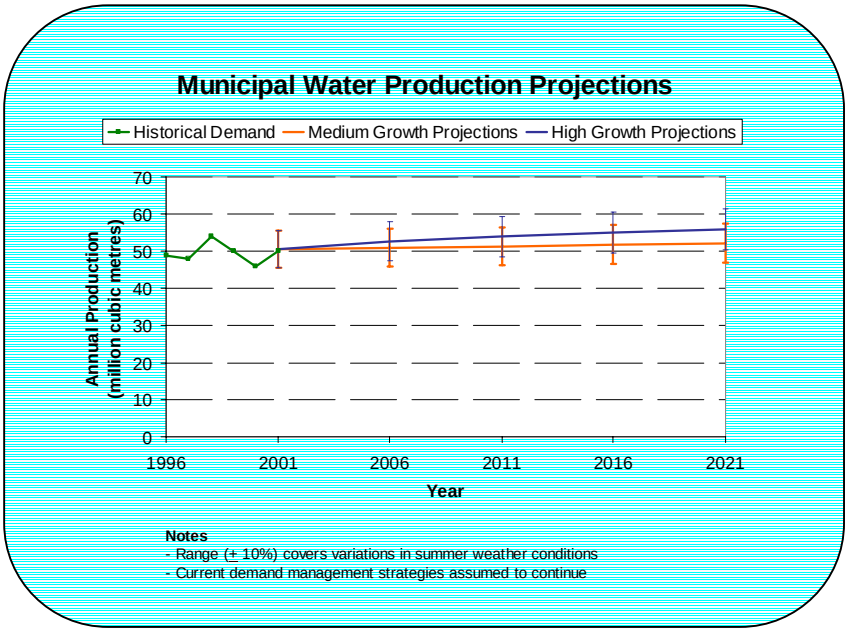


Overall, total peak demand over the next 25 years is expected to remain almost constant despite significant growth in households and population. This demonstrates the value both of the current demand management programme, but also other trends such as low water use fittings. Similarly, total annual consumption is expected to grow much more slowly than would be expected from an analysis of urban growth.

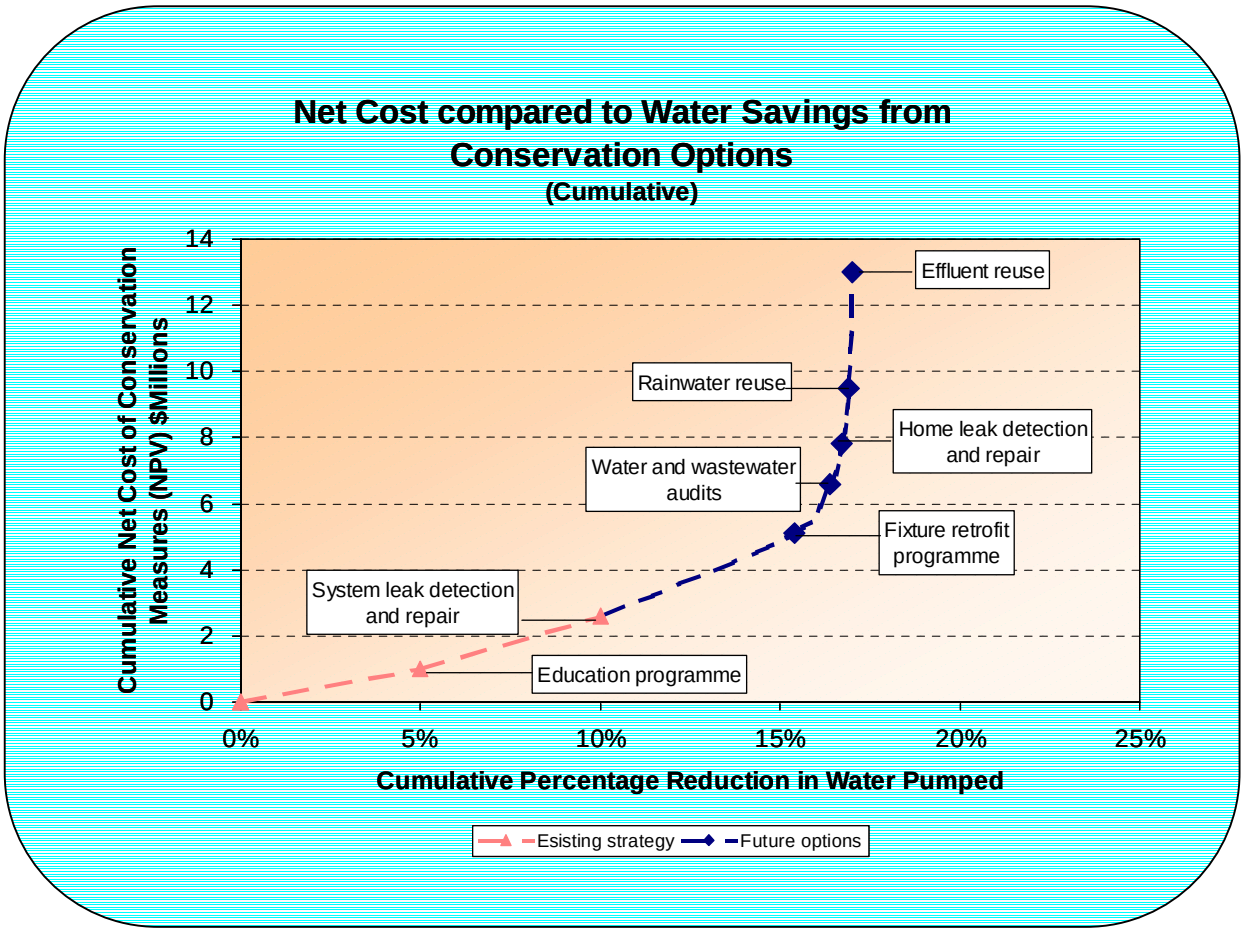


Only a small increase on the City's total water requirements of 50 million cubic metres (±10% for climatic influences) is expected over the next two decades.

This chart shows the projected demand over the next 20 years for medium and high growth projections, using current demand management strategies.



A broad range of additional conservation measures have been considered, as indicated in the chart below. Because cost of supplying water in Christchurch is comparatively low, even the present conservation strategy costs more than it is expected to save in reduced operating and capital costs. The present strategy is justified by considering resource and risk management issues. As new information on environmental risks and costs comes to hand, other measures can be progressively introduced if warranted.



The Assets

Key Facts

Reticulation (mains and sub-mains) is the most significant asset, accounting for over $200m by replacement value.

Pumping stations are a critical system asset, particularly on the flat where there is very little storage capacity available. There are 53 primary stations with wells and pumps which extract the water, and 27 secondary stations which boost pressure at critical points.

Reservoirs provide storage capacity primarily for hill areas.

There are also other assets, including those associated with 98,132 domestic connections and 7,200 commercial connections.

The total asset replacement value is $308 million.

Asset Description	Quantity	Replacement Value $millions
Water Mains (incl valves, hydrants etc)	1,356 km	161
Submains	1,313 km	42
Connections (boxes, valves & meters)	111,105	36
Land (inc Improvements)	various	8
Pump Station Buildings	80	8
Wells	166	11
Pumps – long life	137	4
Pumps – short life	82	1
Pipework	Various	6
Standby Diesels	26	4
Reservoirs and Tanks	32 sites	4
Electrics	Various	1
Instrument and Control	Various	2
Total		**308**

The network comprises 5 pressure supply zones, and one of these (Central) has 3 sub-zones.

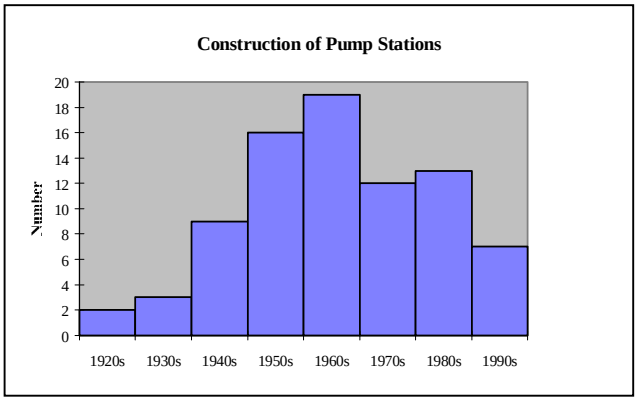
These normally operate independently, but in emergencies or at times of peak demand, valves can be opened to allow most zones to be interconnected.

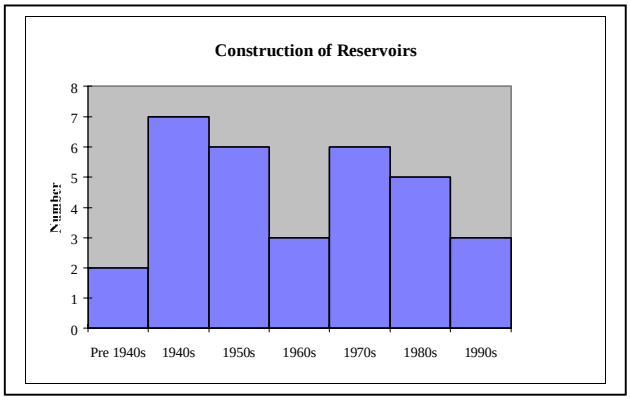
Reservoir and pump station constructed at Halswell in 1990

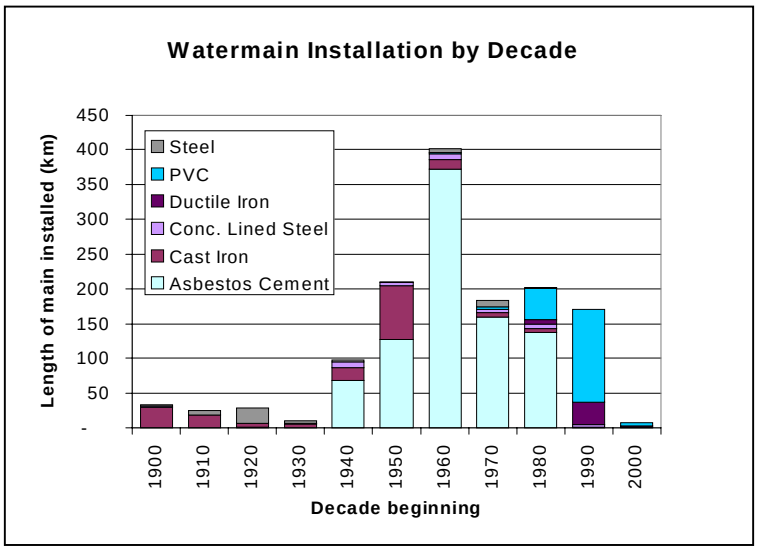
Asset Age and Condition Data

Most **wells and pumping stations** were constructed between the 1950's and 1980's. Wells typically have a life of 60-70 years, and "fail" due to severe encrustation, holing of the casing, or collapse of the hydraulic connection to the aquifer. Long-life pumps typically have a similar life, but "fail" because of falling efficiency and economic performance. Other associated assets, such as short-life pumps, stand-by diesels, switchboards and electronics have lives varying between 10-50 years.

A regular ongoing maintenance and renewal programme is required to maintain the performance and reliability of this system.



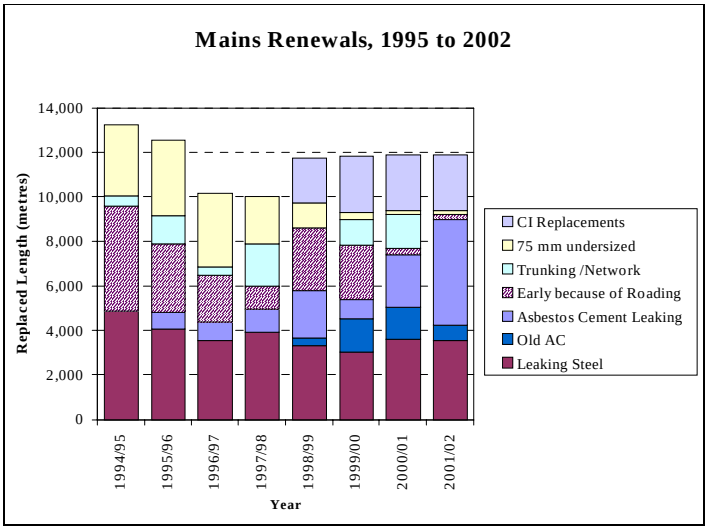




Reservoir lives can be up to 100 years, but "failure" can occur through cracking, lack of seismic strength, and security against contamination.

Six reservoir renewals are expected to be necessary over the next twenty years for these reasons.

Reticulation lives vary between 60-130 years, with renewals increasingly being driven by the deterioration of asbestos cement (AC) pipe, and historical records show that the rate of breakages increases significantly once these pipes reach an age of about 50 years. Also, breakages are monitored by location. Older cast iron and steel pipes are also progressively being replaced.

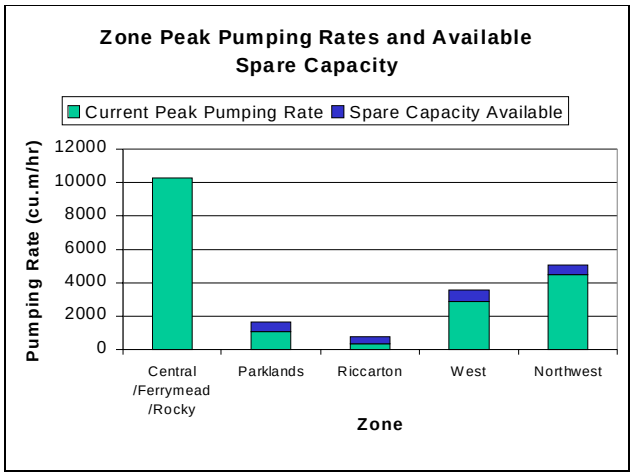


Asset Capacity and Performance

Peak pumping **capacity** is the primary driver matching supply to demand. As shown, the available capacity is closely linked to demand in the five major pressure supply zones, with some additional capacity still available in most.

Projected growth in "greenfields" subdivisions over the next 20 years will require the installation of new pumping capacity and mains reticulation.

In some zones extra capacity can also be provided by utilising more reservoir storage, however the location of development means that some additional infrastructure will be essential



The table below shows that additional pumping capacity of some 240 litres/sec will be needed to meet the extra demand of over 13,000 new dwelling units.

Zone		Peak pumping per lot for zone (l/s/dwel.)	Peak Demand for new lots (l/s)	"spare" capacity currently available (l/s)	Required additional pumping capacity to 2026 (l/sec)
Central	10,342	0.04	85	0	85
Ferrymead	2,797	0.04	87	30	57
Northwest	4,865	0.05	187	150	37
Parklands	2,056	0.08	164	150	14
Riccarton	850	0.03	13	120	0
West	3,914	0.07	226	180	46
Total	**24,823**		**762**	**630**	**240**

Asset **performance** is measured in a variety of ways. This table shows the methods used to monitor pumping station performance.

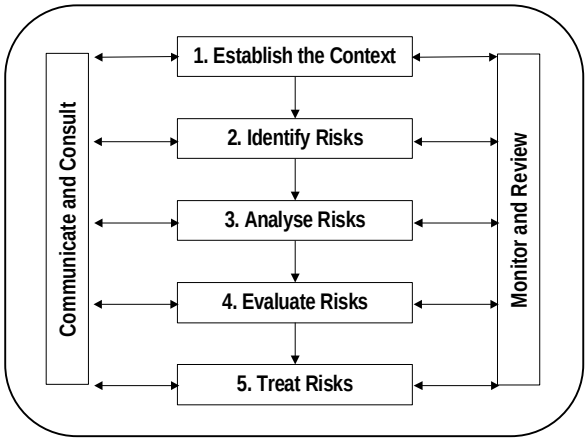
Reticulation is monitored for hydraulic performance and capacity, water hammer, water discolouration and particles, sand, stagnant water, asbestos, air and work practices.

Deteriorating cast iron pipe in particular affects water flow, and this is closely monitored – triggering renewal where there are problems.

Method	What is Measured	Frequency
SCADA	Instantaneous flow and pressure at each pump station.	2 minutes
Pump station records	Power use, aquifer flows	Monthly
Hydrant tests	Fire flows and residual pressures	As required
Fire Sprinkler Systems	Sprinkler flows and residual pressures	As required
Data-logging (using 17 portable loggers)	Pressure and flow to investigate problem areas and calibrate models	As required
Hydraulic Modelling	Calculated pressure and flows throughout system	As required
Reactive maintenance Contract reports	Length of shutdown	Monthly
Flow tests at connection	Flow and residual pressure at connection	As required

Managing Risk

Risk management is an integral part of managing the lifecycle of major infrastructural assets. A risk management framework consistent with the joint Standard, AS/NZS 4360:1999 Risk Management has been applied.



This process has involved the systematic identification, analysis and evaluation of risks across all assets, from the water source to the distribution system. Risk action plans have been developed, with the priority being based on the probability and consequences of individual risks. These risks include events such as natural hazards, product risks, and asset risks.

The table below summarises the results of the analysis and the risk action plan for those risks categorised as "**High**". These include mitigation measures that have arisen through the Engineering Lifelines Project, and also cover Business Continuance and Emergency Response Plans.

Risk	Risk Description	Potential Impact	Current Controls	Risk Action Plan
Earthquake	Serious city-wide damage to most of Christchurch's reticulation	Inability to restore basic reticulated system for several days	Lifelines, Disaster recovery and Business continuance plans, standpipes for basic needs	Setting up of further emergency watering points at strategic locations
	Major damage to many pump stations	Several zones without water	Prioritised response schedule in place. Stations rated by criticality for upgrading.	Earthquake proofing of critical stations according to Section 6.4
	Failure of rigid pipe at entrance to reservoir	Loss of storage during critical stage of recovery form earthquake, some erosion resulting	11 reservoirs currently have flexible joints	21 reservoirs programmed for installation of flexible joints 01 to 05
	Cashmere Reservoir Failure	Up to 6,800 cu.m suddenly discharged	Reservoir can be bypassed	Replacement included in 10 year plan
Groundwater contamination	Point source contamination from industry, old landfill, road spill	Well(s) in localised area exceed standards Need to abandon a station	City Plan Rules ECan Monitoring	Input into city plan variations and regional plans to manage risk in long term
Malicious Contamination	Injection of contaminants into system or reservoir	Reservoir inspections for security	Security systems on most stations and major reservoirs, and response procedures in place	Review in progress
Backflow	Reverse flow through connection allows contamination to enter system	sickness or fatality	Backflow prevention programme in place Procedures ensure pressure maintained	Continue with Backflow prevention programme
Operational	Contamination resulting from failure or repair	sickness	Mains flushing Chlorinating new mains, reservoirs Reactive maintenance contract spec. and monitoring	Review contract and monitoring procedures
	Incorrect commissioning of new works	sickness	Contract procedures specified	Review contract and monitoring procedures
Reservoir Contamination	All Reservoirs	Major accidental reservoir contamination, possibly causing death	Reservoirs emptied and inspected according to 4 year schedule.	Risk Management Plan according to NZDWS being developed
Reservoirs	Reservoir Overflow	Significant property damage, injury	Investigation of reservoir drainage in progress Subdivisions assessed for impact and mitigation required	Provide mitigation as determined by investigation Investigation of legal liability
Undetected reticulation leak	landslide	3rd party damage	Leak detection and monitoring Priority response to hill leaks Insurance against breaks (leaks not insurable)	Investigate legal liability in relation to awareness and seepage
600ϕ Huntsbury Resv to Eastern Tce	Main Failure	Washout, 3rd Party damage	Leak detection and monitoring Priority response to hill leaks	Carry out condition assessment

Levels of Service

Water Supply Service Levels

Levels of service (LOS) must be meaningful and address the issues customers believe to be important.

The LOS in this Plan have been developed from:

- Water supply goals and strategies
- Environment Canterbury's groundwater plans and policies
- Knowledge of key water supply issues
- Standards and legislative requirements
- Customer expectations

Customer Expectations

Consultation is a key to understanding expectations, and includes:

- Individual customer contact on a day to day basis
- Annual CCC Ratepayer Satisfaction surveys
- Focus group meetings held for the first AM Plan
- 'Your City Your Choice' Consultation Process (1997)
- Water supply customer research study (2000)

The research conducted in 2000 was more in-depth and covered levels of service, key water, supply resource issues, customer service, costs and general issues.

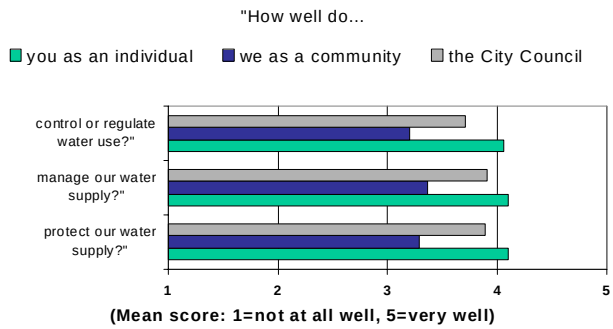
It found great pride in the quality of Christchurch water, but varying attitudes to conservation of the resource and whose responsibility it was.

Most residents accept the need for periodic restrictions, and believed that the Council should encourage more efficient use. Christchurch people would prefer not to supplement the supply with other sources, but most would support a modest rates increase to supplement stream flows if this improved allowable abstraction rates.

The survey found little support for increasing rates to increase levels of service, with high satisfaction for water flow and pressure, and water purity.

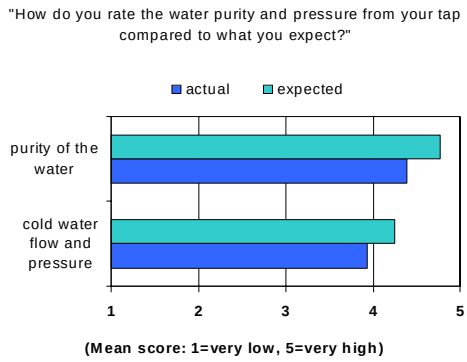
At an average cost for water supply of $82 per residential property, 90% thought this was good or very good value for money.

Attitudes to Water Supply

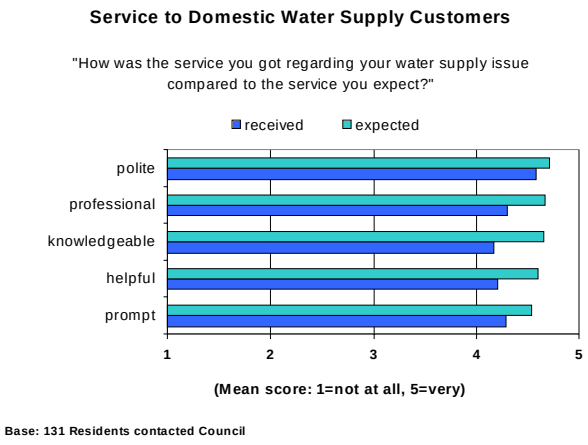


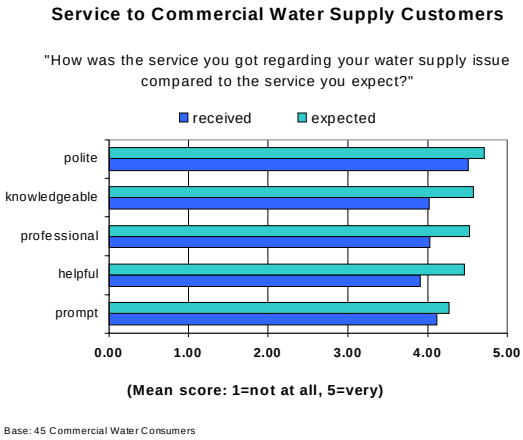
Base: 500 residential

Perception of Water Quality and Pressure



Base: 500 residential





Customer service provided by Council staff is strongest for "politeness" and weakest for "helpfulness" (commercial consumers).

Key Level of Service Targets and Strategies

LOS have been defined for key water supply issues, as shown below. Strategies to ensure that these are achieved are also listed.

Characteristic	Issues	Target LOS Measure	Strategy
Pressure and flow	Continuous availability of satisfactory pressure. Fire-fighting and commercial sprinklers. Pressure management within and between zones.	Minimum flow of 25litres / minute at boundary 250 kPa minimum working pressure	Manage pumping stations using pressure trigger thresholds and new automation software. Develop new pumping stations and wells to meet predicted growth needs. Upgrade key reticulation constraints. Implement demand management pgm.
Water Quality	NZ Drinking Water Standards. Appearance and taste. Contamination control.	Grading B-a[1], in accordance with the new grading rules. Meet NZ Drinking Water Standards.	Confirm security of underground aquifers. Chemical and microbiological sampling. Develop Public Health Risk Management Plan. Backflow prevention programme.
Restrictions	Infrastructure capacity or failure (eg pumping stations, reticulation). Resource conservation.	Currently once every 20 years for capacity reasons, or more often for resource management reasons.	Maintenance and renewal programmes for infrastructure. Capacity upgrades. Demand management programme to promote efficient use.
Responsiveness	Response times and standards for customer service.	There are a wide number of measures relating to timeliness and resolution – including enquiries, complaints, requests for information, new connections, subdivisions, etc.	Provide customer service resources to meet needs. Monitor achievement of service standards. Review appropriateness of standards with customers.
Reliability	Loss of water due to water supply asset shutdowns.	No more than 5 unplanned headworks shutdowns with loss of supply to customers up to 4 hours. Maximum of 12 unplanned reticulation shutdowns exceeding 4 hours supply loss.	Reticulation renewal programme which is triggered by the number of faults. Contract requirements – operations, maintenance and renewals.
Leakages	Water losses, placing additional pressure on the resource.	Unaccounted for leaks no more than 150 litres / connection / day by June 2006. Response times to repair leaks: 1 hour – safety 1 day – poor supply, flowing water 3 days – other leaks	Water loss reduction programme. Operational contract requirements.

1 The "B" grading relates to the source and treatment, and the "a" grading to the reticulation system. Because the City's water is not chlorinated to mitigate the risk of bacterial contamination, an "A" grading is not possible for source.

Financial Projections and Programmes

Asset Lifecycle Management

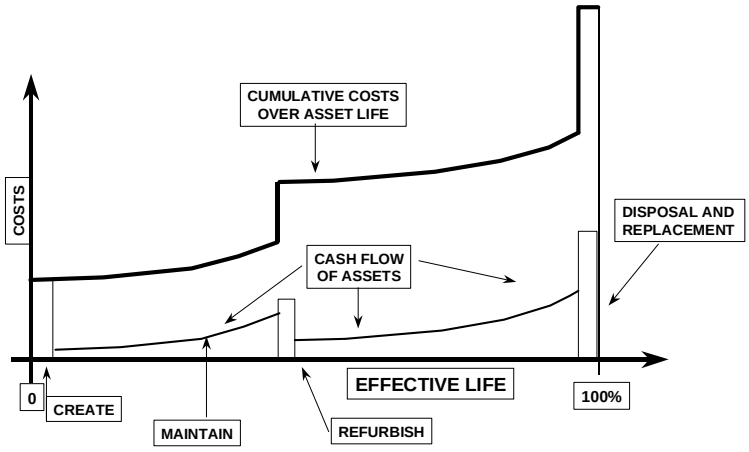
Asset management defines four major types of expenditure. The difference between each is important, and it is necessary to monitor expenditure in each area in order to be able to optimise future costs and to recognise changes in "service potential".

- **Operational**: utilisation of assets, such as electricity, cleaning, monitoring. These activities do not change the physical nature of the assets.
- **Maintenance**: day to day work on assets to keep them functioning at the desired service levels. Maintenance activity involves physical changes to the assets, and the cost is expensed in the period.
- **Renewals**: replacement or rehabilitation to original size and capacity. Renewals are "capitalised", so that the cost can be depreciated over the future life of the asset. Renewals restore "service potential".
- **New assets**: creation of new assets or an upgrade or expansion of an existing asset beyond its original size and capacity. New assets are also "capitalised", but they do not restore "service potential". Rather, they increase the asset base.

In addition, where asset **disposal** involves expenditure, this must also be accounted for, along with any residual value.

The Asset Management Plan identifies the programmes that are needed to minimise the total expenditure needed on the assets over their whole of life.

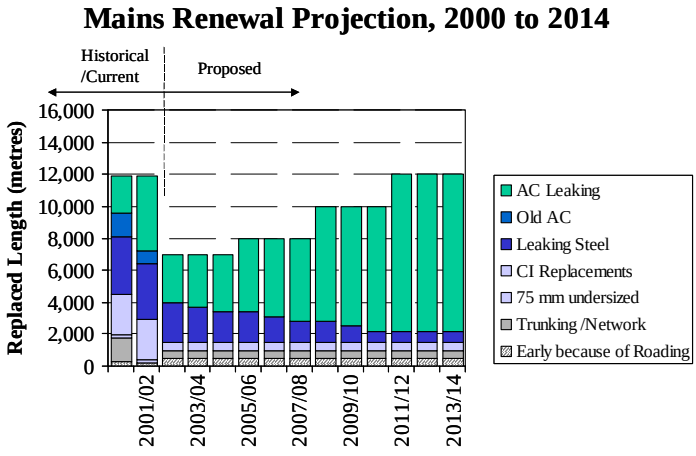
This diagram shows how the long term costs typically far exceed the initial construction costs, and the timing of major works such as refurbishments or renewals is critical to economic efficiency.



Asset Renewals

A long-term renewals strategy has been developed to define the requirements outlined in this Plan.

As an example, recent work indicates that reticulation renewals can be slowed compared to recent rates, but climbing over the 10 years from 7km per year to 10-11km in ten years, and to 21km by 2022.



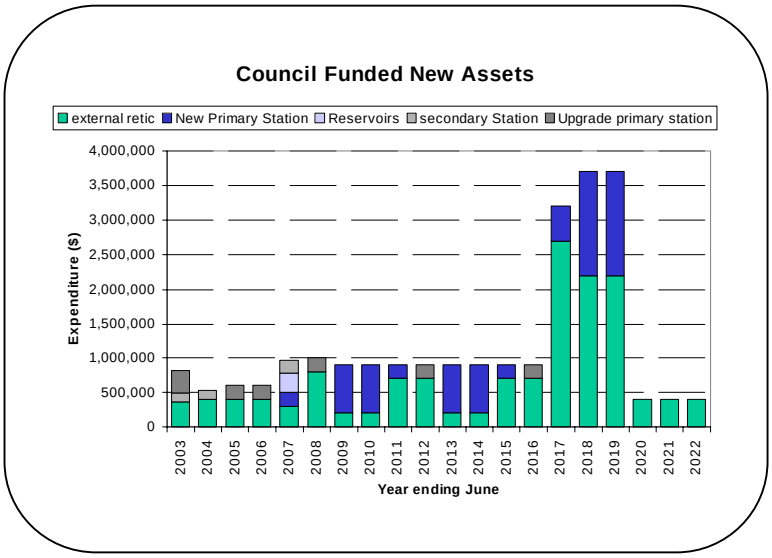
New Assets

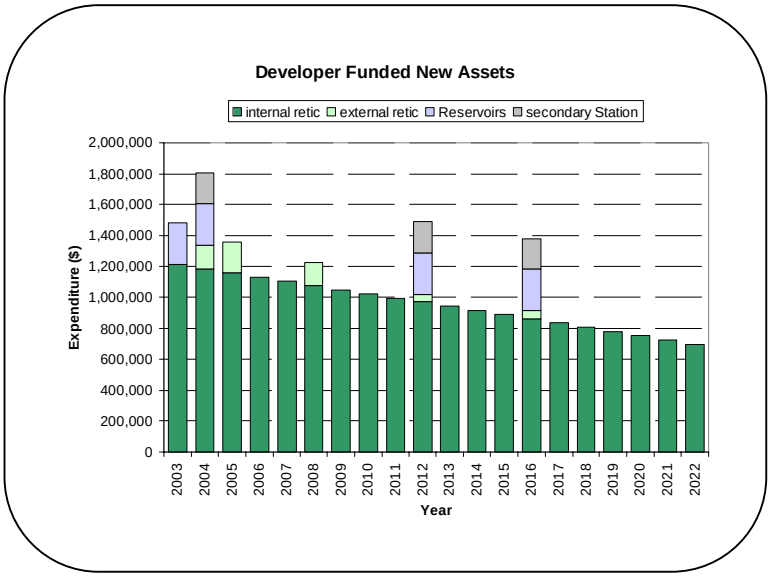
The Council will need to invest in new assets for growth, as shown in the top graph.

These include two new primary pumping stations by around 2010 and 2015. Furthermore, it is assumed that the development of alternative sources outside the district will not be required before 2017.

Total projected expenditure on new assets is some $38m, which is funded in part from headworks contributions and cost share contributions, levied as conditions of subdivision.

In addition, developers of subdivisions are expected to vest some $21m of assets over the next 20 years.





Financial Projections

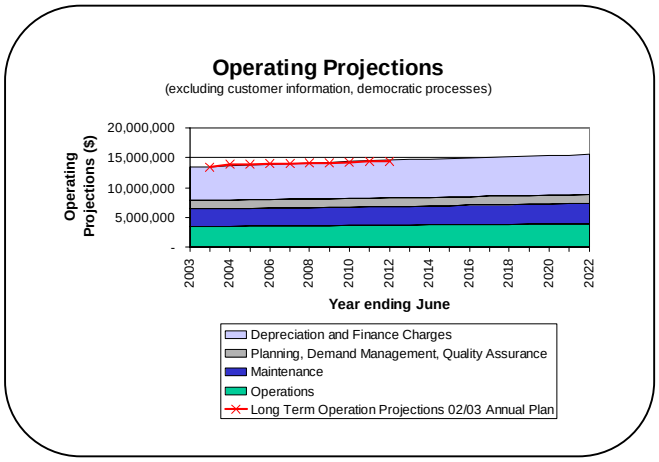
Proposed long term financial projections based on a minimum 20 year timeframe have been developed from:

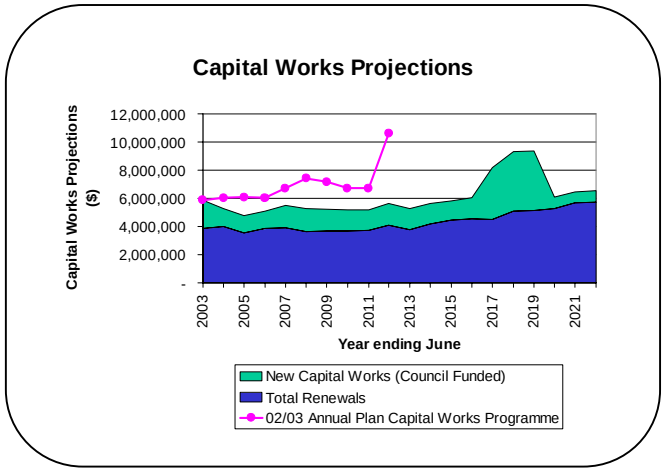
- Levels of service
- An analysis of the likely growth in population and household distribution and the resulting future demand
- Assumptions on the effectiveness of the Council's Demand Management Programme
- An assessment of the risks (eg asset failure, natural hazards) that the assets are exposed to, and the possible mitigation measures
- Recognition of lifecycle asset management needs – for example, the Renewals Strategy
- Review of historical cost trends

CCC budgets are presented in two parts, firstly "Operational" which includes General, Operations, and Maintenance expenditure as defined in the AMP, as well as Depreciation. Secondly, "Capital" which includes Renewals and New Assets expenditure. The long term forecast fits within the Council's Long Term Financial Strategy, with Operational being on target and Capital below target, as shown in the graphs on the following page.

General expenditure includes planning, financial charges, planning, asset information systems, demand management education programme, water loss reduction programme, quality assurance, water supply control and operations, water billing, monitoring and meter reading.

"Capital" expenditure does not include subdivisional works constructed by developers, but does include improvement works for which a financial contribution or cost sharing mechanism applies.





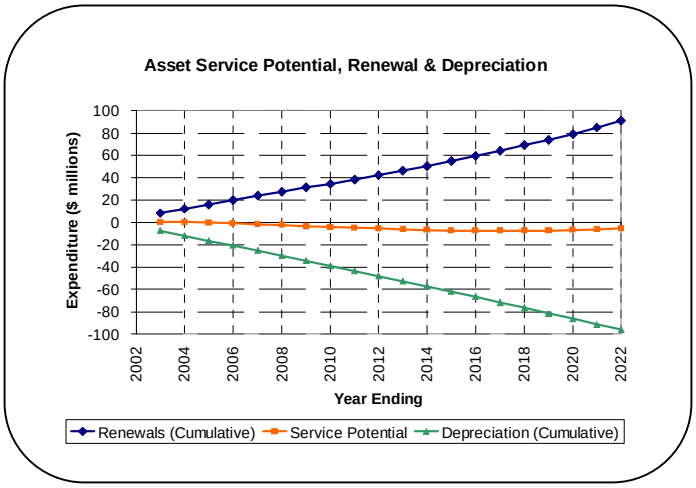
Service Potential and Asset Valuation

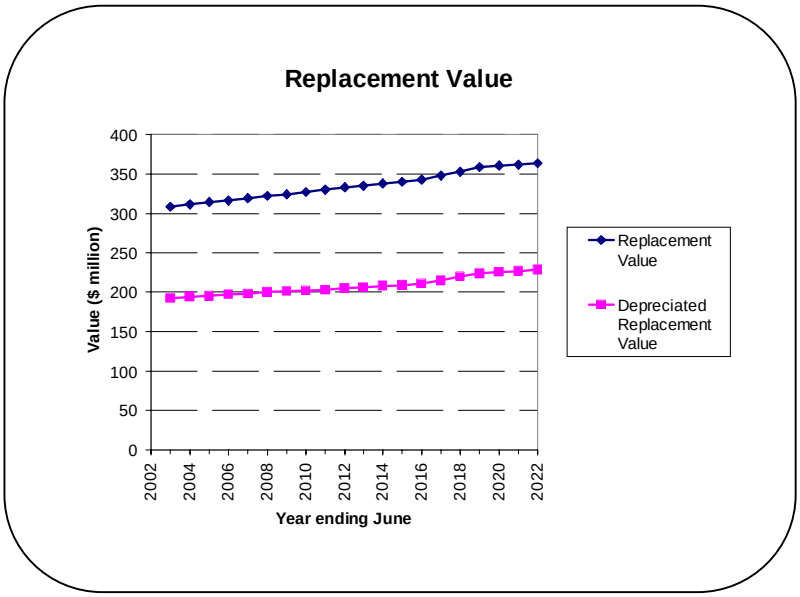
In accounting terms, the decline (or gain) in service potential is defined as the value of renewals less depreciation.

Depreciation based on the latest valuation (as at 30 June 2001) is projected to closely track the actual volume of asset renewal work undertaken, and a small "decline in service potential" is anticipated over the 20 year period.

This is expected, as there will be a number of new assets created during the period that will not require renewal, but on a "straight line depreciation" basis must be depreciated annually in proportion to their expected total life.

With the overall growth in new assets over the period, an increase in total asset replacement value of 18% to $355 million is anticipated. This includes $21 million of new assets installed within new subdivisions and vested in the City.



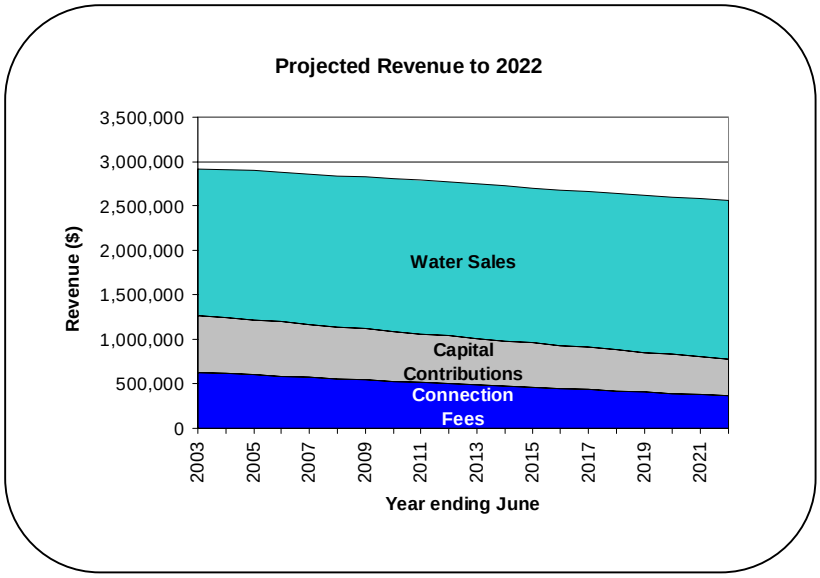


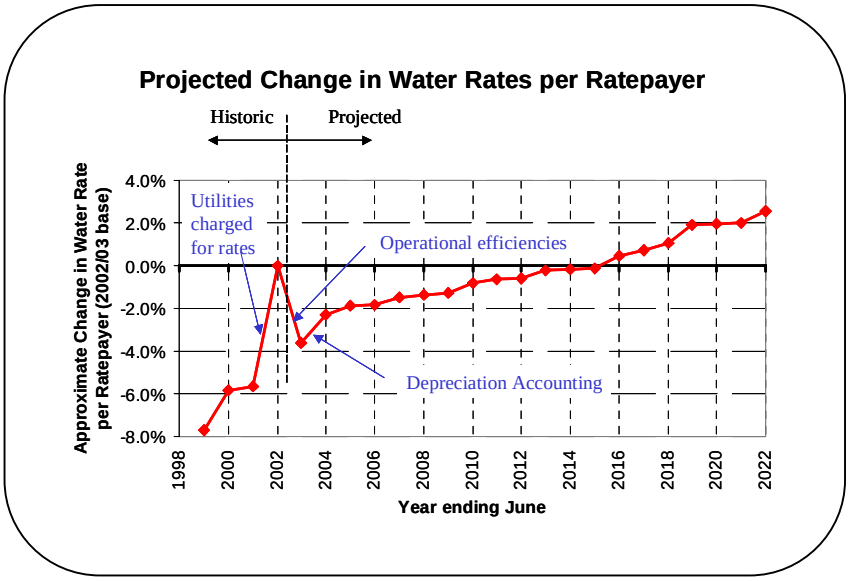
Revenue

Revenue is provided from several sources, as shown.

These include recoveries for new customer connections, cost sharing and capital contributions for improvements required as a result of new subdivisions, and sales of water to commercial customers. Capital contributions and income from connection fees is expected to reduce as urban expansion slows. This is anticipated to be partly offset by growth in commercial use.

It is expected that the average water rate per ratepayer will increase gradually over the next 15 to 20 years, being lower for the next 15 years than in the 2001/02 financial year.





Measuring Our Performance

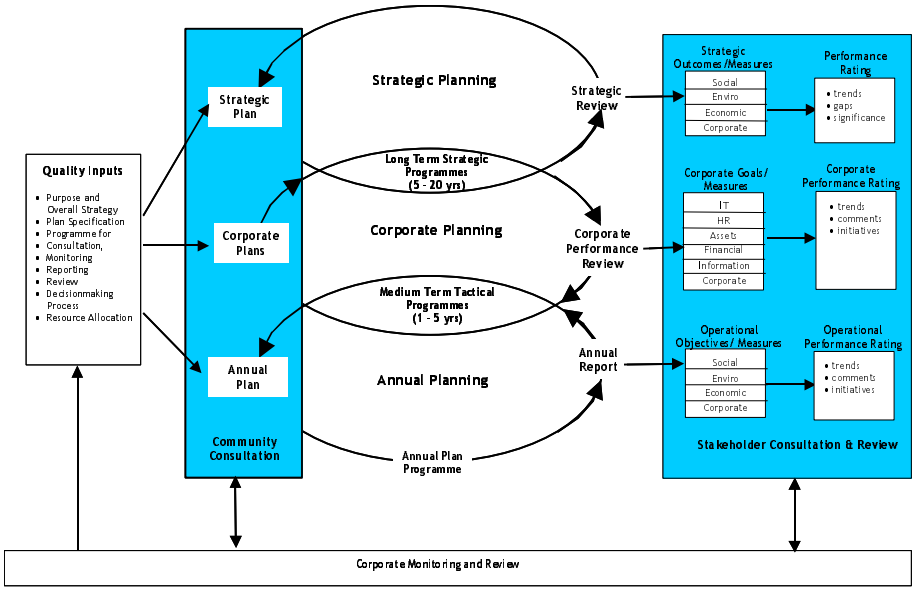
Performance can be measured at three levels, long term strategic, medium term tactical and short term annual.

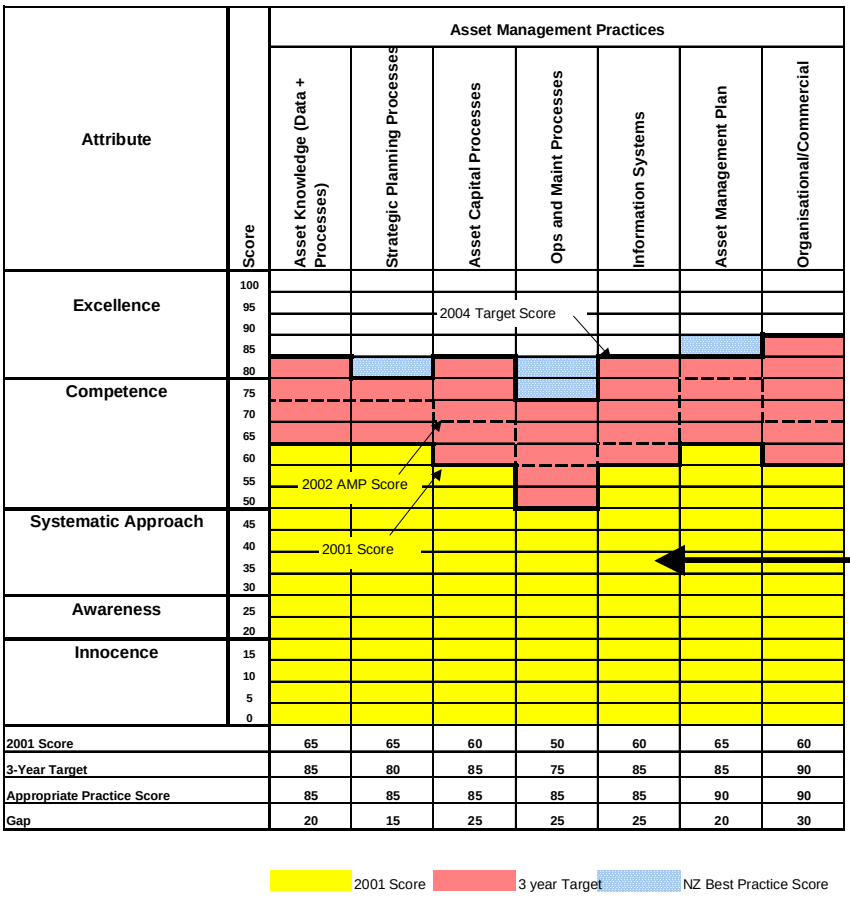
The AM Plan provides measures for:

- Triple bottom line outcomes
- LOS achievement
- Network measures
- Legislative standards
- Financial measures, including value for money, and
- Satisfaction ratings

This diagram shows how these planning cycles are linked.

It is intended that an annual report covering asset management performance will be





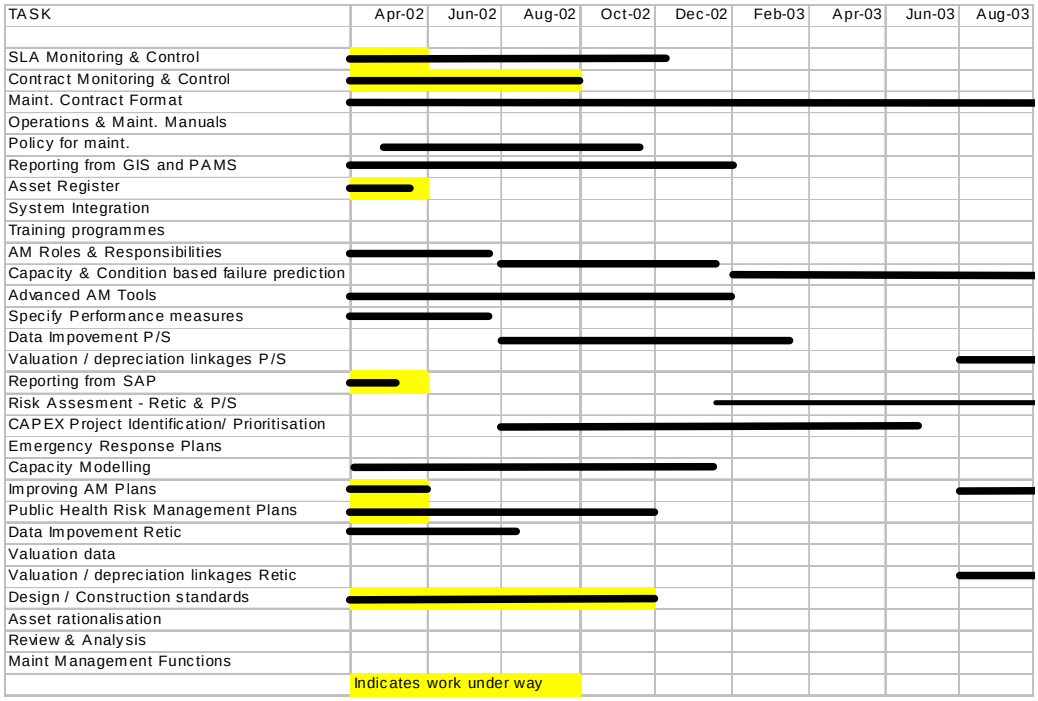
The annual report on asset management for water supply assets will cover:

- Achievement of levels of service
- Scope and value of assets
- Asset condition trends
- Asset utilisation and performance
- Useful life remaining
- Service potential and asset consumption
- Expenditure
- AM Improvements

Gap Analysis of AM Practices

The gap analysis chart summarises the position of Water Supply asset management practices, as at mid 2001 and currently. It is expected that achievement of the key Improvement Plan tasks below will over the next three years bring performance close to NZ best practice.

Asset Improvement Programme



Appendix – Water Supply System Overview Map