ASSET MANAGEMENT PLAN 2022-2032

Central Tablelands Water

This document has many parts based upon the March 2015 report completed by HydroScience Consulting. It also uses parts of the Institute of Public Works Engineering Australasia (IPWEA) Asset Management Plan template 2020.

EXECUTIVE SUMMARY

General

Central Tablelands Water (CTW) asset management plan has been developed to describe how CTW manages its water supply assets to meet its responsibilities in a cost effective manner. It also provides guidance on how CTW plans to enhance its asset management to move from core asset management systems to more advanced systems.

This asset management plan is a key component in CTW's asset management system for water supply. The system comprises asset policy, asset strategy and this plan. The asset management plan is the blueprint for the operation and maintenance and capital works of physical assets over their entire life cycle and links to CTW's Long Term Financial Plan, which typically considers a 10 year planning period. It supports Council in meeting the current and future levels of service (LOS) and regulatory requirements at an optimum asset life cycle cost.

Water Supply

CTW operates three water supply systems servicing the towns and villages in Blayney, Cabonne and Weddin Shire Council local government areas (LGAs). CTW also supplies bulk water to Cowra Shire Council to service the villages of Woodstock and Gooloogong.

CTW is responsible for the installation, maintenance and operation of the water supply infrastructure including Lake Rowlands Dam, bores, two water filtration and treatment plants, trunk and reticulation mains networks, reservoirs, pump stations and associated hydrants and valves.

Levels of Service

CTW has defined levels of service (LOS) that detail the standards that the water supply systems will deliver to customers. CTW's objectives are summarised below:

- To provide water supply services to customers in accordance with acceptable LOS;
- To build on reputation as a reliable, sustainable and regional water utility service provider;
- To offer a comprehensive service in the location, treatment, storage, movement and delivery of water and associated services, and
- Meet the 2011 Australian Drinking Water Guidelines.

The full water supply LOS descriptions are included in Section 5.

Lifecycle Management

Lifecycle management details how CTW plans to manage and operate its water infrastructure assets at the agreed levels of service while managing life cycle costs.

CTW maintains asset and mapping registers that are updated on a regular basis. These registers include important information about each asset including asset condition and remaining useful life.

Other important parts of lifecycle management are operational, maintenance, renewal and acquisition plans that need to align with the Long Term Financial Plan (LTFP). CTW's LTFP indicates the capital investment to expand its asset base through new assets and asset renewal to meet future demand and current levels of service.

Future Demand

The factors influencing future demand and the impacts they have on service delivery are created by:

- Population growth
- Climate change

These demands will be approached using a combination of managing existing assets, upgrading existing assets and providing new assets to meet demand. Demand management practices may also include a combination of non-asset solutions, insuring against risks and managing failures. CTW has recently adopted a new Demand Management Plan in 2021.

Risk Management

The 2015 asset management plan applied a risk assessment tool to assess the importance of major assets in meeting the LOS. A high level asset criticality assessment was used to identify the critical asset systems prioritised based on likelihood and consequence of system failures. According to the water supply level 3 assets critically assessment from 2015 (see Section 8) CTW has identified three very high risk assets which require appropriate operation, scheduled maintenance and capital investment. The high risk assets are:

- Lake Rowlands Dam
- Gravity main from Lake Rowlands to Carcoar water filtration plant
- Trunk main "K" transfer water from Trunk Main C to Grenfell North Reservoir

From this CTW has renewed and upgraded Trunk Main K (2016-2020), and the higher risk now is Trunk Main C feed to Trunk Main K.

Financial Summary

Costs occur in all phases of an asset's life. These include the initial capital investment, followed by annual operation and maintenance (O&M) costs and investment in renewals at regular time intervals, depending on the type of assets. Maintaining a sustainable long term approach to asset planning requires preparation of a long term financial plan (LTFP).

Investment in asset renewal offsets the annual depreciation. That is, renewal investment increases the written down values (WDV) and consequently the Infrastructure renewals ratio. The LTFP indicates capital investment for CTW to renew many aging assets such as trunk and reticulation mains.

Improvement Plan

The next steps resulting from this Plan to improve asset management practices are:

- Review customer and technical levels of service more regularly;
- Undertake customer research and expectation levels;
- Undertake risk assessment and criticality of assets review;
- Update and review the high risk critical assets operating rules and procedures;
- Regularly monitor for operations / maintenance costs for acquired assets;
- Develop a disposal plan for impaired / disposed assets; and
- Review Asset Management practices to progress to a more mature system

Contents

1. Introduction

Overview

All NSW Local Water Utilities (LWUs) are encouraged to continually improve their water supply and sewerage businesses according to the best practice guidelines prepared by the former NSW Office of Water in 2007, (now Department of Planning and Environment – Water). Further to this, Central Tablelands Water (CTW) is also required to develop an Integrated Planning and Reporting (IP&R) suite of plans as outlined by the NSW Office of Local Government. One of the plans required in the resourcing strategy is an Asset Management Plan (AMP).

This AMP communicates the requirements for the sustainable delivery of services through management of assets, compliance with regulatory requirements, and required funding to provide the appropriate levels of service over the planning period.

This Plan should be read in conjunction with CTW's planning documents. This should include the Asset Management Policy and Asset Management Strategy, where developed, along with other key planning documents:

- Strategic Business Plan
- Long Term Financial Plan
- Demand Management Plan
- Drought Management Plan
- Development Servicing Plan
- Drinking Water Management System
- Integrated Water Cycle Management (as per NSW Best Practice Framework)

Since 2016 CTW has been developing a core approach to asset management, which has been achieved with the development of a corporate GIS (Geogrpahic Information System) in regard to asset data management, which also holds all financial transactions relating to the assets. Moving forward the organisation is looking to progress towards intermediate and advanced asset maturity.

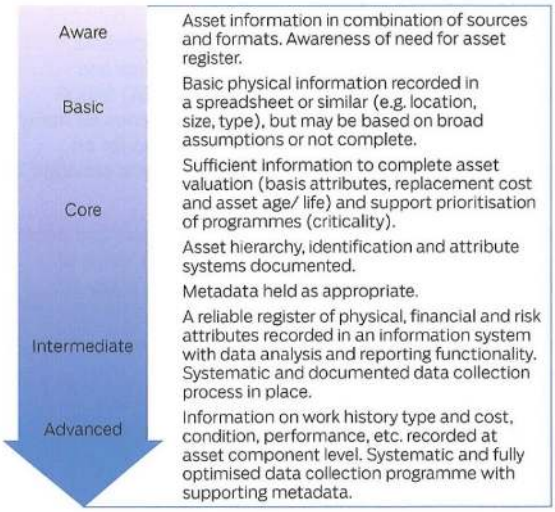


Figure 1.4.1: The Maturity Index for Asset Data Management

(source: International Infrastructure Management Manual (IIMM) 2015)

The infrastructure assets covered by this plan include Lake Rowlands, water treatment plants, reticulation and trunk mains, pump stations, bores and reservoirs. For a detailed summary of the assets covered in this AMP refer to Section 7. These assets are used to provide water supply services. The infrastructure assets included in this plan have a total replacement value of $146.6 million, as of 30 June 2021.

Goals and objectives of asset ownership

Our goal for managing infrastructure assets is to meet the defined level of service (as amended from time to time) in the most cost effective manner for present and future consumers. The key elements of infrastructure asset management are:

- Providing a defined level of service and monitoring performance;
- Managing the impact of growth through demand management and infrastructure investment;
- Taking a lifecycle approach to developing cost effective management strategies for the long term that meet the defined level of service;
- Identifying, assessing and appropriately controlling risks, and
- Linking to a Long Term Financial Plan which identifies required, affordable forecast costs and how it will be allocated.

Key elements of the planning framework are

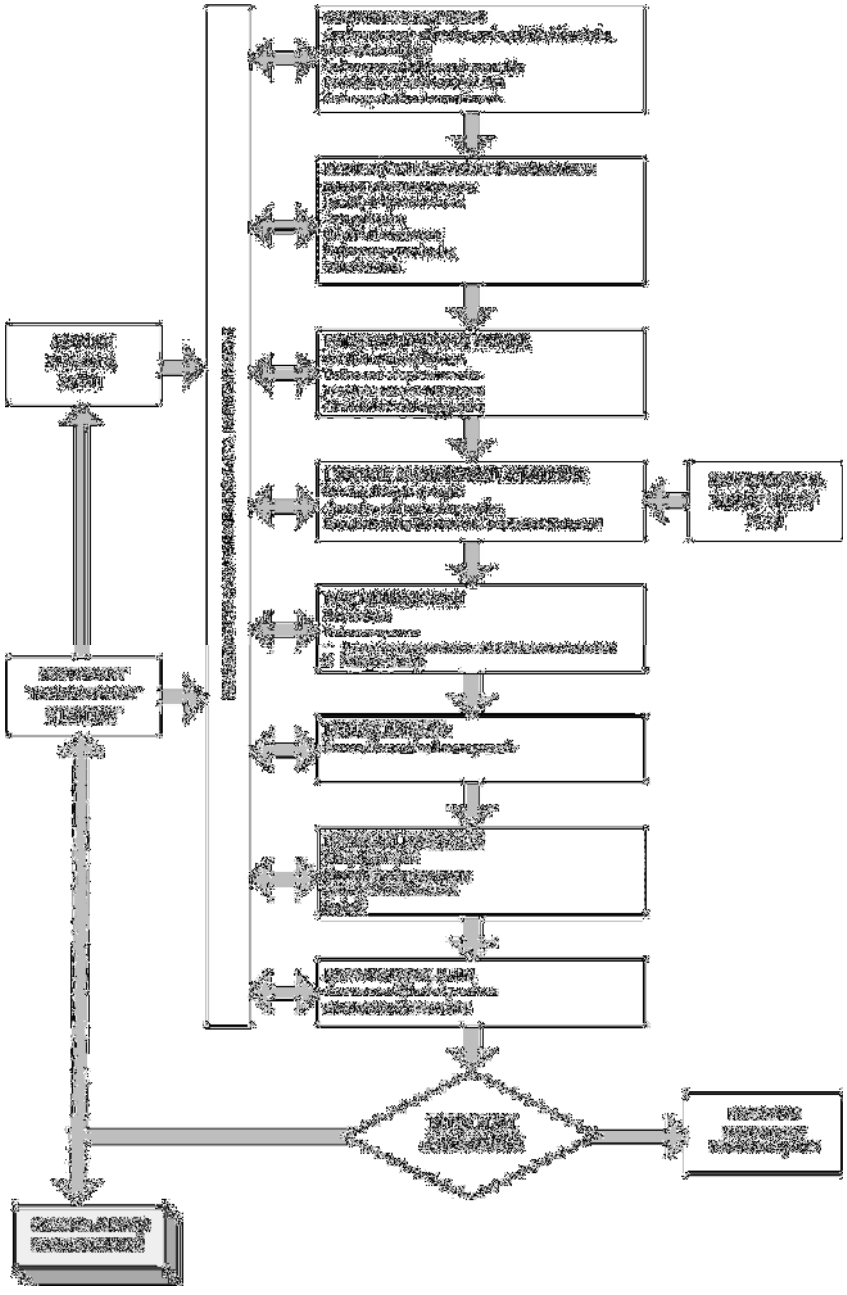
- Levels of service – specifies the services and levels of service to be provided;
- Risk Management;
- Future demand – how this will impact on future service delivery and how this is to be met;
- Lifecycle management – how to manage its existing and future assets to provide defined levels of service;
- Financial summary – what funds are required to provide the defined services;
- Asset management practices – how we manage provision of the services;
- Monitoring – how the plan will be monitored to ensure objectives are met, and
- Asset management improvement plan – how we increase asset management maturity.

Other references to the benefits, fundamentals principles and objectives of asset management are:

- International Infrastructure Management Manual 2015 [1], and
- ISO 55000 [2]

[1] Based on IPWEA 2015 IIMM, Sec 2.1.3, p 2| 13
[2] ISO 55000 Overview, principles and terminology

Road Map for preparing an Asset Management Plan
(Source: IPWEA, 2006, IIMM, Fig 1.5.1, p 1.11)



2. Asset Management Policy

The asset management policy and strategy set the direction and foundation for our asset management system (AMS). The AMS starts at the strategic level (policy and strategy) and then flows through to the operational level (Asset Management Plan, Operation and Maintenance Plans). The Asset Management Plan is then an integral part of CTW's LTFP, Development Servicing Plan, Delivery Plan, Operational Plan and Strategic Business Plan.

The following asset policy for CTW has been developed to ensure that the asset strategy and asset plan satisfy the NSW Office of Local Government Integrated Planning and Reporting (IPR) requirements. The Asset Management Policy also seeks to align CTW's core asset management practices with internationally recognised practices contained within the International Asset Management Standards (ISO 55001).

CTW's vision is to be an independent regional water authority providing a quality water supply reliably and sustainably.

Strategic priority 1 - provide a high quality and reliable drinking water supply.
One of the key components is best practice asset management. CTW is adopting the Asset Management Framework based on ISO 55001 and uses the following four elements:

1. establishing and managing the Asset Management Framework;
2. lifecycle planning and operation;
3. integration with other organisational asset policies, functions, processes, activities and data, and
4. improving and reporting on performance.

Strategic priority 2 – an efficient, sustainable and customer focussed organisation
Key components are quality customer service, sound financial management and continuous improvement whilst managing risk. The Asset Management Framework cannot exist in isolation within CTW and must be an integrated component of the whole organisation. Asset management decisions must have regard to the appropriate balance of cost, risk, performance and levels of service.

The CTW asset management plan identifies customer levels of service, uses risk management and criticality to manage assets, and documents a 10 year long term financial plan to sustain asset renewal and acquisition.

Strategic priority 3 – Regional leadership and collaboration
A key component is regional collaboration and partnerships. CTW is an associate member of Central NSW Joint Organisation (CNSWJO) and a full member of the Water Utilities Alliance (CWUA), participating in opportunities for relevant joint procurement activities, as well as industry knowledge and resource sharing. CTW also collaborates with constituent councils and other water utilities on the governance, management and operation of regional water assets across LGA boundaries.

Responsibilities for asset management within CTW as shown below in Table 1:

Key Stakeholder	Role in Asset Management
Central Tablelands Water Council	• Represent needs of community/shareholders • Allocate resources to meet planning objectives in providing services while managing risks • Ensure services are sustainable
General Manager	• Oversees development and application of all best practice and IP&R documents
Director of Operations & Technical Services	• Develop an review operation, maintenance, renewal and acquisition plans
Director of Finance & Corporate	• Develop and review Long Term Financial Plan
Asset Officer	• Keep GIS and asset register current, including all asset financial transactions, condition of assets and useful lives

Table 1

CTW's asset development, operation and maintenance are the responsibility of the General Manager and Director Operations & Technical Services and are executed by the Water Network Manager, Water Quality Manager and Asset Officer.

3. Asset Management Strategy

The purpose of an asset management strategy is to detail CTW's current status regarding asset management, where it wishes to go and how it is going to get there. CTW is committed to implementing core asset management elements and thereafter progressing towards intermediate and advanced asset management. This strategy and subsequent asset management plan are only for water supply network assets.

Current Status

As of 30 June 2021, the CTW water network comprised of Lake Rowlands Dam, 2 water treatment plants, 5 bores, 45 reservoirs, 29 pump stations, 305 km trunk mains, 268 km reticulation mains, 3 automatic fillings stations and telemetry.

The financial status of CTW water assets are shown in Table 2 below – using 2020/2021 financial year information:

Water Supply asset	Current Replacement Cost	Written Down Value	Depreciation
Trunk Mains	$59,211,286	$30,097,252	$29,114,034
Reticulation Mains	$29,455,221	$16,872,446	$12,582,775
Reservoirs	$13,955,660	$5,424,312	$8,531,348
Pump Stations	$7,250,075	$4,167,695	$3,082,380
Bores	$333,785	$111,755	$222,030
Filtration Plants	$15,813,806	$9,109,354	$6,704,451
Telemetry	$492,713	$185,543	$307,170
Dams	$19,967,919	$10,244,898	$9,723,021
Other	$102,743	$97,606	$5,137
Total	**$146,583,209**	**$76,310,862**	**$70,272,348**

Table 2

Figure 1 below shows the replacement values of Council's assets.

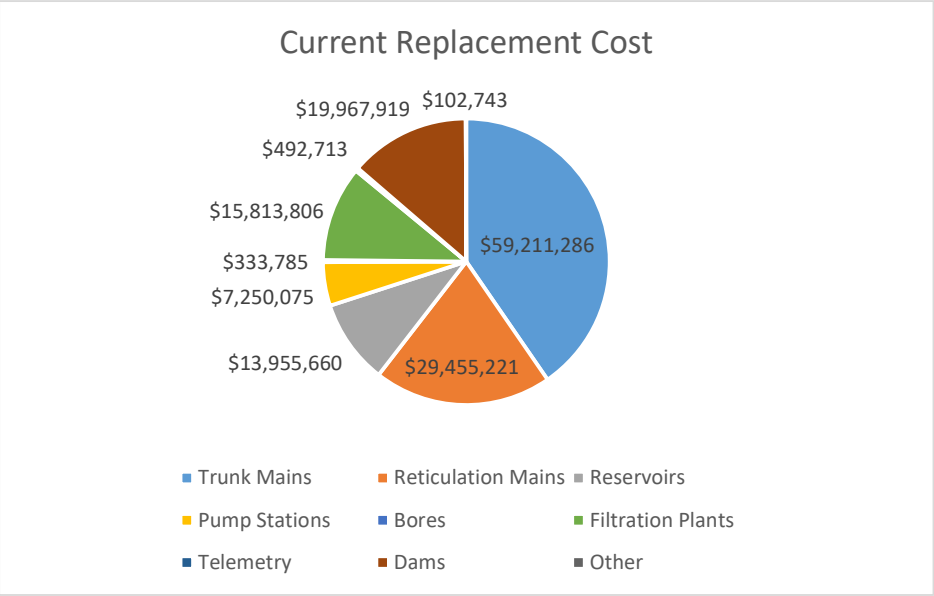


Figure 1

Lifecycle Management

CTW maintains an asset register and GIS (Geographic Information System) that is updated on a regular basis, and includes the condition and remaining useful life of each asset.

Life cycle costs (or whole of life costs) are the average costs that are required to sustain the service levels over the longest asset life. Life cycle costs include operating and maintenance expenditure and asset consumption (depreciation expense). The yearly life cycle costs for CTW assets are shown in Table 3 - using 2020/2021 financial year figures.

Water Supply asset	Maintenance and Operations cost	Depreciation cost	Lifecycle cost ($ / yr)
Trunk Mains	$250,373	$958,927	$1,209,300
Reticulation Mains	$488,975	$316,660	$805,635
Reservoirs	$111,413	$182,689	$294,102
Pump Stations	$287,880	$222,501	$510,381
Bores	$39,858	$8,866	$48,724
Filtration Plants	$599,310	$416,367	$1,015,676
Telemetry	$75,108	$20,051	$95,159
Dams	$97,132	$204,384	$301,515
Other	$4,960	$5,091	$10,051
Total	**$1,955,008**	**$2,335,535**	**$4,290,543**

Table 3

Asset condition

Figure 2 shows the condition of Council's assets

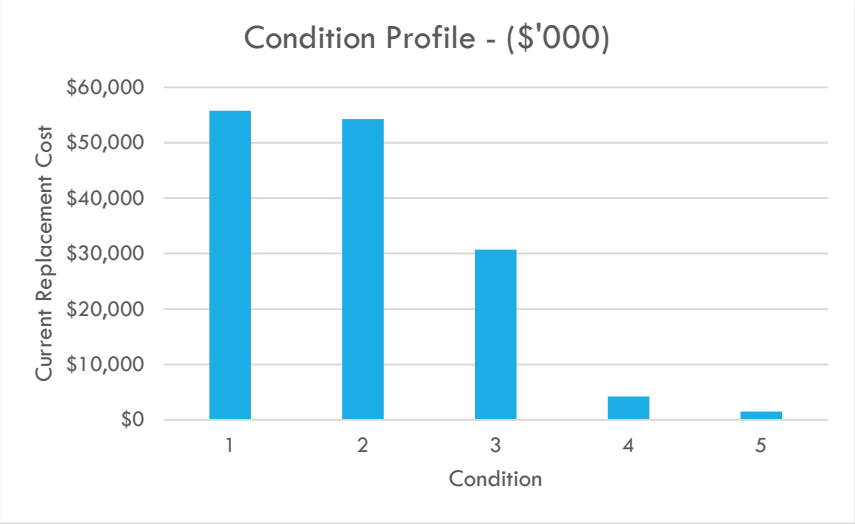


Figure 2

The majority (95%) of Council's infrastructure assets are in condition 3 or better, with less than 5 percent in condition 4 or 5.

The condition of CTW's assets is monitored throughout their lifecycle to ensure they are meeting service requirements. Regular condition assessments are completed, and a full valuation and condition assessment of assets has just been completed by Australis Asset Advisory Group. The condition ratings are linked to age of assets and maintenance records to assist assessment of asset remaining life, serviceability and renewal cycles. The condition of assets naturally deteriorates with age and is impacted through maintenance and renewal activities. Poor maintenance of assets and delay in renewal can adversely impact the life of the asset. Depending on the level of criticality assigned, the aim should be to rehabilitate the asset before it reaches a condition rating of 5 – Very Poor.

Levels of service

Levels of service can be broken down into customer levels of service and technical levels of service, one being dependent on the other. The more technical levels of service are detailed in Section 5 of the asset management plan.

The Customer Levels of Service are considered as follows:

Condition	How good is the service? What is the condition or quality of the service?
Function	Is it suitable for its intended purpose …. Is it the right service?
Capacity/Use	Is the service over or under used … do we need more or less of these assets?

In Table 3 under each of the service measure types (Condition, Function, Capacity/Use) there is a summary of the performance measure being used and the current performance.

These are measures of fact related to the service delivery outcome (e.g. number of occasions when service is not available) to provide a balance in comparison to the customer perception that may be more subjective.

Type of Measure	Level of Service	Performance Measure	Current Performance
Condition	Availability of water service	No. of main breaks / leaking service	For 20/21 FY, 23.5 breaks/leaks per 1,000 properties connected
	Water Quality	No. water quality complaints, meets ADWG 2011	For 20/21 FY, 4 complaints per 1,000 properties connected, currently meeting ADWG 2011
Function (Urban areas)	Minimum flow rate – for domestic customer 15L/min	No. of no water complaints	For 20/21 FY, 0.5 complaints per 1,000 properties connected
	Pressure – min pressure when delivering 15L/min – 20m head	No. of low pressure complaints	For 20/21 FY, 1.7 complaints per 1,000 properties connected
Capacity	New service connections / subdivisions can be provided with required flow rate / pressure	Monitoring existing network	Meeting existing service levels, monitoring with flow sensors

Table 3: Customer Levels of Service Measures

Future Demand

The factors influencing future demand and the impacts they have on service delivery are created by:

- Population growth, and
- Climate change

These demands will be modelled using a combination of managing existing assets, upgrading existing assets and providing new assets to meet demand. Demand management practices may also include a combination of non-asset solutions, insuring against risks and managing failures. CTW has recently adopted a new Demand Management Plan in 2021.

Risk Management

The highest priority asset systems for action are those with consequence and likelihoods ratings within the high risk range in the risk matrix. From the 2015 risk and critically assessment of assets, CTW only identified three assets that come under this category, such as:

- Lake Rowlands Dam
- Gravity main (Trunk Main A) from Lake Rowlands to Carcoar WTP
- Trunk Main "K" transfer water from Trunk Main "C" to Grenfell North

From this, CTW has renewed and upgraded Trunk Main K (2016-2020), and the higher risk is now referred back to Trunk Main C that feeds the augmented Trunk Main K.

For the asset systems with high risk ratings, it would be expected that scheduled maintenance processes and systems with moderate risk ratings would be applied with unscheduled breakdown approaches or where, as in the case of buried pipelines, scheduled maintenance approaches are technically more difficult.

CTW will continue to review and conduct a risk analysis and criticality assessment in the future to include new and renewed assets since 2015.

Financial summary

At the beginning of every financial year CTW adopts a new LTFP for the next 10 years. This highlights our renewals program as well as capital investment for growth. There is always a trade-off between one-off Capital Expenses and ongoing Operation and Maintenance costs. It is believed that increased capital investment in renewing aged assets would provide lower operational costs and lower depreciation costs, whilst enabling assets to continue to operate at an acceptable level of service.

Estimated available funding for acquisitions, renewals, and maintenance/operations of infrastructure assets in the 10 year period is $88,887,711 or $8,888,771 on average per year as per the LTFP. The infrastructure reality is that only what is funded in the LTFP can be provided.

Improvement plan

To improve asset management practices CTW have identified the following processes:

- Review customer and technical levels of service more regularly;
- Undertake customer research and expectation levels;
- Undertake risk assessment and criticality of assets review;
- Update and review the high risk critical assets operating rules and procedures;
- Regularly monitor for operations / maintenance costs for acquired assets;
- Develop a disposal plan for impaired / disposed assets, and
- Review Asset Management practices to progress to a more mature system

4. Water Supply Network

4.1 Overview

CTW operates a network that has three water supply systems, servicing the towns and villages in Blayney, Cabonne and Weddin Shire Council areas for over 6,000 properties. CTW also supplies bulk water to Cowra Shire Council to service the villages of Woodstock and Gooloogong. Blayney and Carcoar water supply systems source water primarily from Lake Rowlands, supplemented by water from bores at Gooloogong in peak demand periods. Quandialla is a stand-alone bore operated system.

CTW water supply schematic diagram is shown in Figure 3.

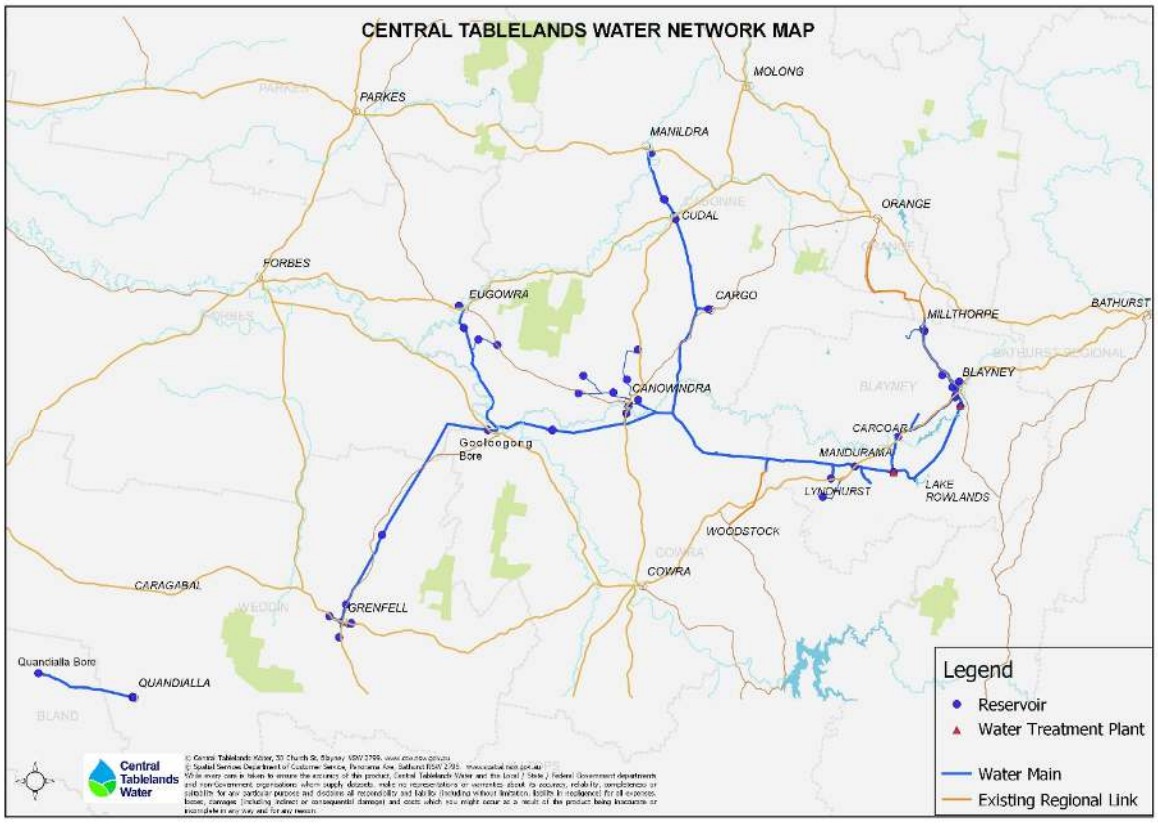


Figure 3: Map of CTW network

4.2 Source water

Lake Rowlands is the primary water source that supplies water to Carcoar and Blayney water supply systems. Lake Rowlands lies within the north eastern region of the Lachlan catchment as seen in Figure 3 – CTW network map. It is located 16 km south west of Blayney township and 7 km south east of Carcoar township and has a catchment area of 197 km^2.

Within the Lake Rowlands catchment, the most extensive land use is sheep farming. To protect raw water quality, Blayney Shire Council has declared the Lake Rowlands catchment as a drinking water catchment area and putting in place land-use restrictions. In addition to this, Lake Rowlands has been fully fenced around its perimeter to prevent stock and wildlife access. To avoid stratification, CTW has installed perforated hoses at the bottom of the Lake, through which compressed air is pumped to promote destratification of water layers. (Source: CTW Drinking Water Management System, Sept 2018)

Groundwater flow within the CTW supply area is drawn mainly from the Lachlan and South Western Fractured Rock aquifer, which is part of the Lachlan Fold Belt (Figure 4). Blayney Well, Gooloogong, Bangaroo and Cudal bores draw from this aquifer, although only the Gooloogong bores are in regular use during peak demand periods. Only the Quandialla Bores draw from the Lachlan inland alluvial aquifer (Source – NSW Office of Water, Water Resources and management overview – Lachlan Catchment April 2011).

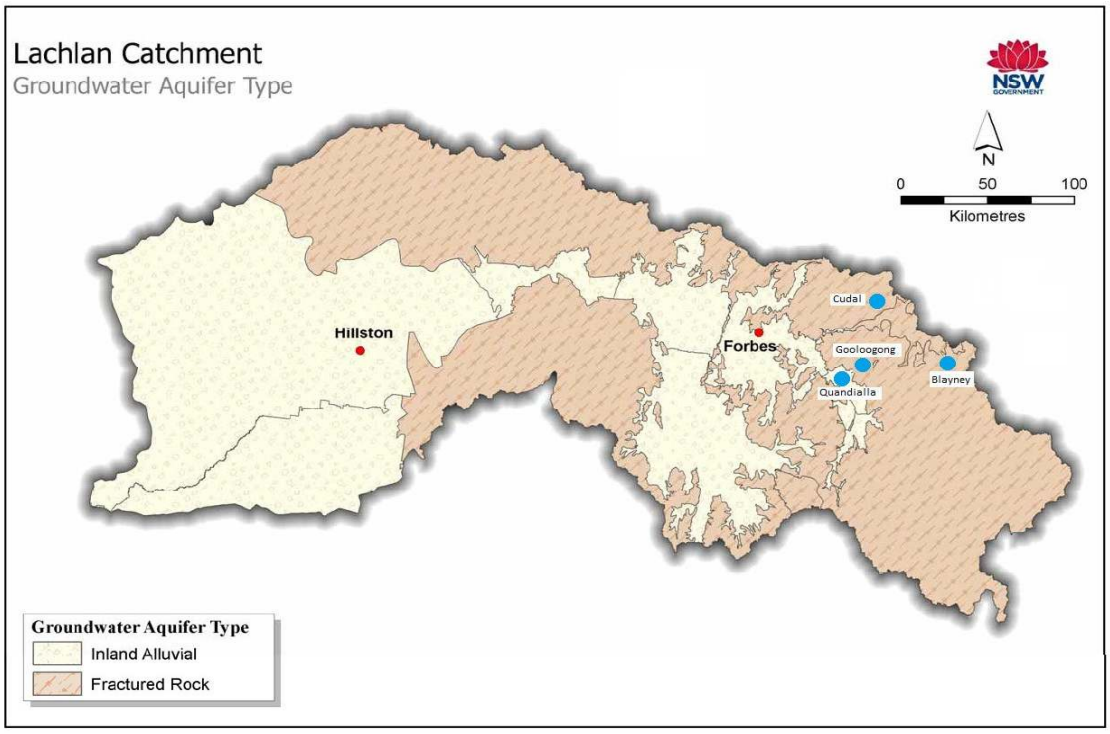


Figure 4

CTW holds water extraction licences for its water sources from NSW DPI – Water under the NSW Water Management Act 2000 and Water Act 1912. The main water source used for CTW's network is Lake Rowlands Dam. Various groundwater bores supplement Lake Rowlands water during summer or under emergency conditions. Quandialla water supply system extracts water from two bores which were commissioned in 2002. CTW water sources and extraction licences are summarised in Table 4 - (Source: CTW Drought Management Plan 2021).

Water Source	Capacity	Extraction Licence ML /yr	Comments
Lake Rowlands	4,500 ML	3,150 ML/yr	Water Supply for Blayney and Carcoar WTP's
Gooloogong (2 bores)	Bore Pump: 3.8 ML/day Bore field rated: 5.0 ML/day	400 ML/yr	Secure source with long term yield
Quandialla (2 bores)	Bore pump: 1.2 ML/day	266 ML/yr	Supplies rural area and town of Quandialla
Cudal	Well: 0.35 ML/day Bore pump: 0.35 ML/day	100 ML/yr	Standby source that must be kept in operating condition
Blayney Well / Blayney Blue Hole	Well: 0.6 ML/day Surface Pump: 1 ML/day	250 ML/yr	Standby source that must be kept in operating condition
Bangaroo	Bore field rated: 3.0 ML/day	472 ML/yr	Not in use

Table 4: CTW Water sources and Extraction licences

4.3 Water Supply Systems

CTW has connected nearly 6,000 properties and provides potable water to a population of approximately 15,000 consumers in 14 towns and villages through 305 kilometres of transfer and trunk mains and 268 kilometres of reticulation mains.

A summary of existing water supply systems is shown in the Table 5 below:

Category	Carcoar	Blayney	Quandialla
Catchment	Lachlan catchment Upper Lachlan alluvium	Lachlan catchment Upper Lachlan alluvium	Upper Lachlan alluvium
Source Water	• Lake Rowlands (primary) • Gooloogong Bore (peak demand supply) • Cudal Bore (emergency) • Bangaroo Bores (emergency)	• Lake Rowlands (primary) • Blayney Well (emergency)	• Quandialla Bore
Treatment	Treatment process at Carcoar WFP: • Coagulation and flocculation • Dissolved Air Flotation (DAF) • Filtration • Disinfection • Fluoridation	Treatment process at Blayney WFP: • Coagulation and flocculation • Clarification • Filtration • Disinfection • Fluoridation	Treatment process at Quandialla supply: • Disinfection
Reservoirs	Thirty three reservoirs in the Carcoar drinking water supply system.	Six reservoirs in the Blayney drinking water supply system.	Six reservoirs in the Quandialla drinking water supply system.
Points of Supply	Blayney Shire: • Carcoar (pop. 200) • Lyndhurst (pop. 310) • Mandurama (pop. 355) Cabonne Shire: • Canowindra (pop. 2,258) • Cargo (pop. 596) • Cudal (pop. 339) • Eugowra (pop. 779) • Manildra (pop 464) Weddin Shire: • Grenfell (pop. 2,573) Cowra Shire: • Gooloogong (pop. 295) • Woodstock (pop. 812)	Blayney Shire: • Blayney (pop. 3,253) • Millthorpe (pop. 1,253)	Weddin Shire: • Quandialla (pop. 150)

Table 5: Overview of CTW Water Supply Systems

For more details on the three water supply systems, refer to CTW Drinking Water Management System, Sept 2018.

4.4 Regulatory requirements

CTW manages its water supply assets to meet customer and stakeholder expectations (defined through regulatory responsibilities) and its water supply levels of services.

The regulatory requirements to manage CTW's water supply systems are summarised in Table 6.

Regulatory or Formal Requirement	Relevance to Drinking Water Quality	Agency
Commonwealth Legislation		
Water Act 2007	Provides for the management of the ground and surface water resources of the Murray-Darling Basin, with particular focus on managing extractions to "protect, restore and provide for the ecological values and ecosystem services of the Murray-Darling Basin".	Murray Darling Basin Authority
Competition and Consumer Act 2010	Replaces the Trade Practices Act 1974 and incorporates Schedule 2 - The Australian Consumer Law. As a "seller" of water, the local council is subject to provisions of Consumer transactions and Consumer guarantees, which guarantees that the goods supplied are reasonably fit for purpose.	Australian Competition and Consumer Commission
NSW Legislation		
Catchment Management Authorities Act 2003	Natural resource management, from planning to operations, is to be undertaken at the catchment level. State-wide standards are to be applied. Catchment Action Plans are used to define key themes for each catchment, each with specific catchment and management targets.	Natural Resources Commission
Dam Safety Act 1978 No 96 *Dam Safety Regulation 2019*	Owners of prescribed dams are required to operate, maintain, extend and report on prescribed dams to the Dams Safety NSW to ensure the safety of their dams. Lake Rowlands is a prescribed dam.	Dams Safety NSW
Environmental Planning & Assessment Act 1979	Requires that the environmental impacts of projects be studied at all stages on the basis of scale, location and performance. Under Part 3 of the Act, Local Environmental Plans (LEPs) are developed to establish what forms of development and land use are permissible and/or prohibited. LEPs ensure that drinking water quality is considered when assessing development applications. The Blayney, Cabonne and Weddin LEPs apply to all lands within their respective council areas.	NSW – Department of Planning and Environment

Regulatory or Formal Requirement	Relevance to Drinking Water Quality	Agency
Fluoridation of Public Water Supplies Act 1957 *Regulation and Code of Practice*	Requirements for testing and reporting where water supplies are fluoridated.	NSW Health
Local Government Act 1993	Local councils have the responsibility for the provision of water supply to consumers, in accordance to the NSW Best Practice Management of Water Supply and Sewerage Guidelines.	NSW Office of Local Government
NSW Groundwater Quality Protection Policy 1998	Manages groundwater resources for sustainable economic, social and environmental uses, with a specific principle to protect town water supplies against contamination. A key recommendation is to develop wellhead protection plans.	Department of Planning and Environment - Water
Water Act 1912	Licences to extract water outside areas covered by water-sharing plans. Affecting alterations to the quantity or quality of water in certain circumstances is an offence. Water Act 1912 is being progressively phased out and replaced by Water Management Act 2000.	Water NSW
Water Management Act 2000	Provides the basis for water planning, the allocation of water resources and water access entitlements. Licences for extraction for the three systems are governed by the provisions of this Act. CTW is part of the Water Sharing Plan for the Lachlan Unregulated River Water Sources 2012 which is under review at present.	Department of Planning and Environment – Water Natural Resources Commission
Work, Health & Safety Act 2011	All CTW operational and maintenance activities are affected by this act. It also specifies conditions for storage and handling of chemicals on-site at water treatment plants	WorkCover Authority of NSW

Regulatory or Formal Requirement	Relevance to Drinking Water Quality	Agency
Guidelines and Programs		
Australian Drinking Water Guidelines 2011	Ensures the accountability of drinking water managers and operators and health authorities and auditors for the supply of safe, good quality drinking water to consumers.	NSW Health
NSW Best-Practice Management of Water Supply and Sewerage Guidelines 2007	Provides for appropriate, affordable and cost- effective services to meet community needs while protecting public health and the environment and making best use of regional resources. Requires a Strategic Business Plan (SBP), including a Financial Plan and associated asset management plans, reviewed and updated every four years; a 30- year Integrated Water Cycle Management (IWCM) plan. CTW has an IWCM and a	Department Industry (Water)
NSW Health Drinking Water Monitoring Program 2005	NSW Health provides analysis of drinking water samples for water utilities, providing an independent analysis of water at point of supply.	NSW Health
NSW Health Response Protocol for management of microbial quality of drinking water 2011	Guides Public Health Units and water utilities in their joint response to rapidly changing source water quality, treatment failure or microbial contamination.	NSW Health
NSW Health Response Protocol for management of physical and chemical quality 2004	Guides Public Health Units and water utilities in their joint response following the detection of physical and chemical water characteristics that exceed the Guidelines. Aesthetic and health related guideline values are considered.	NSW Health

Table 6: Legislation requirements for CTW

5 Levels of Service

CTW has defined levels of service (LOS) that are used to define explicitly the standards required for the supply of water from the perspective of the individual customer. CTW's adopted water supply LOS are summarised in Table 7.

To address the LOS Council applies design criteria to assets. Design criteria for flows and pressure are an engineering consideration and will vary with circumstances, provided that the levels of service are upheld.

- Design criteria for flows: This will be based on adopted strategies, historical use, demographics, end use requirements and demand management. However for domestic non- rural customers CTW targets to provide 15 Litres per minute.
- Design criteria for water supply system pressure: Hydraulic design will aim to achieve a minimum of 20 metre head at the tapping point under peak summer demand

Current Levels of Service	
Availability of Supply	
Normal quantity available	Domestic peak day: 1600 L/tenement/day Domestic annual: 180 kL/tenement/year Total annual average consumption: 1,575 ML/year Total peak daily consumption (potable): 10 ML/day
Fire fighting	100% of urban reticulation area served
Pressure (urban areas)	20m head (minimum when delivering 15 L/min) 60m head (maximum static pressure)
Flow rates	Domestic (non-rural consumers): 15 L/minute Rural consumers: 6.3 L/minute
Consumption restrictions in droughts	See CTW Drought Management Plan
Supply Interruptions	
Planned interruptions (95% of time)	Notice given to domestic and commercial customers: 48 hours Notice given to major industrial and institutional customers: 7 days
Unplanned interruptions (95% of time – urban areas)	Maximum duration of interruption: 12 hours

Current Levels of Service	
Response Time to Customer complaints – defined as time to have staff on site to rectify problem	
Supply failure (99% of time) (95% of time) (95% of time) (95% of time)	Priority 1 - Defined as failure to maintain continuity or quality of supply to a large number of customers or to a critical users at a critical time during working hours: 1 hour outside working hours: 2 hours Priority 2 - Defined as failure to maintain continuity or quality of supply to a small number of customers or to a critical user at a non-critical time during working hours: 3 hours outside working hours: 4 hours Priority 3 - Defined as failure to maintain continuity or quality of supply to a single customers: 1 working day Priority 4 - Defined as a minor problem or complaint, which can be dealt with at a time convenient to the customer and CTW: 1 week
Customer complaints	Personal, oral or written: 5 working days for 95% of complaints
Water Quality – should meet Australian Drinking Water Guidelines (ADWG) 2011	
Microbial quality	Total coliforms: 98% compliance with ADWG Thermo-tolerant coliforms: 98% compliance with ADWG Sampling frequency: 52 samples / week
Physical and chemical characteristics at WTP's	pH: 7.5 Turbidity: <1.0 NTU Fluoride: 1 mg/L Free chlorine (in reticulation): 0.2 mg/L Sampling frequency: 1 sample/day Compliance with physical and chemical parameters: 100%

Table 7: CTW Levels of Service

Note: Levels of Service are the targets which Council aims to meet, they are not intended as a formal customer contract.

6 Future Demand

6.1 Demand Drivers

Drivers affecting demand include things such as population change, regulations, changes in demographics, seasonal factors, vehicle ownership rates, consumer preferences and expectations, technological changes, economic factors, agricultural practices, environmental awareness, etc.

6.2 Demand Forecasts

The present position and projections for demand drivers that may impact future service delivery and use of assets have been identified and documented in the CTW Demand Management Plan June 2021. The main highlight of this plan is to maintain the target demand at 254 L/person/day.

6.3 Demand Impact and Demand Management Plan

The impact of demand drivers that may affect future service delivery and use of assets are shown in Table 5.3.

Demand for new services will be managed through a combination of managing existing assets, upgrading of existing assets and providing new assets to meet demand and demand management. Demand management practices can include non-asset solutions, insuring against risks and managing failures.

Opportunities identified to date for demand management are shown in Table 8. Further opportunities will be developed in future revisions of this asset management plan.

Demand driver	Current position	Projection	Impact on services	Demand Management Plan
Population growth	6,000 connections, 15,000 population	From DMP 16,000 population by 2028	Increase demand on current service levels	From DMP, permanent water restrictions, community education, water loss management
Climate change	Aware of potential impacts – less frequent rainfall, increased drought longevity, increased evaporation	Reduced secure yield from water sources	Possible reduced level of service	Recently adopted Drought management plan, augmentation of water sources, potential bulk water supply from neighbouring councils

Table 8: Demand management opportunities

6.4 Asset Programs to meet Demand

The new assets required to meet demand may be acquired, donated or constructed. Additional assets are discussed in Section 7.

Acquiring new assets will commit CTW to ongoing operations, maintenance and renewal costs for the period that the service provided from the assets is required. These future costs are identified and considered in developing forecasts of future operations, maintenance and renewal costs for inclusion in the LTFP (Refer to Section 9).

6.5 Climate Change Adaptation

The impacts of climate change may have a significant impact on the assets we manage and the services they provide. In the context of the Asset Management Planning process climate change can be considered as both a future demand and a risk.

How climate change impacts on assets will vary depending on the location and the type of services provided, as will the way in which utilities respond and manage those impacts. [3]

As a minimum we consider how to manage our existing assets given potential climate change impacts for our region.

Risk and opportunities identified to date are shown in Table 9.

Climate Change Description	Projected Change	Potential Impact on Assets and Services	Management
Minimum 1°C rise in temperature	Increase evaporation and reduce soil moisture	Reduce runoff into Lake Rowlands Dam, and greater water loss due to evaporation	Investigation to raise dam wall / or new dam for better drought security
More days over 35°C temperature	Increase peak daily demand	To have enough reservoir storage and pumping infrastructure for treated water to cope with increased maximum flow demand	New 12 ML Clearwater reservoir at CWTP site
Decrease in capture of extreme rainfall events	Lower Dam secure yields and higher external demand	Impact on lake levels storage, ability to meet customer LOS	Monitor effectiveness of water restrictions, potential regional augmentation of water sources

Table 9: Managing the Impact of Climate Change on Assets and Services

Additionally, the way in which we construct new assets should recognise that there is opportunity to build in resilience to climate change impacts. Building resilience can have the following benefits:

- Assets will withstand the impacts of climate change;
- Services can be sustained; and
- Assets that can endure may potentially lower the lifecycle cost and reduce their carbon footprint.

Table 10 summarises some asset climate change resilience opportunities.

New Asset Description	Climate Change impact These assets?	Build Resilience in New Works
Replace pumps in pump stations when due for renewal with more efficient pumps	Possible increased run time due to demand need	Integrate solar panel use for electricity to run new pumps

Table 10: Building Asset Resilience to Climate Change

The impact of climate change on assets is a new and complex discussion and further opportunities will be developed in future revisions of this Plan.

[3] IPWEA Practice Note 12.1 Climate Change Impacts on the Useful Life of Infrastructure

7 Lifecycle management

Lifecycle management details how CTW plans to manage and operate its water infrastructure assets at the agreed levels of service (Refer to Section 5) while managing life cycle costs. Lifecycle refers to a "cradle to grave" approach to assets, which includes the following elements: plan, design, construct, acquire, renew, operate, maintain, impair, decommission and disposal.

7.1 Existing assets

Overview

CTW operates three drinking water supply systems, at Blayney, Carcoar and Quandialla. Blayney and Carcoar systems source water primarily from Lake Rowlands, supplemented by water from bores at Gooloogong in peak demand periods. Quandialla is a stand-alone bore operated system. Overall there are 5 bores, 29 pump stations, 45 reservoirs and 573 km trunk and reticulation mains, which service over 6,000 properties in 4 LGA's, covering a wide geographic area in central NSW.

The assets covered by this AMP are shown in Table 11.

Asset Category	Description	Replacement Value ($ `000)
Lake Rowlands	4,500 ML	19,968
Filtration plants	Carcoar 9ML / day, Blayney 5 ML/ day	15,813
Reticulation mains	268 km	29,455
Trunk mains	305 km	59,211
Reservoirs	45	13,956
Pump stations	29	7,218
Bores	5	334
Telemetry	Remote Monitoring and Control of Pumps, Reservoirs and Flow control Actuators.	493
Other – Filling stations	3	103
TOTAL		146,551

Table 11: CTW Water Infrastructure assets

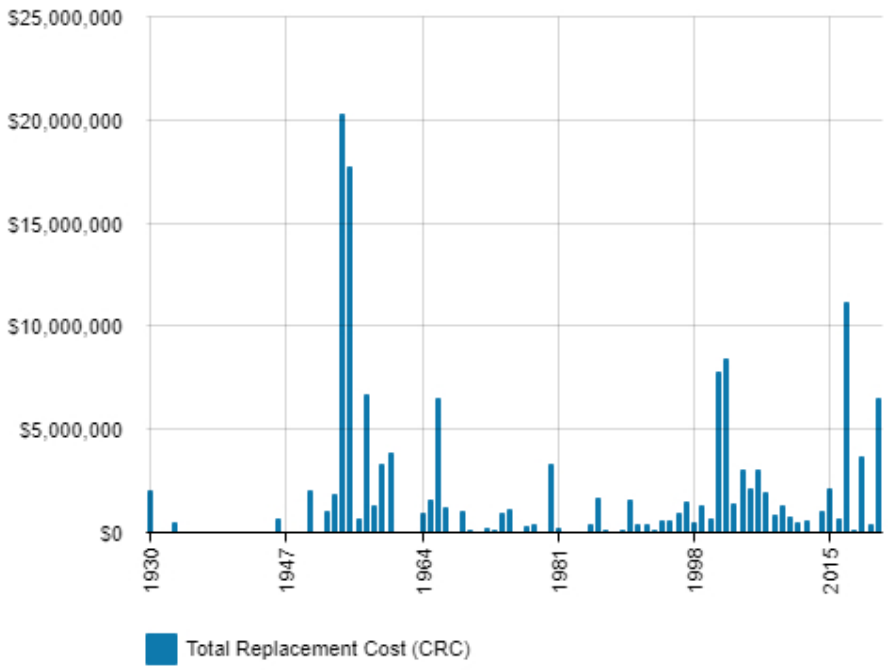


Figure 5: age profile of the assets by replacement cost.

CTW has an aging asset base stemming from the fact that many of the assets were installed in the 1950's and 1960's – eg Lake Rowlands, Reservoirs and Mains. One of the ongoing tasks is for regular condition and maintenance inspections to monitor the asset and to plan for renewal towards the end of its useful life.

For a full listing of CTW assets see appendix A.

7.2 Asset condition

Condition is currently monitored annually, with updates when assets are renewed or part renewed. All assets are assessed in a revaluation year, which for water assets is this year 2021/2022.

Condition is measured using a 1 – 5 grading system [4] as detailed in Table 12.

Condition Grading	Description of Condition
1	**Very good**: free of defects, only planned and/or routine maintenance required
2	**Good**: minor defects, increasing maintenance required plus planned maintenance
3	**Fair**: defects requiring regular and/or significant maintenance to reinstate service
4	**Poor**: significant defects, higher order cost intervention likely
5	**Very poor**: physically unsound and/or beyond rehabilitation, immediate action required

Table12: Condition Grading System

[4] IPWEA, 2015, IIMM, Sec 2.5.4, p 2|80.

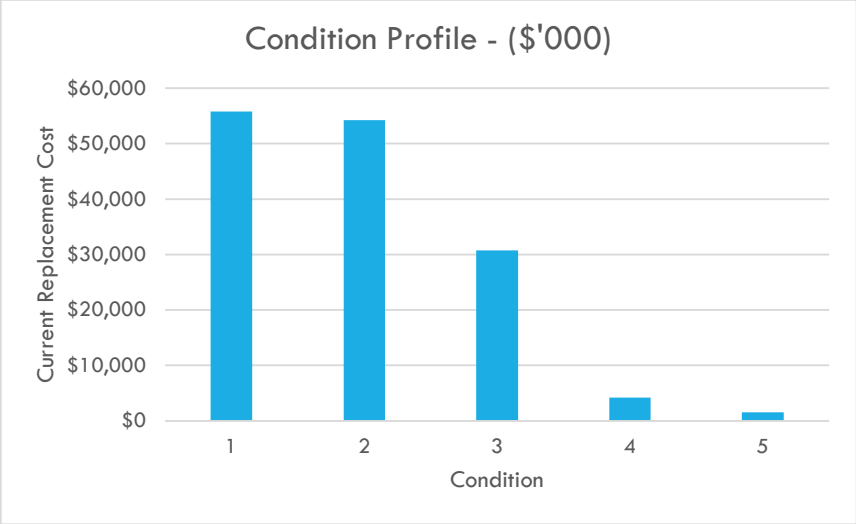


Figure 6: Asset Condition Profile

All current replacement cost values shown above are from 2020/21 financial information.

According to the outcomes of the 2017 CTW assets condition assessment the majority of assets (>95%) were at condition 3 or better. Once an asset is deemed to be at condition 3 – it is flagged to be annually monitored with discussions as to when it may need to be replaced in the next 10 or 20 years or when it reaches condition 4.

From the 2017 condition assessment the following items were rated poor or very poor (condition 4 or 5):

- Lake Rowlands Outlet works – mechanical and electrical
- Carcoar WTP 2.1ML Clear Water tank – civil
- Bangaroo bores north & west – civil, mechanical, electrical
- Bangaroo bore pump station - mechanical and electrical
- Hines Lane pump station – civil
- Old River pumphouse – civil
- Reticulation Mains – Canowindra St, Canowindra – 100mm IT fibro pipe

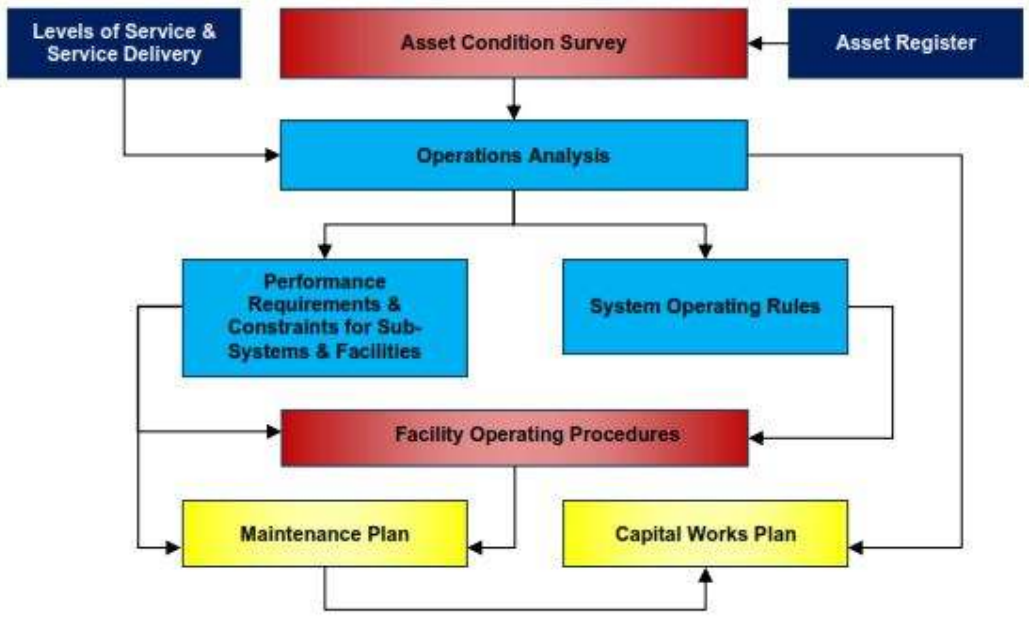
These assets will continue to be monitored by operational staff. At present, Bangaroo bore and pump station are decommissioned, if they are to be used again they will need a complete replacement program to be brought back to an operating condition. Old River pumphouse is a corrugated iron shed that houses a chlorinator and telemetry station. Hines Lane is a brick pit with a small pump inside it. A project is underway to build a new 12ML Clearwater tank at Carcoar WTP. Planning has commenced for the replacement of the 100mm pipe in Canowindra St, Canowindra.
Once CTW receives the condition report from the 2021/2022 revaluation, priorities will be reassessed.

7.3 Operations and Maintenance Plans

The purpose of the operations plan is to ensure that the service objectives are achieved at the least cost and that the impact of any breakdowns or outages is minimised. The operating plan sets out system operating rules and operating procedures for operating the water supply systems and their individual sub-systems. For more details – see CTW's Operation Management Plan 2013.

CTW has been successfully operating its water supply systems for many years. This has been done on the informal basis of operational and maintenance knowledge as well as according to the work method statements and safe operating procedures developed by CTW staff. The work method statements identify safety issues and controls for each task, as well as providing basic operating procedures. A list of work method statements and safe operating procedures apply to CTW's water treatment plants and the whole system are listed in Appendix 2. CTW has a telemetry system available for all the critical control devices. This telemetry information is closely monitored by CTW Managers and the Director Operations and Technical Services. However, CTW's existing work method statements or operating procedures do not discuss the trouble shooting, shut down and restart method of the relevant asset. This can be addressed in the improvement plan.

Operations include regular activities to provide services. Examples of typical operational activities include asset inspection, meter reading, water licence costs, chemical costs and electricity costs.
The purpose of the maintenance plan is to support the operations plan by ensuring that the assets are maintained for "fit and proper purpose." This translates as actual outputs in terms of quality, reliability and availability of the individual sub-systems, facilities. The appropriate assets maintenance will ensure Council meets water supply levels of service in the most cost effective manner. The link between operations, levels of service, maintenance, capital works, asset register can be seen in the flow chart below:



Clearly, if the cost of the scheduled maintenance is very high then this would point towards the need to examine replacing or augmenting the asset, thereby initiating the capital works processes – eg renewal. Similarly if unscheduled maintenance occurs in the same area on a frequent basis, discussions about renewal of the asset would occur.

Maintenance includes all actions necessary for retaining an asset as near as practicable to an appropriate service condition including regular ongoing day-to-day work necessary to keep assets operating. Examples of typical maintenance activities include pipe repairs, mains flushing, and equipment repairs.
Regular inspections or monitoring of assets to assess their condition leads to condition based maintenance. Maintenance can also be scheduled on time based cycles for example weekly, monthly or yearly maintenance (from manufacturers manuals) or by the number of operating hours.

CTW developed an Assets Maintenance Plan in May 2014. To ensure all of CTW's assets are able to meet the required levels of service, CTW maintains a water supply asset register which records the age, type, location and material of the water supply assets managed by CTW including dams, treatment plants, reservoirs, pipelines and telemetry. To ensure the ongoing performance of assets, it is important that inspections are carried out at intervals whose frequencies are appropriate to the age, condition and importance of the relevant asset. The Asset Maintenance Plan (May 2014) details the inspection schedules of all water supply assets managed by CTW (see Table 13).

Asset Type	Frequency	Task
Dams	Annually	DSC inspection
	5 Yearly	Produce a formal Surveillance report
Filtration Plants	As per WTP Manual	As per WTP Manual
Pump Stations	Weekly	Visual and safety inspection
Reservoirs	Annually/ 3 yearly	Clean out
Trunk Mains	As necessary	Break down maintenance
	Yearly	flushing
Chlorinators	As per manual	Routine inspections and servicing on an annual basis
Telemetry	Quarterly	Test, calibrate and repair
Meters	As required	Replace
Electrical	As required	Repair
Building and Structures	As required	Repair

Table 13: Overview of CTW Scheduled Maintenance for Water Supply Assets

Based on the overview at Table 13 and the criticality assessments (Section 8), identified priorities of which a program of scheduled maintenance system enhancements will be developed.

As discussed in Section 8 high criticality areas of the asset system will be focused on to achieve levels of service. If the operational plans and procedures cannot meet levels of service, then maintenance protocols and procedures will need to be developed. This is especially for the high priority asset systems identified from the criticality assessment. It is most likely that frequent scheduled maintenance would be applied to key component assets that have been deemed to be the most likely source of prolonged and/or frequent failure that have a high impact. Such high priority scheduled maintenance would be documented as scheduled maintenance procedures with a focus on the outcome that ensures the asset is "fit for purpose" at the completion of the task and documents key asset data.

Forecast operations and maintenance costs are expected to vary in relation to the total value of the asset stock. If additional assets are acquired, the future operations and maintenance costs are forecast to increase. Lifecycle costs also include annual depreciation, which can vary depending on the amount of renewals and acquisitions. Table 14 shows the forecast lifecycle costs budgeted for in the LTFP.

Year	Maintenance	Operations	Depreciation	Lifecyle cost
2022/23	2,060,720	855,407	2,250,000	5,166,127
2023/24	2,109,224	904,195	2,272,500	5,285,919
2024/25	2,157,118	934702	2,395,225	5,487,045
2025/26	2,200,260	962,743	2,419,177	5,582,180
2026/27	2,244,266	991,625	2,603,369	5,839,260
2027/28	2,289,151	1,021,374	2,679,403	5,989,928
2028/29	2,334,934	1,052,015	2,706,197	6,093,146
2029/30	2,381,633	1,083,576	2,783,259	6,248,467
2030/31	2,429,265	1,116,083	2,911,092	6,456,440
2031/32	2,477,851	1,149,566	2,940,403	6,567,819

Table 14: Asset lifecycle costs

7.4 Renewal and Acquisition

Renewal is major capital work which does not significantly alter the original service provided by the asset, but restores, rehabilitates, replaces or renews an existing asset to its original service potential. Work over and above restoring an asset to original service potential is considered to be an acquisition resulting in additional future operations and maintenance costs.

CTW has recently updated the 10 year capital works program which is included in Appendix B. Council is committed to reviewing its capital works program annually to ensure the provision of future assets are adequate to meet the levels of service.

CTW can develop capital works prioritisation criteria and business case processes that will ensure all significant projects are assessed against other projects in terms of how they address improvements in CTW's levels of service or reduce operational or maintenance costs. It is possible to prioritise capital works by identifying assets or asset groups that:

- Have a high consequence of failure;
- Have high use and subsequent impact on users would be significant;
- Have higher than expected operational or maintenance costs, and
- Have potential to reduce life cycle costs by replacement with a modern equivalent asset that would provide the equivalent service. [5]

Forecast renewal costs are projected to increase over time if the asset stock increases. The forecast costs associated with renewals are shown relative to the proposed renewal budget in Table 15, along with the Acquisition budget. Forecast renewal costs are based on assets that have zero remaining years on their useful life according to the assets database with the cost being 2020/21 current replacement values. The remaining useful life of assets is reviewed every year, and updated at every full revaluation year. The remaining useful lives will be updated when we get the information for the recently completed revaluation by Australis.

[5] Based on IPWEA, 2015, IIMM, Sec 3.4.5, p 3|97.

Year	Renewal Forecast	Renewal Budget	Acquisition budget	Comment
2022	1,839,835	1,273,211	540,000	New assets – Renewable energy infrastructure, Retic mains renewal
2023	22,494	609,307	194,500	Retic mains renewal
2024	680,551	5,231,451	4,985,000	Lake Rowlands upgrade - half renewal half acquisition
2025	810,795	4,238,145	4,040,000	Lake Rowlands upgrade - half renewal half acquisition
2026	735,507	439,889	1,205,000	New bore at Gooloogong
2027	706,786	4,088,486	1,847,200	TM C upgrade - 2/3 renewal 1/3 upgrade
2028	1,601,946	5,040,337	1,667,200	TM C upgrade - 2/3 renewal 1/3 upgrade
2029	2,037,794	1,362,943	207,500	Carcoar WTP Mechanical and Electrical renewal
2030	2,606,728	3,632,406	2,385,000	Blayney WTP renewal, TM U upgrade - half renewal half acquisition
2031	328,285	10,926,928	2,217,500	Blayney WTP renewal, TM U upgrade - half renewal half acquisition

Table 15: Renewal forecast costs and renewal and acquisition budget figures from LTFP

The large renewal forecasts for 2022/23 are predominantly renewal of reticulation AC pipe. Similarly 2027 to 2030 are predominantly renewal of Trunk Mains.

The acquisition in the assets system in 2022/23 will show an extra $5,760,000 approx. for newly commissioned assets – Carcoar WTP 12 ML reservoir and the new pump station at Woodstock, which have been funded in previous financial years.

7.5 Disposal

Disposal includes any activity associated with the disposal of a decommissioned asset including sale, demolition or relocation. At present CTW does not have any disposal plan. This is because any renewals in recent times have mainly been mains pipe, whereby the old pipe is left in situ, so the only costs are depreciation costs which are not part of the asset plan. A disposal plan for bigger infrastructure eg reservoirs or treatment plants could be looked at as part of the Improvement plan.

8 Risk Management [6]

8.1 General

One of the key factors in deciding how to manage assets is to understand the importance of those assets in assisting the organisation to meet its regulatory and levels of service responsibilities. Risk assessment offers a tool to assess this. In particular, criticality analysis offers a form of risk assessment that focuses on key asset system components.

To assess the criticality of assets for CTW water supply, a preliminary criticality analysis was performed in September 2014. The following section describes the methodology and the outcomes of this analysis.

In asset management asset "levels" refer to the approximate level of detail in which the assets are examined. At CTW Level 1 would include all of CTW's water assets. Level 7 might be individual valves or reticulation pipes.

Another key issue is what type of asset failures need to be considered to identify criticality. Typically in a preliminary criticality assessment, a major failure would be assumed to throw asset importance into higher relief.

8.2 Methodology

The following definitions are within in the criticality analysis:

- **Consequence of Failure:** Refers to the severity of the impact of a failure in an asset
- **Likelihood of Failure:** Refers to the probability that the asset will fail
- **Worst Case Scenario (Criticality):** Select worst case situation of failure of asset which could not meet the CTW's LOS targets

8.3 Asset Level

For the preliminary criticality analysis at CTW, the focus was to examine CTW's Level 3 water supply assets. Some examples to illustrate this follow:

- **Level 1:** All water supply systems assets in CTW
- **Level 2:** Independent systems e.g. Blayney, Carcoar and Quandialla water supply systems
- **Level 3:** Independent systems sub-components e.g. Blayney water treatment plant, Carcoar water treatment plant, individual trunk mains, individual reservoirs, individual pumping stations, etc.

Assessment below Level 3 criticality assessments may entail application of probable failure modes to allow for likelihood of failure of parallel systems; such as duty and backup pumps etc. To usefully perform such an analysis would require good breakdown history. At this point in the development of CTW's Asset Management Plans this approach is considered too complex and detailed for a core asset management plan.

[6] This section is the same as Section 7.2 in the CTW 2015 AMP prepared by Hydroscience.

8.4 Definition of the Failure Event

For this criticality analysis the standard event that was considered was for each Level 3 asset sub-system and the following questions were asked:

What would be the consequence for each levels of service element of their failure of the Level 3 system for a week in summer?

- Failure meant inability to meet the levels of service or regulatory requirements CTW is targeted on achieving. The magnitude of such a consequence was assessed as described in bookmark51 Table 13
- What is the likelihood of this failure occurring in this level 3 asset system? The likelihood was assessed as described in Table 16.

8.5 Criticality Assessment

Consequence of Failure for Water Supply

Six consequence factors for CTW's consequence analysis within the document are as described below:

- Pressure (20-60 m)
- Domestic Peak Demand (1.6 kL/d/tenement)
- Supply Interruption (Unplanned):

12 hours per event less than 2 times per year per customer

- Fire Fighting supply:

Compliance with the water supply investigation manual

- Water Quality meets Australian Drinking water Guidelines (ADWG) (2011)
- Environmental Incidents

Table 13 below shows the definitions used for assessing the specific consequence of failure if the system failed for a week in summer. Consequence was assessed on a logarithmic scale, decreasing in factors of 10, from 1 (Insignificant) up to 5 (Catastrophic). The example definitions in the table relate to each of the consequence factors (columns) included in the analysis.

Most of the levels of service were included as consequence factors for the analysis. However, it was decided to leave LOS for drought and response times out as drought was an acute issue handled as an emergency and response time overlapped with supply interruption.

Consequence of Failure	Pressure (12-90m)	Peak Demand (Domestic, 2.2kL/d)	Unplanned Supply Interrupt (3 hours, 10 times/yr)	Fire Fighting (Positive Head Fire Flow at 75% Design Peak)	Water Quality 2011 ADWG	Environmental
5 – Catastrophic	Lose pressure more than 6,000 customers	Not meet peak demand for more than 6,000 customers	Lose supply more than 6,000 customers	Lose supply more than 6,000 customers	More than 6,000 customers boil water	Catastrophic environmental incident
4 – Major	Lose pressure more than 1,000 customers	Not meet peak demand for more than 1,000 customers	Lose supply more than 1,000 customers	Lose supply more than 1,000 customers	More than 1,000 customers boil water	Long term negative impact to the environment
3 – Moderate	Lose pressure more than 100 customers or major hospital	Not meet peak demand for more than 100 customers	Lose supply more than 100 customers and major hospital	Lose supply more than 100 customers and major hospital	More than 100 customers boil water	Serious impact to the environment but reversible
2 – Minor	Lose pressure more than 10 customers or major industry	Not meet peak demand for more than 10 customers	Lose supply more than 10 customers or major industry	Lose supply more than 10 customers or major industry	More than 10 customers boil water	Significant impact to the environment
1 – Insignificant	Lose pressure 1 to 10 customers or minor industry	Not meet peak demand for 1 to10 customers	Lose supply 1 to 10 customers or minor industry	Lose supply 1 to 10 customers or minor industry	1 to 10 customers boil water or aesthetic	On-site minor environment impact

Table 16

8.6 Likelihood of Failure

Three factors were used to assess the likelihood of failure. Each of these was assessed on a logarithmic scale between rare (1) and almost certain (5).

- **Condition**: The ability of the asset to perform acceptably refers to the likelihood of failure due to the asset's condition. For instance if the asset is failing now then the likelihood of failing is almost certain (5). While if the asset is in excellent condition it would be expected to perform acceptably and be rated as 1
- **Capacity**: The likelihood of this asset to fail to meet the capacity requirement is rated between 1 (it will meet current or future (in 30 years) levels of service) and 5 (it will not meet current and Future LOS 30 years)
- **Technology**: This relates to the likelihood of failure due to obsolescence. For instance this is less likely to occur with pumps and pipes but may be more likely with faster changing technologies and quality requirements such as water treatment plants

The definitions used to assess the various level 3 systems likelihood of failures are shown in Table 17 below:

Likelihood of failure	1 Rare	2 Unlikely	3 Possible	4 Likely	5 Almost certain
Condition (performs acceptably)	Excellent	Adequate	Action required	Poor	Very poor (failing now)
Capacity (performs acceptably)	Will meet current & future LOS (30 year)	Adequate current LOS (15 year)	Adequate current LOS (1 year)	Action needed soon	Won't meet current & future LOS (30 year)
Technology (performs acceptably)	Will meet current & future LOS (30 year)	Adequate current LOS (15 year)	Adequate current LOS (1 year)	Action needed soon	Won't meet current & future LOS (30 year)

Table 17

The level 3 assets criticality assessments were undertaken with the CTW staff at a workshop held on 11 September 2014.

Figure 7 illustrates CTW's risk matrix and a theoretical approach in terms of which form of asset management actions might be required.

CONSEQUENCE						
LIKELIHOOD		1	2 Minor	3 Moderate	4 Major	5 Catastrophic
	1 Rare	Low	Low	Moderate	High	High
	2 Unlikely	Low	Low	Moderate	High	Very high
	3 Possible	Low	Moderate	High	Very high	Very high
	4 Likely	Moderate	High	High	Very high	Very high
	5 Almost certain	Moderate	High	Very high	Very high	Very high

Risk Level	Asset management action required
LOW	Likely covered normal operations
MODERATE	Likely covered unscheduled maintenance
HIGH	Likely covered by scheduled maintenance
VERY HIGH	Likely that capital works will be required

Figure 7: Theoretical Asset Management Actions

In Table 18 the "Worst Case" Scenario columns at right combines the highest consequence figures with the highest likelihood to indicate the most critical assets for addressing CTW's levels of service and meet the environmental requirements.

Loss of use of Level 3 assets would not be expected to be of low consequence. This analysis presents them in a relative criticality basis. The output of the assessment is shown in Figure 8 on page 70.

Table 18: Water Supply Assets Criticality Assessment Outcomes

(Note: NA = Not Applicable, WC = Water Cart)

CTW Water Supply Assets Criticality Assessment - Only for Level 3 Assets																	
Consequence of Failure (for a Week in Summer)			(5= Catastrophic ; 1 =Insignificant)							(5= Almost Certain ; 1 = Rare)							
			Levels of Service							Likelihood of Failure			Worst Case Scenario				
WSS	Reference No	Asset Description Level 3 Assets	Pressure (20 - 60 m)	Peak Demand (3 kL/d/tenement)	Unplanned Supply Interrupt (12hrs per event, 2 times/y/customer)	Fire Fighting (Compliance with the Water Supply Investigation Manual* (AS 2419.1 classifications 2,3,4 & 9 with floor area less than 1000	Water Quality 2011 ADWG	Environmental		Condition	Capacity	Technology	Consequence	Likelihood	Risk		
Blayney	1	Lake Rowlands Dam (capacity 4,500 ML)	5	5	5	5	4	2		2	1	3	5	3	Very High		
Blayney	2	Intake including intake pumps (2 pumps @ 6 ML/d total capacity)	4	4	4	4	n/a	n/		1	1	1	4	1	High		
Blayney	3	(WTP) (Total length approx 15 km)	4	4	4	4	n/a	3		2	1	1	4	2	High		
Blayney	4	Blayney WTP (6ML/d)	n/a	n/a	n/a	n/a	4	n/		2	1	2	4	2	High		
Blayney	5	Blayney Clear Water Tank (CWT)	n/a	n/a	n/a	n/a	n/a	n/		2	1	1	0	2	low		
Blayney	6	Chlorinator @ Blayney WTP	n/a	n/a	n/a	n/a	5	n/		1	1	1	5	1	High		
Blayney	7	Gravity main from CWT to Hill Street Resevoir	4	4	4	4	n/a	n/		2	1	1	4	2	High		
Blayney	8	Palona Street pumping station (PS) (2 pumps @ 0.22 ML/d each)	3	n/a	n/a	n/a	n/a	n/		2	1	1	3	2	Moderate		
Blayney	9	Rising main from Polona Street pumping station (PS) to Patrick's	3	n/a	n/a	n/a	n/a	n/		2	1	1	3	2	Moderate		
Blayney	10	Patrick's Reservoir (0.45 ML)	3	n/a	n/a	n/a	n/a	n/		2	1	1	3	2	Moderate		
Blayney	1	Blayney Reticulation System	2	n/a	n/a	1	n/a	n/		2	1	1	2	2	Low		
Blayney	1	Plumb Street Reservoir (0.91ML)	n/a	n/a	n/a	n/a	n/a	n/		2	1	1	0	2	low		
Blayney	13	Hill Street Reservoir (1.14 ML)	n/a	n/a	n/a	n/a	n/a	n/		2	1	1	0	2	low		
Blayney	14	Blayney Well	n/a	n/a	n/a	n/a	n/a	n/		2	4	1	0	4	low		
Blayney	1	Blayney Well pumps (0.6 ML/d)	n/a	n/a	n/a	n/a	n/a	n/		1	1	1	0	1	low		
Blayney	1	Rising main from Blayney Well to Hill Street Reservoir	n/a	n/a	n/a	n/a	n/a	n/		2	1	1	0	2	low		
Blayney	17	Plumb Street PS (2 pumps @ 1.0 ML/d each)	3	3	3	3	n/a	n/		1	1	1	3	1	Moderate		
Blayney	18	Rising main from Plumb Street PS to Browns Creek Reservoir (3.15km)	3	3	3	3	n/a	n/		2	2	2	3	2	Moderate		
Blayney	1	Browns Creek Reservoir (0.23 ML)	n/a	n/a	n/a	n/a	n/a	n/		2	1	1	0	2	low		
Blayney	2	Browns Creek PS (2 pumps @ 0.8 ML/d each)	3	3	3	3	n/a	n/		1	1	1	3	1	Moderate		
Blayney	21	Rising main from Browns Creek PS to Millthorpe Reservoir (length 8.38	3	3	3	3	n/a	n/		2	2	2	3	2	Moderate		
Blayney	22	Millthorpe Reservoir (1.36ML)	n/a	n/a	n/a	n/a	n/a	n/		2	1	1	0	2	low		
Blayney	2 3	Millthorpe Reticulation System	1	n/a	n/a	1	n/a	n/ a		1	1	1	1	1	Low		

Consequence of Failure (for a Week in Summer)			(5= Catastrophic ; 1 =Insignificant)							(5= Almost Certain ; 1 = Rare)						
			Levels of Service							Likelihood of Failure				Worst Case Scenario	
WSS	Reference No	Asset Description Level 3 Assets	Pressure (20 - 60 m)	Peak Demand (3 kL/d/tenement)	Unplanned Supply Interrupt (12hrs per event, 2 times/y/customer)	Fire Fighting (Compliance with the Water Supply Investigation Manual* (AS 2419.1 classifications 2,3,4 & 9 with floor area less than 1000	Water Quality 2011 ADWG	Environmental	Condition	Capacity	Technology	Consequence	Likelihood	Risk
Carcoar	2	Gravity main from Lake Rowlands to Carcoar WTP (length 4.81 km)	5	5	5	3	3	3	2	2	2	5	2	Very High
Carcoar	2	Carcoar WTP (9 ML/d)	5	5	5	3	3	3	1	1	1	5	1	High
Carcoar	2	Carcoar Clear Water Tank (CWT) (2.16 ML)	n/a	n/a	n/a	n/a	n/a	n/	2	4	2	0	4	low
Carcoar	2	Chlorinator at Carcoar WTP	n/a	n/a	n/a	n/a	4	n/	1	1	1	4	1	High
Carcoar	2 8	Booster #1 PS - deliver water from Carcoar WTP to Carcoar Reservoir (2 pumps @ 1.6 ML/d each)	1	1	1	n/a	n/a	n/ a	1	1	1	1	1	Low
Carcoar	2	Rising main Booster #1 Pump Station to Carcoar CTLX	n/a	3	n/a	n/a	n/a	n/	2	1	2	3	2	Moderate
Carcoar	3	Pipeline CTLX to Browns Creek -	n/a	n/a	n/a	n/a	n/a	n/	5	5	5	0	5	low
Carcoar	3	Carcoar Reservoir (0.68 ML)	n/a	n/a	n/a	n/a	n/a	n/	2	1	2	0	2	low
Carcoar	3	Carcoar Reticulation System	2	n/a	n/a	1	n/a	n/	1	1	1	2	1	Low
Carcoar	3 3	Trunk Main 'B' from Carcoar CWT to joins Trunk Main at the Mandurama off- take (length 5.45 km)	3	3	3	n/a	n/a	n/ a	2	2	2	3	2	Moderate
Carcoar	3	Trunk Main 'P' transfer water from Trunk Main 'B' to the village of Somers (length 3.22 km)	n/a	n/a	n/a	n/a	n/a	n/	1	1	1	0	1	low
Carcoar	3	Mandurama Reservoir (0.91 ML)	n/a	n/a	n/a	n/a	n/a	n/	1	1	1	0	1	low
Carcoar	3	Mandurama PS (3 pumps @ 0.1 ML/d each)	3	n/a	n/a	n/a	n/a	n/	1	1	1	3	1	Moderate
Carcoar	3	Mandurama Reticulation System	2	n/a	n/a	1	n/a	n/	1	1	1	2	1	Low
Carcoar	3 8	Trunk Main 'C' from Trunk Main B to all CTW consumers west of Mandurama (length 70 km)	3	3	3	n/a	n/a	n/ a	2	2	2	3	2	Moderate
Carcoar	3	Trunk Main 'G' from Trunk Main C to Lyndhurst Reservoir (length 2.13	n/a	3	n/a	n/a	n/a	n/	1	1	1	3	1	Moderate
Carcoar	4	Lyndhurst Reservoir (0.68ML)	n/a	n/a	n/a	n/a	n/a	n/	2	1	2	0	2	low
Carcoar	4	Lyndhurst Reticulation System	2	n/a	n/a	1	n/a	n/	1	1	1	2	1	Low
Carcoar	4	Garland PS (one pump @0.1 ML/d)	n/a	n/a	n/a	n/a	n/a	n/	2	1	2	0	2	low
Carcoar	4	Garland Reservoir (0.045 ML)	n/a	n/a	n/a	n/a	n/a	n/	2	1	2	0	2	low
Carcoar	44	Newry Downs PS - accept water from Trunk Main 'C' boost to Sugarloaf Road pump station or boost into Trunk Main 'C' (2 pumps @7.1 ML/d each)	n/a	n/a	n/a	n/a	n/a	n/ a	1	1	1	0	1	low
Carcoar	4	Sugarloaf Road PS (2 pumps @6.0 ML/d each)	n/a	n/a	n/a	n/a	n/a	n/	1	1	1	0	1	low
Carcoar	4	Canomodine PS (2 pumps @1.8 ML/d each)	n/a	n/a	n/a	n/a	n/a	n/	2	1	2	0	2	low
Carcoar	4	Trunk Main 'U' from Trunk Main C to Greys Hill Reservoir (length 55	n/a	3	n/a	n/a	n/a	n/	2	2	2	3	2	Moderate

Consequence of Failure (for a Week in Summer)			(5= Catastrophic ; 1 =Insignificant)							(5= Almost Certain ; 1 = Rare)						
			Levels of Service							Likelihood of Failure				Worst Case Scenario		
WSS	Reference No	Asset Description Level 3 Assets	Pressure (20 - 60 m)	Peak Demand (3 kL/d/tenement)	Unplanned Supply Interrupt (12hrs per event, 2 times/y/customer)	Fire Fighting (Compliance with the Water Supply Investigation Manual* (AS 2419.1 classifications 2,3,4 & 9 with floor area less than 1000	Water Quality 2011 ADWG	Environmental		Condition	Capacity	Technology		Consequence	Likelihood	Risk
Carcoar	48	Cargo PS (2 pumps @0.16 ML/d each)	n/a	n/a	n/a	n/a	n/a	n/a		2	2	2		0	2	low
Carcoar	49	Cargo Reservoir (0.68 ML)	n/a	n/a	n/a	n/a	n/a	n/a		2	1	2		0	2	low
Carcoar	50	Cargo Reticulation System	2	n/a	n/a	1	n/a	n/a		2	1	2		2	2	Low
Carcoar	51	Cudal Reservoir (0.23 ML)	n/a	n/a	n/a	n/a	n/a	n/a		2	1	2		0	2	low
Carcoar	52	Cudal Bore (capacity 4 L/s)	n/a	n/a	n/a	n/a	n/a	n/a		1	1	1		0	1	low
Carcoar	53	Chlorinator @ Cudal Bore (dosing rate 5 mg/L)	n/a	n/a	n/a	n/a	n/a	n/a		2	1	1		0	2	low
Carcoar	54	Cudal Booster PS (2 pumps @2.1 ML/d each)	n/a	n/a	n/a	n/a	n/a	n/a		1	1	1		0	1	low
Carcoar	55	Cudal Reticulation System	2	n/a	n/a	1	n/a	n/a		1	1	1		2	1	Low
Carcoar	56	Greys Hill Reservoir (2.27 ML)	n/a	n/a	n/a	n/a	n/a	n/a		1	1	1		0	1	low
Carcoar	57	Two Trunk Mains from Greys Hill Reservoir to Manildra Reservoir	5	5	5	5	n/a	n/a		1	1	1		5	1	High
Carcoar	58	Manildra Reservoir (0.45 ML)	n/a	n/a	n/a	n/a	n/a	n/a		2	2	2		0	2	low
Carcoar	59	Manildra Reticulation System	2	n/a	n/a	1	n/a	n/a		2	1	1		2	2	Low
Carcoar	60	Trunk Main 'V' from Trunk Main 'C' to Moorbel Reservoir (length 4.2 km)	n/a	n/a	n/a	n/a	n/a	n/a		1	1	1		0	1	low
Carcoar	61	Moorbel Reservoir (1.14 ML)	n/a	n/a	n/a	n/a	n/a	n/a		2	2	2		0	2	low
Carcoar	62	Moorbel Reticulation System	2	n/a	n/a	1	n/a	n/a		1	1	1		2	1	Low
Carcoar	63	3 Reticulation mains from Moorbel Reservoir to Canowindra Reservoir	n/a	n/a	n/a	n/a	n/a	n/a		1	1	1		0	1	low
Carcoar	64	Canowindra Reservoir (0.91 ML)	n/a	n/a	n/a	n/a	n/a	n/a		2	1	2		0	2	low
	65	Canowindra Reticulation System	2	n/a	n/a	1	n/a	n/a		1	1	1		2	1	Low
Carcoar	66	Canowindra PS - to pump water from Canowindra Reservoir to Moorbel Reservoir and/or boost supply to Canowindra and South Canowindra reticulations (2 pumps @ 1.0 ML/d each)	n/a	n/a	n/a	n/a	n/a	n/a		2	2	2		0	2	low
Carcoar	67	South Canowindra Reservoir (0.36 ML)	n/a	n/a	n/a	n/a	n/a	n/a		2	1	2		0	2	low
Carcoar	68	South Canowindra Reticulation System	2	n/a	n/a	1	n/a	n/a		1	1	1		2	1	Low
Carcoar	69	North Canowindra PS - To pump water from Canowindra reticulation to the North Canowindra Rural Scheme (2 pumps @ 0.43 ML/d each)	2	2	2	n/a	n/a	n/a		1	1	1		2	1	Low
Carcoar	70	North Canowindra Reservoir (0.18 ML)	n/a	n/a	n/a	n/a	n/a	n/a		2	1	2		0	2	low
Carcoar	71	North Canowindra Reticulation System	2	2	2	n/a	n/a	n/a		2	2	2		2	2	Low
Carcoar	72	Nyrang Creek PS -To pump water from Canowindra reticulation to the Nyrang Creek Rural Scheme. (a single pump @ 0.1 ML/d)	n/a	n/a	n/a	n/a	n/a	n/a		2	2	2		0	2	low
Carcoar	73	Nyrang Creek Northern Reservoir (0.045 ML)	n/a	n/a	n/a	n/a	n/a	n/a		2	2	2		0	2	low
Carcoar	74	Nyrang Creek Northern Reticulation System	2	2	2	n/a	n/a	n/a		2	2	2		2	2	Low
Carcoar	75	Nyrang Creek Southern Reservoir (0.091 ML)	n/a	n/a	n/a	n/a	n/a	n/a		2	2	2		0	2	low

Consequence of Failure (for a Week in Summer)			(5= Catastrophic ; 1 =Insignificant)							(5= Almost Certain ; 1 = Rare)					
			Levels of Service							Likelihood of Failure			Worst Case Scenario		
WSS	Reference No	Asset Description Level 3 Assets	Pressure (20 - 60 m)	Peak Demand (3 kL/d/tenement)	Unplanned Supply Interrupt (12hrs per event, 2 times/y/customer)	Fire Fighting (Compliance with the Water Supply Investigation Manual* (AS 2419.1 classifications 2,3,4 & 9 with floor area less than 1000	Water Quality 2011 ADWG	Environmental		Condition	Capacity	Technology	Consequence	Likelihood	Risk
Carcoar	76	Nyrang Creek Southern Reticulation System	2	2	2	n/a	n/a	n/a		2	2	2	2	2	Low
Carcoar	77	Bangaroo Bore and Pump Station (West Bore - 3 ML/d and North Bore-0.6 ML/d)	n/a	n/a	n/a	n/a	n/a	n/a		5	1	5	0	5	low
Carcoar	78	Bangaroo Reservoirs -3 Numbers (total - 0.54 ML)	n/a	n/a	n/a	n/a	n/a	n/a		2	1	2	0	2	low
Carcoar	79	Bangaroo PS (2 pumps @ 1.3 ML/d and 0.6 ML/d)	n/a	n/a	n/a	n/a	n/a	n/a		5	1	5	0	5	low
Carcoar	80	Rising main from Bangaroo PS to Trunk Main 'C'	n/a	n/a	n/a	n/a	n/a	n/a		2	1	2	0	2	low
Carcoar	81	Gooloogong Bore and Pump Station (Bore pump capacity 3.8 ML/day)	n/a	4	n/a	n/a	n/a	n/a		1	1	1	4	1	High
Carcoar	82	Gooloogong Reservoir (0.18 ML)	n/a	n/a	n/a	n/a	n/a	n/a		2	1	2	0	2	low
Carcoar	83	Gooloogong Chlorinator @ Gooloogong Reservoir (Dosing rate 5 mg/L)	n/a	n/a	n/a	n/a	4	n/a		1	1	1	4	1	High
Carcoar	84	Gooloogong PS (2 pumps @ 1.8 ML/d each)	n/a	n/a	4	n/a	n/a	n/a		1	1	1	4	1	High
Carcoar	85	Rising main from Gooloogong PS to Trunk Main 'C'	n/a	n/a	4	n/a	n/a	n/a		1	1	1	4	1	High
Carcoar	86	Trunk Main 'L' boost PS to Eugowra (2 pumps @ 2.1 ML/d each)	n/a	n/a	n/a	n/a	n/a	n/a		1	1	1	0	1	low
Carcoar	87	Trunk Main 'L' transfer water from Trunk Main 'C' to Eugowra Reservoir (length 20 km)	n/a	3	3	n/a	n/a	n/a		2	1	1	3	2	Moderate
Carcoar	88	Trajere PS (2 pumps @ 0.1 ML/d each)	n/a	2	2	n/a	n/a	n/a		2	1	2	2	2	Low
Carcoar	89	Trajere Reservoir (0.14 ML)	n/a	n/a	n/a	n/a	n/a	n/a		2	1	2	0	2	low
Carcoar	90	Pyes Gap Reservoir (0.14 ML)	n/a	n/a	n/a	n/a	n/a	n/a		2	1	2	0	2	low
Carcoar	91	Trajere Reticulation System	2	2	2	n/a	n/a	n/a		2	1	2	2	2	Low
Carcoar	92	Eugowra Reservoir (1.36 ML)	n/a	n/a	n/a	n/a	n/a	n/a		2	1	1	0	2	low
Carcoar	93	two Eugowra Reservoirs (0.5 ML)	n/a	n/a	n/a	n/a	n/a	n/a		1	1	1	0	1	low
Carcoar	94	Broad street PS	2	n/a	n/a	n/a	n/a	n/a		1	1	1	2	1	Low
Carcoar	95	Eugowra Reticulation System	2	n/a	n/a	1	n/a	n/a		1	1	1	2	1	Low
Carcoar	96	Trunk Main 'K' transfer water from Trunk Main 'C' to Grenfell North Reservoir (length 34.12 km)	4	4	4	n/a	n/a	n/a		3	3	3	4	3	Very High
Carcoar	97	Mcdonalds Lane PS (2 pumps @ 2.6 ML/d each)	n/a	4	n/a	n/a	n/a	n/a		2	1	1	4	2	High
Carcoar	98	Grenfell North Reservoir (4.55 ML)	n/a	n/a	n/a	n/a	n/a	n/a		2	2	1	0	2	low
Carcoar	99	Grenfell Reticulation System	2	n/a	n/a	1	n/a	n/a		1	1	1	2	1	Low
Carcoar	100	Grenfell Western Reservoir (1.36 ML)	n/a	n/a	n/a	n/a	n/a	n/a		2	1	2	0	2	low
Carcoar	101	Grenfell Eastern Reservoirs (0.45 ML)	n/a	n/a	n/a	n/a	n/a	n/a		1	1	1	0	1	low
Quandialla	102	Quandialla Bore (1.3 Ml/d)	3	3	n/a	n/a	n/a	n/a		1	1	1	3	1	Moderate
Quandialla	103	Quandialla bore reservoir (0.02 ML)	n/a	n/a	n/a	n/a	n/a	n/a		1	1	1	0	1	low
Quandialla	104	Chlorinator at Quandialla bore reservoir (2 mg/L)	n/a	n/a	n/a	n/a	n/a	n/a		1	1	1	0	1	low
Quandialla	105	Quandialla bore surface pumps (2 pumps @ 0.8 ML/d each)	n/a	3	n/a	n/a	n/a	n/a		1	1	1	3	1	Moderate
Quandialla	106	Trunk Main 'Q' from the Quandialla Surface Pumps to the on-ground storage at Quandialla (length) 16.5 km	n/a	3	n/a	n/a	n/a	n/a		1	1	1	3	1	Moderate
Quandialla	107	Quandialla on-ground surface reservoir (0.18ML)	n/a	n/a	n/a	n/a	n/a	n/a		1	1	1	0	1	low
Quandialla	108	Quandialla Booster PS	n/a	n/a	n/a	n/a	n/a	n/a		1	1	1	0	1	low
Quandialla	109	Quandialla Reticulation system	2	n/a	n/a	1	n/a	n/a		1	1	1	2	1	Low

8.7 Outcome

It could be interpreted that according to the water supply Level 3 asset criticality assessment (see Table 18 and Figure 19) CTW only have three critical assets which have very high risk due to failure to meet the water supply LOS.

The outcomes of the worst case scenarios provide a guide to the asset systems relative priority in terms of how scarce capital works funds should be focussed. This is illustrated in Figure 19 where the worst case consequence and likelihood outcomes are laid out within the theoretical asset management action sectors.

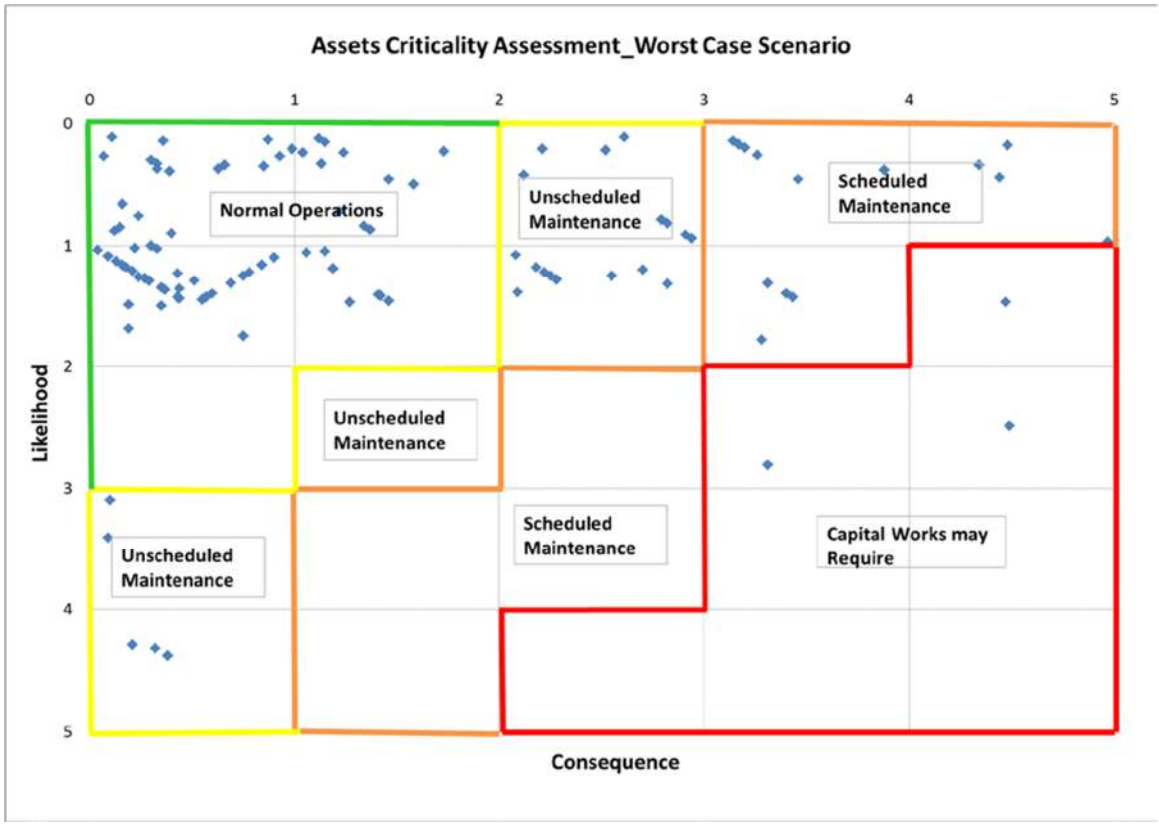


Figure 8: Asset Criticality Assessment – Worst Case Scenario

Asset Management theory would say that the asset management systems indicating almost certain likelihood of catastrophic consequences would attract problem solving focus usually in the form of intense maintenance and capital replacement. Less critical asset systems would be expected to be maintained by scheduled or breakdown maintenance approaches. To address the issues raised by the criticality analysis Council has a number of management options.

If suitable the fastest approach to addressing the risks identified is to develop, assuming it does not exist already, an incident plan followed closely by operating procedures. However if these procedures do not modify the potential LOS impact CTW can increase the maintenance levels by moving from unscheduled to scheduled maintenance with increasing frequency. If maintenance is not able to modify the criticality to a manageable level then capital works will need to be undertaken. There is always the alternative of reducing the levels of service however on most occasions this is difficult e.g. drinking water quality.

The highest priority asset systems for action are those with consequence rating and likelihoods ratings within the very high risk range in the risk matrix. From this 2015 analysis CTW has only identified three assets that come under this category:

- Lake Rowlands Dam
- Gravity main from Lake Rowlands to Carcoar WTP
- Trunk Main "K" transfer water from Trunk Main "C" to Grenfell North

CTW has now renewed and upgraded Trunk Main K with 250mm PVC and 300mm ductile iron pipes (2016-2020), and the higher risk now is the Trunk Main C feed to Trunk Main K.

For the asset systems with high-risk ratings, it would be expected that scheduled maintenance processes and systems with moderate risk ratings would be applied with unscheduled breakdown approaches or where, as in the case of buried pipelines, scheduled maintenance approaches are technically more difficult.

To address the issues raised by the criticality assessment Council has a number of management options. The highest priority assets in each system that required scheduled maintenance are summarised in the table below. If scheduled maintenance is not able to modify the criticality to a manageable level then capital works may need to be undertaken. It should be noted, CTW has identified capital investments for some of these critical assets (see Table 19).

Ref No.	Asset Description	Operating rules and procedures in place	Scheduled maintenance plan in place	Included in 10 years capital works program	Worst case scenario Likelihood (L) & Consequence (C)
Blayney WSS					
1	Lake Rowlands Dam	Yes	Yes	Lake Rowlands Remediation	C=5 L=3
2	Blayney intake including intake pumps	Work method statement in place	Yes	Annual provision for pumps replacement	C=4 L=1
3	Raw water transmission main from Blayney intake to Blayney WTP (Trunk main 'X')	Work method statement for water main repair in place	Yes (yearly flushing, otherwise breakdown maintenance)	Trunk main X renewal	C=4 L=2
4	Blayney WTP	Automated telemetry system. No written which includes troubleshooting and shutdown procedure for Blayney WFP	Yes	Renewal and upgrade in Blayney WTP	C=4 L=2
6	Chlorinator at Blayney WTP	Work method statement in place	Yes	Renewal work in Blayney WTP	C=4 L=2
7	Gravity main from Blayney Clear Water Tank to Hill Street Reservoir	Work method statement for water main repair in place	Yes (yearly flushing, otherwise breakdown maintenance)	No capital work allocation	C=4 L=2
Carcoar WSS					
24	Gravity main from Lake Rowlands to Carcoar WTP (Trunk Main 'A')	Work method statement for water main repair in place	Yes (yearly flushing, otherwise breakdown maintenance)	Trunk main A renewal	C=5 L=2
25	Carcoar WTP	Automated telemetry system. No written down procedure which includes troubleshooting and shutdown procedure for Carcoar WTP	Yes	Renewal work in Carcoar WTP	C=5 L=2
27	Chlorinator at Carcoar WTP	Work method statement in place	Yes	No capital works allocation in next 30 years	C=4 L=1
57	Trunk main from Grays Hill Reservoir to Manildra Reservoir	Work method statement for water main repair in place	Yes (yearly flushing otherwise breakdown maintenance)	No capital works allocation	C=5 L=1

81	Gooloogong Bore	Work method statement in place	No	Refurbish Gooloogong Bore	C=4 L=1
83	Gooloogong chlorinator	Work method statement in place	Yes	Refurbish Gooloogong Bore	C=4 L=1
84	Gooloogong pump station (PS)	Work method statement in place	Yes	Some work already completed on pipework and VSD's	C=4 L=1

Table 19

9 Financial summary

Costs occur in all phases of the life of an asset. These include the initial capital investment, followed by annual operation and maintenance (O&M) costs and investment in renewals at some time intervals, depending on the type of assets. There is a clear trade-off between capital and O&M costs. The higher the initial investment, it is likely that the operation costs would be lower (e.g. automation); and higher maintenance costs are likely to result in lower renewal costs.

The objectives of an asset management system is to achieve the lowest total life cycle costs, while delivering the specified levels of service at an acceptable risk. To maintain a sustainable long-term approach to asset planning requires preparation of long-term financial plans. This section describes the financial performance of CTW current and future assets and the long term financial projections. The asset plan's financials assume a continuation of current levels of service.

Table 20 shows information about CTW current replacement cost (CRC), depreciation and written down value (WDV) of infrastructure assets since 2017/18.

Year	Current Replacement Cost	Written Down Value	Depreciation
2017/18	$129,577,764	$59,829,784	$69,747,980
2018/19	$146,355,848	$72,828,473	$73,527,375
2019/20	$148,024,982	$71,453,131	$76,571,851
2020/21	$146,583,209	$76,310,861	$70,272,348

Table 20

The CRC increase in 2018/19 resulted from the new OCC/CTW trunk main and associated pump stations, the old main having been impaired in the previous financial year. Mains renewals for TM K were commissioned in December 2020. The depreciation for the impairment of the old main was over 2 financial years with the biggest hit in 2019/20.

Below are 2 graphs figures 9 and 10. One is the Infrastructure renewals ratio – asset renewals over depreciation expense, which is used as an indicator of the rate at which assets are being renewed relative to the rate at which they are depreciating. The benchmark is above 100%. You can see that over the last 5 years as a whole that benchmark has been achieved, individual years show the variations above and below the 100% mark.

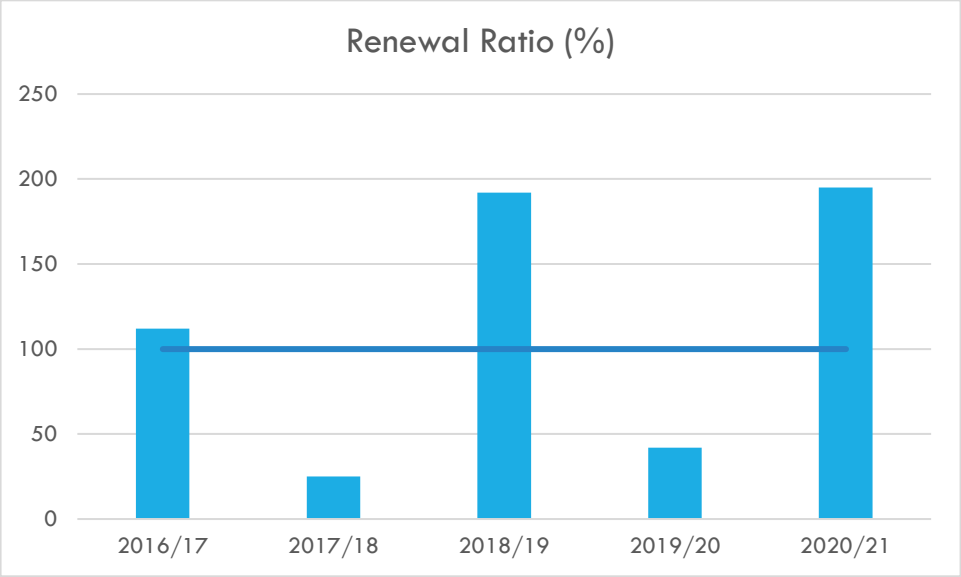


Figure 9

The second graph is the capital expenditure ratio – annual capital expenditure over annual depreciation, which is used as an indicator to measure the extent council is expanding its asset base through new assets and asset renewal. The benchmark is 110%. This has been achieved over the last 2 years as a whole (2020/21 with TM K being commissioned). From 2021/22 the figures are projections from the LTFP, which show that although there are highs and lows in the ratios, overall outlook is positive, with major capital works from 2024 to 2026 of Lake Rowlands, followed by trunk main renewal and Blayney Water Treatment Plant renewal.

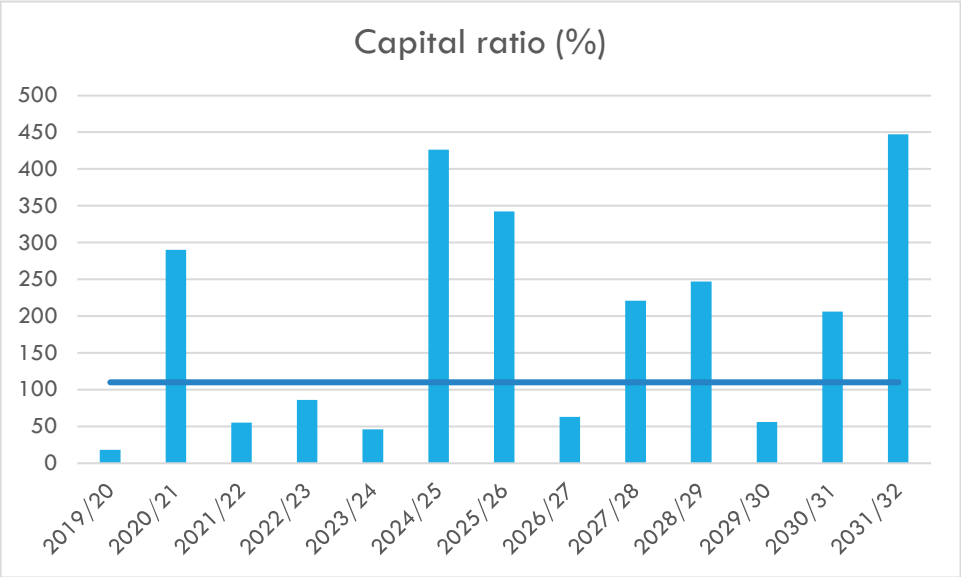


Figure 10

Long Term Financial Plan

Year	Acquisition	Renewal	Maintenance and Operation	Annual Depreciation
2022/23	$540,000	$1,273,211	$2,916,127	$2,250,000
2023/24	$194,500	$609,307	$3,013,419	$2,272,500
2024/25	$4,985,000	$5,231,451	$3,091,820	$2,395,225
2025/26	$4,040,000	$4,238,145	$3,163,003	$2,419,177
2026/27	$1,205,000	$439,889	$3,235,891	$2,603,369
2027/28	$1,847,200	$4,088,486	$3,310,525	$2,679,403
2028/29	$1,667,200	$5,040,337	$3,386,949	$2,706,197
2029/30	$207,500	$1,362,943	$3,465,209	$2,783,259
2030/31	$2,385,000	$3,632,406	$3,545,348	$2,911,092
2031/32	$2,217,500	$10,926,928	$3,627,417	$2,940,403
Total	**$19,288,900**	**$36,843,103**	**$32,755,708**	**$25,960,625**

Table 21

Table 21 shows the forecast costs (outlays) required for consideration in the 10 year LTFP.

Providing services in a financially sustainable manner requires a balance between the forecast outlays required to deliver the agreed service levels with the planned budget allocations in the long term financial plan.

The proposed funding for assets is outlined in CTW's budget and LTFP. The financial strategy of the organisation determines how funding will be provided, whereas the asset management plan communicates how and when this will be spent, along with the levels of service and risk consequences.

Asset values are forecast to increase as additional assets are acquired. Additional assets will generally add to the operations and maintenance needs in the longer term. Additional assets will also require additional costs due to future renewals. Any additional assets will also add to future depreciation forecasts.

The two main upcoming acquisitions are a new reservoir at Carcoar WTP, and the upgrade of Lake Rowlands Dam wall. Both of these assets have 100 year useful lives, so future renewal costs can be developed over a long term period, and there will be additional operational and maintenance costs. Other acquisitions are primarily new mains extensions for new connections or subdivisions, which again will have a 100 year useful life.

A key assumption in the LTFP is the upgrade of Lake Rowlands Dam wall from 2024 to 2026 - this is not a certainty to go ahead, it depends on getting government funding. For the purposes of this financial plan we have assumed it will occur.

10 Improvement plan

The next steps resulting from this Plan to improve asset management practices are:

- Review customer and technical levels of service more regularly;
- Undertake customer research and expectation levels;
- Undertake risk assessment and criticality of assets review;
- Update and review the high risk critical assets operating rules and procedures;
- Regularly monitor for operations / maintenance costs for acquired assets;
- Develop a disposal plan for impaired / disposed assets, and
- Review Asset Management practices to progress to a more mature system.

Appendices

Appendix A: CTW- List of Assets

Pump Stations

Asset Name	Description	Construction Date	Asset Condition	Useful Life	Capacity
Lake Rowlands	Civil	1/07/1966	Good	60 years	6.0 ML/d
	Mechanical	1/07/1988	Good	40 years	132 kW
	Electrical	1/07/2010	Good	30 years	
Browns Creek - Booster 2	Civil	25/5/2007	Very Good	50 years	0.8 ML/d
Polona St	Civil	30/1/1974	Good	50 years	0.22 ML/d
	Mechanical	30/1/1974	Good	25 years	18.5 kW
	Electrical	30/1/1974	Good	25 years	
Plumb St	Civil	30/6/2005	Good	50 years	1.0 ML/d
	Mechanical	1/10/2005	Very Good	25 years	18.5 kW
	Electrical	1/10/2005	Very Good	25 years	
Plumb St –new PS	Civil	1/11/2018	Very Good	50 years	
	Mechanical	1/11/2018	Very Good	25 years	
	Electrical	1/11/2018	Very Good	25 years	
Canomodine	Civil	30/6/1957	Fair	70 years	1.8 ML/d
	Mechanical	1/11/1996	Good	25 years	55 kW
	Electrical	1/11/1996	Good	25 years	
Nyrang Creek	Civil	30/6/1969	Poor	50 years	0.1 ML/d
	Mechanical	1/1/2000	Fair	25 years	5.5 kW
	Electrical	1/1/2000	Fair	25 years	
Canowindra Reservoir	Mechanical	1/7/1990	Good	35 years	1.0 ML/d
	Electrical	1/7/1990	Fair	35 years	30 kW
North Canowindra	Civil	30/6/1997	Good	50 years	0.43 ML/d
	Mechanical	1/11/1996	Fair	25 years	5.5 kW
	Electrical	1/11/1996	Good	25 years	
Sugarloaf Road	Civil	27/6/2003	Good	50 years	6.0 ML/d
	Mechanical	27/6/2003	Very Good	25 years	132 kW
	Electrical	27/6/2003	Good	25 years	
Carcoar WTP – new PS	Civil	1/11/2018	Very Good	50 years	
	Mechanical	1/11/2018	Very Good	25 years	
	Electrical	1/11/2018	Very Good	25 years	
Cargo	Civil	1/4/2000	Good	50 years	0.16 ML/d
	Mechanical	1/4/2000	Good	25 years	5.5 kW
	Electrical	1/4/2000	Good	25 years	

Pump Stations continued

Asset Name	Description	Construction Date	Asset Condition	Useful Life	Capacity
Cudal	Civil	30/6/2004	Very Good	50 years	2.1 ML/d
	Mechanical	30/6/2004	Very Good	25 years	37 kW
	Electrical	30/6/2004	Very Good	25 years	
Grays Hill Pump House	Civil	30/6/1962	Fair	60 years	No pump
	Mechanical	1/1/2015	Very Good	25 years	
Bangaroo Bore	Civil	17/2/1967	Fair	50 years	1.3 ML/d
	Mechanical	31/8/1996	Poor	25 years	55 kW
	Electrical	31/8/1996	Poor	25 years	
Broad St Eugowra	Civil	4/1/2002	Good	50 years	0.8 ML/d
	Mechanical	1/5/2017	Very Good	25 years	11 kW
	Electrical	4/1/2002	Good	25 years	
Trunk Main L Booster	Civil	30/6/2001	Very Good	50 years	2.1 ML/d
	Mechanical	1/7/2001	Fair	25 years	22 kW
	Electrical	1/7/2001	Good	25 years	
Trajere	Civil	30/6/1967	Fair	60 years	0.1 ML/d
	Mechanical	1/5/1997	Good	25 years	5.5 kW
	Electrical	1/5/1997	Good	25 years	
Garland	Civil	30/6/1960	Poor	60 years	0.1 ML/d
	Mechanical	1/5/2003	Very Good	25 years	3.0 kW
	Electrical	1/5/2003	Very Good	25 years	
Gooloogong Bore	Civil	30/6/1977	Good	50 years	1.8 ML/d
	Mechanical	1/9/1999	Good	25 years	132 kW
	Electrical	1/9/1999	Good	25 years	
Old River Pump House	Civil	30/6/1946	Poor	75 years	No pump
	Mechanical	1/1/2016	Very Good	25 years	
	Electrical	1/1/2021	Very Good	25 years	
McDonalds Lane	Civil	30/6/1981	Good	50 years	2.6 ML/d
	Mechanical	1/8/1999	Good	25 years	110 kW
	Electrical	1/8/1999	Good	25 years	
Millthorpe	Civil	1/11/2018	Good	50 years	
	Mechanical	1/11/2018	Good	25 years	
	Electrical	1/11/2018	Good	25 years	
Quondong Road Grenfell	Civil	1/1/2009	Good	50 years	0.1 ML/d
	Mechanical	1/7/1990	Good	35 years	4.0 kW
	Electrical	1/7/1990	Good	35 years	

Pump Stations continued

Asset Name	Description	Construction Date	Asset Condition	Useful Life	Capacity
North St Grenfell	Civil	9/9/1999	Good	50 years	0.1 ML/d
	Mechanical	9/9/1999	Good	25 years	7.5 kW
	Electrical	1/7/2015	Very Good	25 years	
North Transfer - Grenfell North	Civil	30/6/2000	Good	50 years	2.6 ML/d
	Mechanical	1/7/2016	Very Good	25 years	18.5 kW
	Electrical	1/12/1999	Good	25 years	
Newry Downs Road	Civil	13/6/2003	Very Good	50 years	7.1 ML/d
	Mechanical	13/6/2003	Good	25 years	250 kW
	Electrical	13/6/2003	Very Good	25 years	
Mandurama	Civil	1/1/1993	Good	50 years	0.1 ML/d
	Mechanical	1/12/1997	Good	25 years	5.0 kw
	Electrical	1/12/1997	Good	25 years	
Quadialla Bore	Civil	12/4/2002	Fair	50 years	0.8 ML/d
	Mechanical	1/7/2016	Very Good	25 years	18.5 kW
	Electrical	12/4/2002	Good	25 years	
Quandialla Town	Civil	22/2/2002	Good	50 years	1.7 ML/d
	Mechanical	22/2/2002	Good	25 years	5.5 kW
	Electrical	22/2/2002	Good	25 years	

Reservoirs

Asset Name	Description	Construction Date	Asset Condition	Useful Life	Capacity (ML)
Hill St, Blayney	Civil	1/12/1930	Good	100	1.14
	Roof	30/6/1999	Good	40	
Blayney WTP	Civil Works	30/6/1966	Fair	80	4.55
	Roof	1/7/2004	Good	40	
	Mechanical		Very Good	40	
	Electrical		Very Good	20	
Patricks - Blayney	Civil	30/6/1974	Good	100	0.45
	Roof	1/7/1974	Good	60	
Plumb St, Blayney	Civil	1/7/1958	Good	100	0.91
	Roof	30/6/1999	Good	40	
Browns Creek	Civil	1/7/1954	Good	100	0.23
	Roof	30/6/1997	Good	40	
Millthorpe	Civil	1/12/1955	Good	100	1.36
	Roof	30/6/1998	Good	40	

Reservoirs continued

Asset Name	Description	Construction Date	Asset Condition	Useful Life	Capacity (ML)
Carcoar tower	Civil	6/4/1954	Good	100	0.68
	Roof	1/7/1999	Good	40	
Carcoar WTP	Civil Works	30/6/1953	Poor	100	2.16
	Roof/Mechanical	1/7/1999	Very Good	40	
	Electrical		Good	20	
Mandurama	Civil	3/3/1953	Good	100	0.91
	Roof	1/7/1998	Good	40	
Lyndhurst	Civil	27/7/1953	Good	100	0.68
	Roof	1/7/1997	Good	40	
Garland	Civil	30/6/1954	Good	100	0.05
	Roof	30/6/1998	Good	40	
Bangaroo #1	Civil	30/6/1968	Fair	100	0.18
	Roof	30/6/1988	Good	40	
Bangaroo #2	Civil	30/6/1968	Fair	100	0.18
	Roof	30/6/1988	Good	40	
Bangaroo #3	Civil	30/6/1968	Fair	100	0.18
	Roof	30/6/1988	Good	40	
Eugowra	Civil	3/8/1953	Good	100	1.36
	Roof	30/6/1994	Good	40	
Hill St #2 - Eugowra	Civil	30/6/1971	Fair	100	0.05
Hill St #1 - Eugowra	Civil	20/5/2002	Good	100	0.45
	Roof	20/5/2002	Good	40	
Trajere	Civil	30/6/1967	Good	100	0.14
	Roof	30/6/1989	Good	40	
Pyes Gap	Civil	30/6/1965	Good	100	0.14
	Roof	30/6/1989	Good	40	
Canowindra tower	Civil	30/6/1933	Good	100	0.91
	Roof	1/7/1985	Good	40	
South Canowindra #1	Civil	30/6/1986	Good	100	0.18
	Roof	30/6/1989	Good	40	
South Canowindra #2	Civil	30/6/1990	Good	100	0.18
	Roof	30/6/1989	Good	40	
South Canowindra #2	Civil	30/6/1990	Good	100	0.18
	Roof	30/6/1990	Good	40	
North Canowindra #1	Civil	30/6/1967	Good	100	0.09
	Roof	30/6/1989	Good	40	

Reservoirs continued

Asset Name	Description	Construction Date	Asset Condition	Useful Life	Capacity (ML)
North Canowindra #2	Civil	30/6/1967	Good	100	0.09
	Roof	30/6/1989	Good	40	
Moorbel	Civil	30/6/1955	Good	100	1.14
	Roof	30/6/1990	Good	40	
Nyrang Creek #1	Civil	1/1/1969	Good	100	0.136
(Eastern)	Roof	30/6/1989	Good	40	
Nyrang Creek #2	Civil	1/1/1969	Good	100	0.091
(Southern)	Roof	30/6/1989	Good	40	
Nyrang Creek #3	Civil	1/1/1969	Good	100	0.045
(Northern)	Roof	30/6/1989	Good	40	
Cargo	Civil	30/6/1958	Good	100	0.68
	Roof	30/6/1997	Good	40	
Cudal	Civil	20/11/1959	Good	100	0.23
	Roof	30/6/2000	Good	40	
Manildra	Civil	1/12/1959	Good	100	0.45
	Roof	30/6/1990	Good	40	
Grays Hill	Civil	30/6/1964	Good	100	2.27
	Roof	30/6/1997	Good	40	
Gooloogong Bore	Civil	30/6/1977	Fair	100	0.18
	Roof	30/6/2004	Good	40	
Grenfell North	Civil	30/6/1959	Good	100	4.55
	Roof	30/6/2004	Very Good	40	
Grenfell West	Civil	30/6/1930	Fair	100	1.36
	Roof	1/7/1996	Good	40	
Grenfell South		30/6/1970	Good	100	0.09
Grenfell East #1	Civil	30/6/1965	Good	100	0.272
	Roof	1/7/1965	Good	60	
Grenfell East #2	Civil	30/6/1991	Good	100	0.45
	Roof	1/7/1991	Good	40	
McDonalds Lane	Civil	30/6/1981	Fair	100	0.14
	Roof	1/11/2006	Good	40	
Quandialla Town #1	Poly tank	6/4/2002	Good	25	0.045
Quandialla Town #2	Poly tank	6/4/2002	Good	25	0.045
Quandialla Town #3	Poly tank	6/4/2002	Good	25	0.045
Quandialla Town #4	Poly tank	6/4/2002	Good	25	0.045
Quandialla Town #5	Poly tank	6/4/2002	Good	25	0.02
Quandialla Bore	Poly tank	6/4/2002	Good	25	0.02

Water Sources: Dam and Bores

Asset Name	Description	Construction Date	Asset Condition	Useful Life	Capacity
Lake Rowlands	Concrete Dam	1/07/1954	Fair	100 years	4,500 ML
Blayney Well	Well and pipework	1/07/1930	Fair	25 years	Well - 0.6 ML/d
	Pump Station Civil	1/1/1993	Good	50 years	Surface pump - 1.0 ML/d
	Pumps - Mechanical, Electrical	1/3/2007	Good	25 years	Emergency standby
Cudal Bore	Civil	30/6/1994	Good	30 years	Bore pump - 0.35 ML/d
	Mechanical	1/7/1994	Good	25 years	Emergency standby
	Electrical	1/7/1994	Good	25 years	
Bangaroo Bore	Civil	30/6/1987	Poor	30 years	Bore pump 1 - 0.6 ML/d
	Mechanical	30/6/1987	Poor	25 years	Not in use
	Electrical	1/6/1998	Poor	25 years	
Bangaroo Bore	Civil	30/6/1968	Good	30 years	Bore pump 2 - 3.0 ML/d
	Mechanical	30/9/1991	Good	25 years	Not in use
	Electrical	30/9/1991	Fair	25 years	
Gooloogong Bore No. 1	Civil	30/6/1993	Good	30 years	Bore pump 1 - 3.8 ML/d
	Mechanical	30/6/1993	Good	25 years	
	Electrical	1/7/2004	Good	25 years	
Gooloogong Bore No. 2	Civil	30/6/1987	Good	40 years	Bore pump 2 - 3.8 ML/d
	Mechanical	30/6/1987	Good	35 years	
	Electrical	30/6/1987	Good	35 years	
Quandialla Bore	Civil	12/4/2002	Good	30 years	Bore pump - 1.3 ML/d
	Mechanical	12/4/2002	Good	25 years	
	Electrical	12/4/2002	Good	25 years	
Quandialla Standby Bore	Civil	29/02/2008	Very Good	30 years	Bore pump - 1.3 ML/d
	Mechanical	29/02/2008	Very Good	25 years	
	Electrical	29/02/2008	Very Good	25 years	

Water Treatment Plants

Asset Name	Description	Construction Date	Asset Condition	Useful Life	Capacity
Blayney WTP	Sedimentation Tank - Civil	1/07/1966	Poor	80 years	5 ML/d
	Filter Plant - Civil	1/07/1976	Good	80 years	
	Chlorinator		Very Good	20 years	
	Fluoride Plant	1/07/2005	Very Good	20 years	
	Control	1/07/2015	Good	15 years	
	Clearwater Tank - Civil	1/07/1966	Fair	80 years	
Carcoar WTP	DAFF System - Civil	1/01/2002	Very Good	60 years	9 ML/d
	Chlorinator	1/01/2002	Good	30 years	
	Fluoride Plant	1/01/2002	Very Good	30 years	
	Control	1/01/2002	Very Good	15 years	
	Clearwater Tank - Civil	1/07/1953	Poor	100 years	

Trunk Mains

Trunk Main	Length of pipe km	Year of construction	Material	Useful life	Remaining life	Condition	Comments
TM A	4.97	1955, 2019	CICL(375)	80	13	2, 1	Lake to Carcoar WTP, 160m creek crossing renewed 2019
TM X	21.74	1954 to 1967	mostly AC 300 or 375	80	12 to 25	3, 2	Lake to Blayney WTP then to Hill st Res
TM B	6.63	1955	CICL(250) mostly	80	13	2	Carcoar WTP to Mando reservoir
TM D	3.59	1955, 1990, 2017	DI(200), HDPE(125) BKH	80, 100	13, 68, 95	2, 1	includes new backhouse line, Browns Ck rd to Browns Ck res
TM E	2.4	1954, 2000	CICL(150), UPVC(150)	80, 100	12, 78	2	Hill St Res to Browns Ck reservoir
TM F	0.79	1954	CICL(150)	80	12	2	Browns Ck res to Millthorpe rd
TM I	21.35	2017	DICL(300)	100	95	1	Plumb St res to Carcoar WTP
TM J	14.02	2017	DICL(300)	100	95	1	Millthorpe res to Plumb St res Blayney
TM G	2.35	1955, 2007	CICL(100), UPVC(100)	80, 100	13, 85	2, 1	Newry Downs PS to Lyndhurst res
TM P	3.28	1990, 2020	UPVC(100)	100	68, 98	1	Somers Lane Mandurama, 1800m renewed in 2020
TM C to BSC bdy	14.99	1955, 1995	STEEL(225), CI (225), UPVC (300)	80, 100	13,73	2, 1	Mando res to TM H pit - mostly 225mm, 980m renewed 1995 Grubbenbun Ck
TM C BSC bdy to PRV 9	21.77	1955, 2003, 2012	STEEL(225),CI(225), HDPE(300)	80, 100	13,61,70	3,2,1	TM H pit to PRV 9, mostly 225mm, around Sugarloaf PS renewed 2003, creek crossings replaced 2012
TM C PRV 9 to ORPH	30.16	1955, 1980, 1995	STEEL(200), SINTACOTE STEEL(324)	80, 100	13, 38, 73	3,2,1	PRV 9 to ORPH mostly 200mm, main to Sth Canowindra res 1980, creek crossings renewed 1995

Trunk Mains continued

Trunk Main	Length of pipe km	Year of construction	Material	Useful life	Remaining life	Condition	Comments
TM V	4.45	1955, 1990, 2012	STEEL(200), UPVC(200), HDPE (250)	80, 100	13, 68, 70	3, 1	PRV 9 to Moorbel Reservoir, mostly uPVC 200mm
TM U	60.68	1953, 1957, 2004, 2012	FIB(100), STEEL(150), CI(100), CI(150), UPVC(150), HDPE (225)	80, 100	11, 15, 82, 90	3,2,1	TM C(cranky rock rd) to Manildra, Cranky Rock rd is Steel(150), from Belubula river to Cudal is CI(150) with Cargo offtake Fibro(100), Cudal to Manildra is CI(100) with duplicate line UPVC(150) installed in 2004, river crossings replaced 2012
TM L	21.63	1980, 2014	AC(150), DI(150)	80,100	38, 92	2	ORPH to Eugowra, mostly AC(150)
TM K	54.22	1930, 1946, 2002, 2020	CI(200), CI(225), UPVC(250), DICL(250), DICL(300), HDPE(250)	100, 80	4, 8, 80, 98	3,2,1	ORPH to Grenfell, 42.5km renewed 2017-2020, older parts are now from Grenfell nth res to Grenfell west res, some parts in Grenfell town renewed 2002
TM Q	16.34	2002	UPVC(100)	100	80	1	Quandialla bore to Quandialla town

Appendix B: Ten year capital works program from the 2022/23 LTFP

CTW 10 Year Financial Plan for the years ending 30 June 2032 CAPITAL EXPENDITURE PROGRAM Scenario: Base Case	2022/23 Yr 1 $	2023/24 Yr 2 $	2024/25 Yr 3 $	2025/26 Yr 4 $	2026/27 Yr 5 $	2027/28 Yr 6 $	2028/29 Yr 7 $	2029/30 Yr 8 $	2030/31 Yr 9 $	2031/32 Yr 10 $	2023-2032 Total $
Vehicle replacement	487,353	501,974	517,033	532,544	548,520	564,976	581,925	599,383	617,364	635,885	5,586,957
Other plant and equipment replacement	25,000	25,750	26,523	27,319	28,139	28,983	29,852	30,748	31,670	32,620	286,604
Computer hardware/office equipment	30,000	24,900	25,647	26,416	27,208	28,024	28,865	29,731	30,623	31,542	282,956
Business / corp system				250,000							250,000
Rugged tablets			20,000			20,000			20,000		60,000
Blayney administration office indoor refurbishment			100,000			150,000					250,000
Blayney office outdoor refurbishment	20,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	110,000
Pump replacement	53,211	54,807	56,451	58,145	59,889	61,686	63,537	65,443	67,406	69,428	610,003
Reticulation mains renewals – rural scheme	30,000				35,000				40,000		105,000
Reticulation mains renewals	700,000	150,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	1,490,000
Trunk main renewal – Trajere											
Trunk Main 'U' Renewal - Conomadine Pump Station to Top of Hill - 7 kms		309,000	1,890,000								2,199,000
Trunk main 'U' – 'C' to – Cudal – 28 kms								335,000	4,690,000	4,355,000	9,380,000
Trunk Main 'C' Renewal - Mandurama to 'U' - 35Kms											
Trunk Main 'C' - 'U' to Old River Pump House - 33Kms					330,000	5,424,000	5,424,000				11,178,000

	2022/23 Yr 1 $	2023/24 Yr 2 $	2024/25 Yr 3 $	2025/26 Yr 4 $	2026/27 Yr 5 $	2027/28 Yr 6 $	2028/29 Yr 7 $	2029/30 Yr 8 $	2030/31 Yr 9 $	2031/32 Yr 10 $	2023-2032 Total $
Carcoar Town Reservoir Refurbishments	120,000										120,000
Lake Rowlands Wall Raising - 2.2 mtrs - 50% Grant			8,000,000	8,000,000							16,000,000
Gooloogong Bore - Renew Switchboard	250,000										250,000
New Bore Gooloogong					1,000,000	180,000					1,180,000
Renewal Energy Infrastructure	500,000										500,000
Reticulation Main Extensions (Funded from Capital Contributions)	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	400,000
Quandialla Town Reservoir Renewal - Reline		50,000									50,000
Carcoar WFP - Mechanical and Electrical Refurbishment	50,000	50,000	50,000	50,000	50,000	100,000	1,000,000	1,000,000	50,000	50,000	2,450,000
Carcoar Clearwater Tank - Roof											
Telemetry Upgrades	20,000		50,000			50,000					120,000
Blayney Water Treatment Plant - Equipment Renewals	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	500,000
Blayney Water Treatment Plant Renewal - Business Case		100,000									100,000
Blayney Water Filtration Plant - Renewals (50% Grant, $1M Reserves)									1,000,000	8,500,000	9,500,000
Total Capital Expenditure	**2,375,564**	**1,366,431**	**10,915,654**	**9,124,424**	**2,258,756**	**6,737,669**	**7,358,179**	**2,240,305**	**6,727,063**	**13,854,475**	**62,958,520**