ASSET MANAGEMENT PLAN

Central Tablelands Water

Central Tablelands Water Asset Management Plan

Updated February 2025

Executive Summary

Asset Management Planning

This Asset Management Plan is a key component of Central Tableland Water's (CTW) Integrated Planning and Reporting (IP&R) Resourcing Strategy. The Resourcing Strategy consists of three inter-related elements:

- Asset Management Planning,
- Long-Term Financial Planning, and
- Workforce Planning.

Encompassed within the 'Asset Management Planning' element resides three (3) key documents, namely, the Asset Management Policy, the Asset Management Strategy, and the Asset Management Plan (this document). The CTW Asset Management Plan is a living document designed to describe how CTW manages its Water Supply infrastructure to meet its responsibilities in a cost-effective and risk-conscious manner.

This Asset Management Plan is the blueprint for operational, maintenance and capital work relating to CTW's physical assets over their entire lifecycle. It links to a Long-Term Financial Plan, which considers at least a 10-year planning period. Also, it supports CTW in meeting the current and future levels of service (LOS) and regulatory requirements at an optimum asset lifecycle cost.

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

- Business Activity Strategic Plan
- Long Term Financial Plan
- Demand Management Plan
- Drought Management Plan
- Development Servicing Plan
- Drinking Water Management System
- Strategic Planning Documents as per the Regulatory Assurance Framework

Scope of Asset Infrastructure

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

The infrastructure assets covered by this Plan include the Lake Rowlands Dam, two (2) water treatment plants, seven (7) bores, 43 reservoirs, 33 pump stations, 376km of trunk mains, 280km of reticulation mains, seven (7) automatic fillings stations, as well as a network of telemetry data systems. These assets are used to provide water supply services and have a total replacement value of $190 million, as of 30 June 2024. For a detailed summary of the assets covered in this plan, refer to Table 1: Asset Portfolio Summary, in section 2.1.

Levels of Service

CTW has defined levels of service that detail the standards that the water supply systems will be delivered to customers. CTW characterises service levels in line with the International Infrastructure Management Manual (IPWEA, 2015). As such, levels of service are considered in two parts: community levels of service and technical levels of service.

The full water supply level of service descriptions can be found in sections 3.1and 3.2.

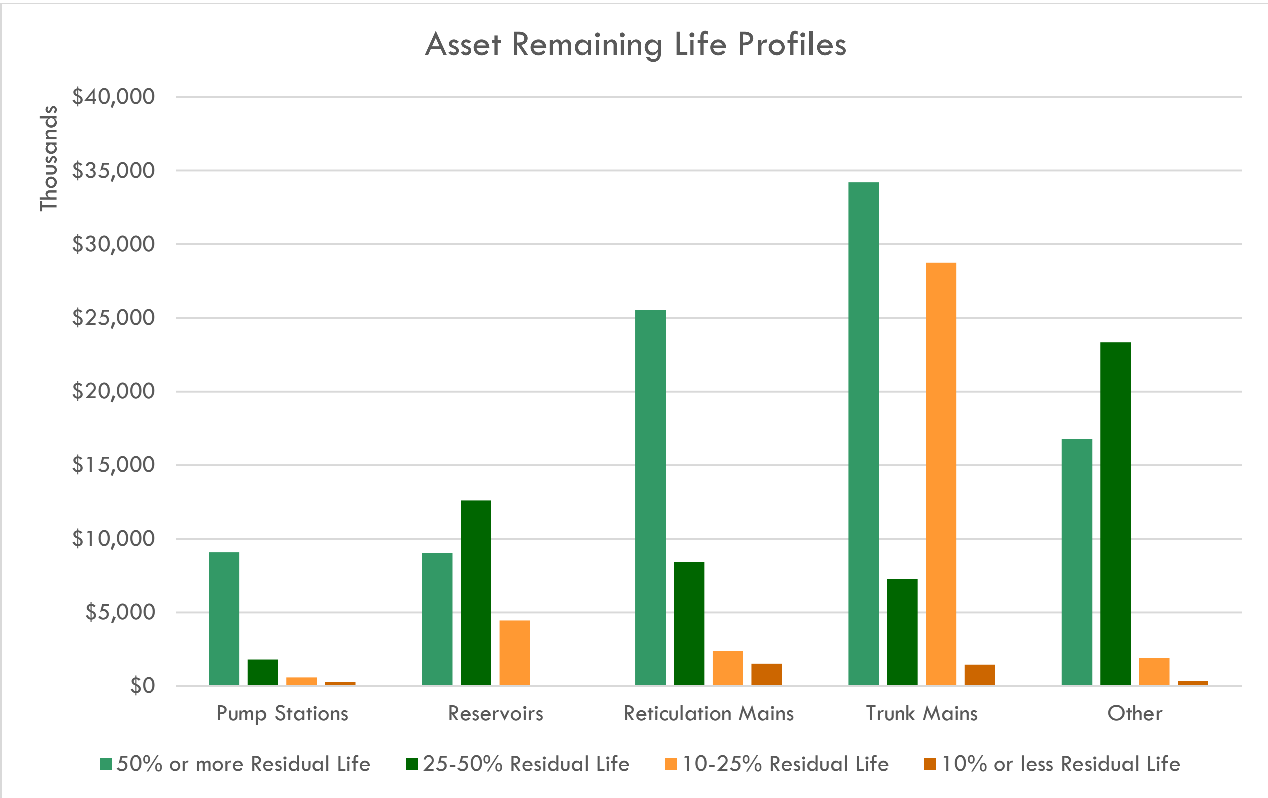
Future Demand

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 (DMP) June 2021. From the DMP, there was one (1) management outcome that specifically impacts how CTW manages its asset infrastructure – Water Loss Management. Section 4.2 discusses this in further detail.

In addition to the above demand drivers, section 4.3 mentions the impact that Climate Change is having on the CTW asset portfolio.

Lifecycle Management

The remaining life profile of CTW's asset portfolio shows the spread of age across the network. Specifically, it highlights the age profile of CTW's trunk main network and reservoirs. This will need to be monitored.



The overall lifecycle cost for various asset types managed by CTW are shown below and detailed in Table 10: Per Unit Lifecycle Costs, in Section 5.1of this plan.

- Trunk Mains: $2,680 per km
- Reticulation Mains: $3,507 per km
- Reservoirs: $11,209 per reservoir
- Pump Stations: $22,181 per station
- Bores: $12,000 per bore

Risk and Criticality

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. Asset Criticality analysis offers a tool to assess this. To assess the criticality of assets for CTW water supply, a preliminary criticality analysis was performed in September 2014.

From this analysis, CTW has identified its critical infrastructure assets as those with a consequence of failure of failure of 5, on a scale of 1 (insignificant), to 5 (catastrophic). These assets are listed below.

- Lake Rowlands Dam.
- Chlorinator at the Blayney Water Treatment Plant.
- Gravity main from Lake Rowlands to Carcoar Water Treatment Plant (Trunk Main A).
- Carcoar Water Treatment Plant.

Central Tablelands Water

Contents

1. Introduction

CTW's 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:

- Levels of service – Providing a defined level of service and monitoring performance.
- Future demand – Managing the impact of growth through demand management and infrastructure investment.
- Lifecycle management – Taking a lifecycle approach to developing cost-effective management strategies for the long-term that meet the defined level of service.
- Risk Management – Identifying, assessing and appropriately controlling risks.

Further to the above, this document links through to a Long-Term Financial Plan which forecast future costs (including infrastructure costs) and how those costs will be funded.

2. Scope of Asset Infrastructure

Central Tablelands Water operates a network that has three water supply systems, servicing the towns & villages in Blayney, Cabonne and Weddin Shire Council areas – around 6,500 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 1: CTW Network Extents.

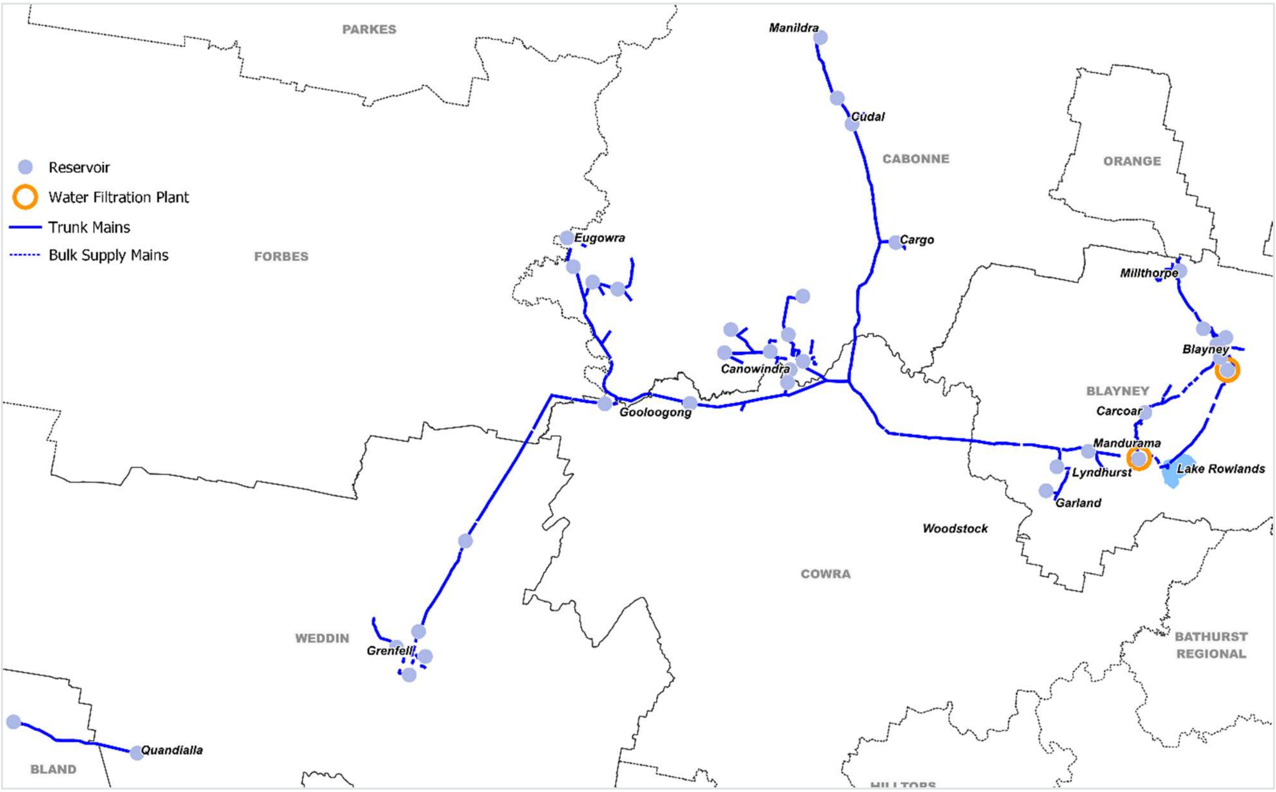


Figure 1: CTW Network Extents

2.1. SUMMARY OF ASSET PORTFOLIO

The infrastructure assets covered by this Plan include the Lake Rowlands Dam, two (2) water treatment plants, seven (7) bores, 43 reservoirs, 33 pump stations, 376km of trunk mains, 280km of reticulation mains, seven (7) automatic fillings stations, as well as a network of telemetry data systems. These assets are used to provide water supply services and have a total replacement value of $190 million, as of 30 June 2024. This portfolio is explained in further detail below, in Table 1: Asset Portfolio Summary.

Asset Type	Current Replacement Cost ($'000)	Quantity
Bores	$729	7 bores
Consumer Meter	-	5735 water meters
Filling Station	$309	7 stations
Filtration Site	$17,179	2 water treatment plants

Asset Type	Current Replacement Cost ($'000)	Quantity
Lakes	$23,061	Lake Rowlands
Pump Station	$11,712	33 pump stations
Reservoir	$26,818	43 reservoirs
Reticulation Mains	$37,875	280km
Solar	$343	2 sites
Telemetry	$676	Telemetry Network
Trunk Mains	$71,646	376km

Table 1: Asset Portfolio Summary

2.2. SOURCE WATER & CATCHMENTS

Lake Rowlands is the primary water source and 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 2: Lachlan Catchment Area. It is located 16 km south-west of Blayney township and 7 km south-east of Carcoar township with 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 has put in place specific land-use restrictions. In addition to this, the Lake has been fully fenced around the 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 mixing (Central Tablelands Water, 2018).

Groundwater flow within the CTW supply area is drawn mainly from the Lachlan and the south-western fractured rock aquifer, which is part of the Lachlan Fold Belt. Blayney Well, and the Gooloogong, Bangaroo & 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 (NSW Office of Water, 2011).

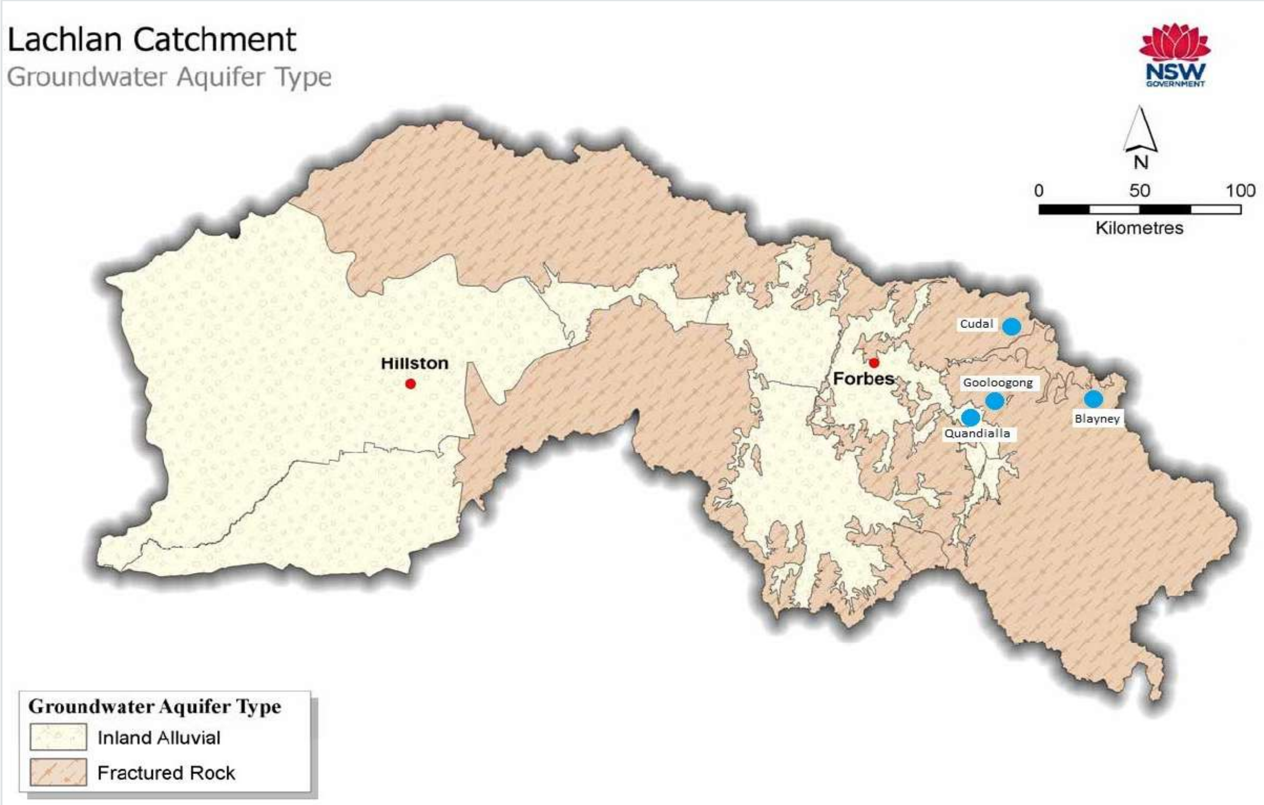


Figure 2: Lachlan Catchment Area

Central Tablelands Water holds water extraction licences for its water sources – under the NSW Water Management Act 2000 and Water Act 1912. The main water source used in the systems is Lake Rowlands. Various groundwater bores supplement water from Lake Rowlands 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 2: Water Sources and Extraction Licences.

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 2: Water Sources and Extraction Licences (Central Tablelands Water, 2021)

2.3. WATER SUPPLY SYSTEMS

CTW has connected around 6,500 properties and provides potable water to a population of approximately 15,000 consumers in 14 towns & villages. This is supplied through 376km of trunk mains and 280km of reticulation mains. The population regions for each Water Supply System is shown in Figure 3: Water Supply Systems Map below.

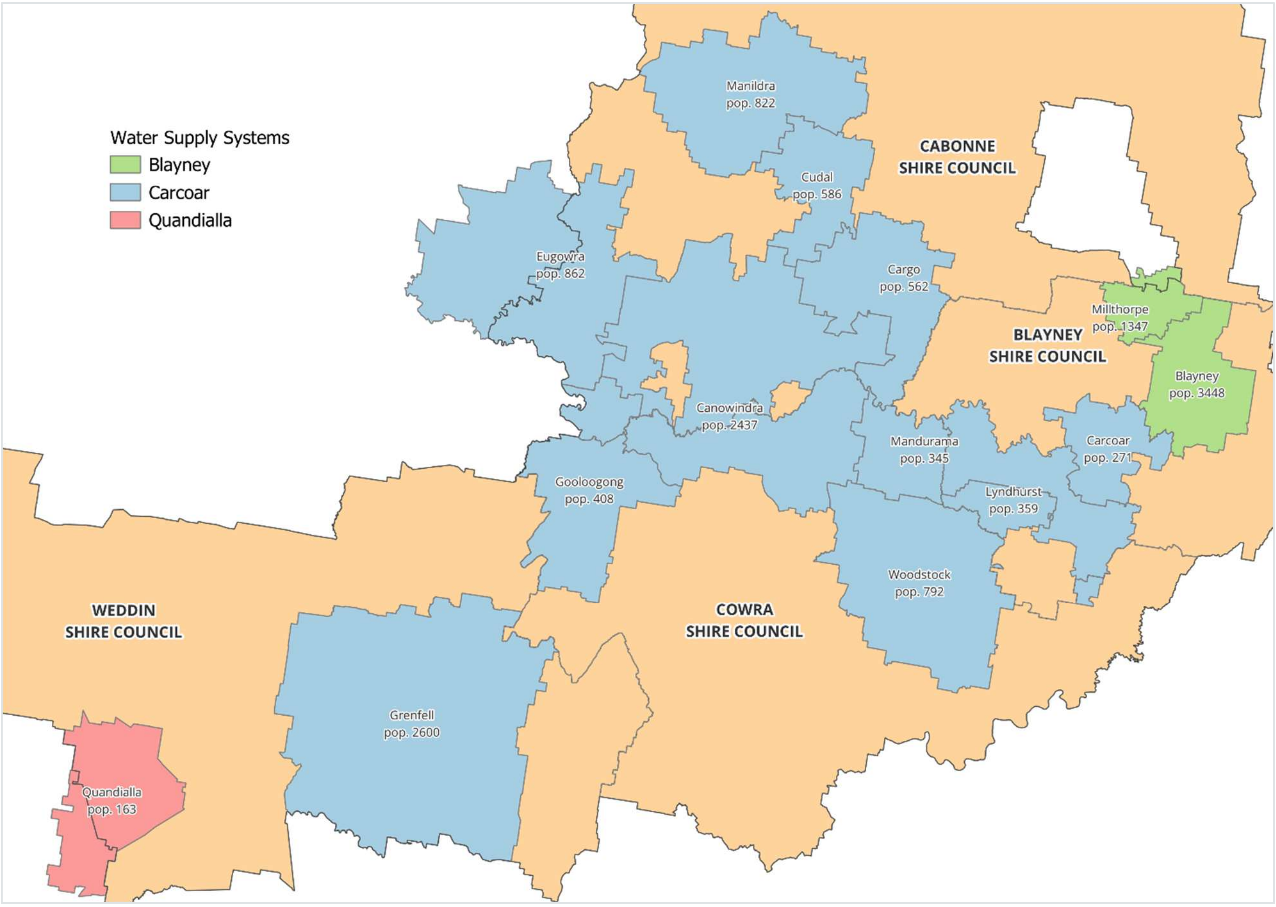


Figure 3: Water Supply Systems Map

A summary of these water supply systems is shown in Table 3: Water Supply Systems. For more details on the three water supply systems, refer to CTW Drinking Water Management System (Central Tablelands Water, 2018).

Category	Carcoar System	Blayney System	Quandialla System
Catchment(s)	Lachlan catchment and Upper Lachlan alluvium	Lachlan catchment and Upper Lachlan alluvium	Upper Lachlan alluvium
Source Water	Lake Rowlands (primary) Gooloogong Bore (peak demand supply) Cudal and Bangaroo Bores (capped)	Lake Rowlands (primary) Blayney Well (emergency)	Quandialla Bore
Treatment	Treatment process at Carcoar WFP:	Treatment process at Blayney WFP:	Treatment process at Quandialla supply:

Category	Carcoar System	Blayney System	Quandialla System
	• Coagulation and flocculation • Dissolved Air Flotation (DAF) • Filtration • Disinfection / Chlorination • Fluoridation	• Coagulation and flocculation • Clarification • Filtration • Disinfection / Chlorination • Fluoridation	• Disinfection / Chlorination
Reservoirs	31 reservoirs in the Carcoar drinking water supply system.	Six (6) reservoirs in the Blayney drinking water supply system.	Six (6) reservoirs in the Quandialla drinking water supply system.
Points of Supply	Blayney Shire: • Carcoar pop. 271 (ABS, 2021) • Lyndhurst pop. 359 (ABS, 2021) • Mandurama pop. 345 (ABS, 2021) Cabonne Shire: • Canowindra pop. 2,437 (ABS, 2021) • Cargo pop. 562 (ABS, 2021) • Cudal pop. 586 (ABS, 2021) • Eugowra pop. 862 (ABS, 2021) • Manildra pop 822 (ABS, 2021) Weddin Shire: • Grenfell pop. 2,600 (ABS, 2021) Cowra Shire: • Gooloogong pop. 408 (ABS, 2021) • Woodstock pop. 792 (ABS, 2021)	Blayney Shire: • Blayney pop. 3,448 (ABS, 2021) • Millthorpe pop. 1,347 (ABS, 2021)	Weddin Shire: • Quandialla pop. 163 (ABS, 2021)

Table 3: Water Supply Systems

3. Levels of Service

CTW characterises service levels in line with the International Infrastructure Management Manual (IPWEA, 2015). As such, levels of service are considered in two parts: community levels of service and technical levels of service.

3.1. COMMUNITY LEVELS OF SERVICE

Community levels of service have been considered under three (3) broad categories, being condition, function, and capacity.

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?

Below, in Table 4: Community Levels of Service, is a summary of CTW's current community levels of service, the performance measures & targets being used to measure those service levels, and the current performance results.

Level of Service	Performance Measure	Performance Target	Current Performance
Condition			
Availability of water	Number of water main/meter breaks/leaks	Less than 195 breaks/leaks per year	For 23/24 FY, 62.
Perceived water quality	Number water quality complaints	Less than 26 complaints per year.	For 23/24 FY, 2
Function			
Flow rate	Number of no water complaints	Less than 3 complaints per year.	For 23/24 FY, 2
Pressure	Number of low-pressure complaints	Less than 11 complaints per year.	For 23/24 FY, 2
Capacity			
New service connections (incl. subdivisions) can be provided with the required flow rate and pressure	Monitoring existing network	Meet demand in accordance with business goals.	Meeting existing service levels, monitoring with flow sensors

Table 4: Community Levels of Service

3.2. TECHNICAL LEVELS OF SERVICE

The technical levels of service are detailed below in Table 5: Technical Levels of Service. Levels of Service are the targets which CTW aims to meet, they are not intended as a formal customer contract.

Level of Service	Performance Measure	Performance Target
Availability of Water	'Normal' Quantities Available *(for potable water supplies)*	Domestic peak: 1,600L / tenement / day Domestic annual: 180kL / tenement / year Annual average consumption: 1,575ML / year Peak daily consumption: 10 ML / Day
	Fire Fighting Water Available	100% of ' CTW serviced urban / village' area served
	Pressure	Minimum Pressures: 20m head* (when delivering 15 L/min) Maximum Pressures: 60m head (static pressure) **Subject to proximity of the property to reservoir.*
	Flow Rates (minimum)	Domestic Customers: 25 L / minute Rural Customers: 6.3 L / minute
Supply Interruptions	Planned Interruptions	Notice to be given to domestic and commercial customers: 48 hours Notice to be given to major industrial and institutional customers: 7 days
	Unplanned Interruptions	Maximum duration of interruption: 12 hours Number of interruptions: < 2 per year per customer
Response Time to Customer Requests	Supply Failure	Priority 1: • During work hours: 1hrs • Outside work hours: 2 hrs

(defined as time to have staff onsite to attend to problem)	*(see customer response time priority details below)*	Priority 2: • During work hours: 3 hrs • Outside work hours: 4 hrs Priority 3: • 1 working day Priority 4: • 1 week
	Customer Complaints	Personal, oral or written: 5 working days for 95% of complaints
	Service Provision	10 working days for 95% of cases
Water Quality *(as per Australian Drinking Water Guidelines* (NHMRC, 2024))	Microbial Quality	Total coliforms: 98% compliance with ADWG Thermo-tolerant coliforms: 98% compliance with ADWG Sampling frequency: 52 samples/year
	Physical & Chemical Characteristics	pH: 7.5 Turbidity: <1.0 NTU Fluoride: 1 mg/L Free chlorine (in reticulation): 0.2 mg/L

Table 5: Technical Levels of ServiceIn Table 5: Technical Levels of Service above, the 'Response Times to Customer Complaints' references complaint 'Priorities'. These are explained below.

Priority 1 Failure to maintain continuity or quality of supply to 'a large number of' customers or to a critical user at a critical time.

Priority 2 Failure to maintain continuity or quality of supply to a small number of customers or to a critical user at a non-critical time.

Priority 3 Failure to maintain continuity or quality of supply to a single customer.

Priority 4 A minor problem or complaint, which can be dealt with at a time convenient to the customer and CTW.

Further to the above priorities, reference is also made to the concept of 'work hours.' For the purposes of this document, standard work hours are between the hours of 9AM and 5PM on normal business days.

3.3. 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 Requirements.

Regulatory or Formal Requirement	Relevance to Drinking Water Quality
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".
Competition and Consumer Act 2010	As a "seller" of water, the CTW is subject to provisions of Consumer transactions and Consumer guarantees, which guarantees that the goods supplied are reasonably fit for purpose.
NSW Legislation	
Dam Safety Act 2015	Owners of prescribed dams are required to operate, maintain, extend and report on prescribed dams to the Dams Safety Committee to ensure the safety of their dams. Lake Rowlands is a prescribed dam.
Environmental Planning & Assessment Act 1979	Requires that the environmental impacts of projects be studied at all stages based on 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.
Fluoridation of Public Water Supplies Act 1957	Requirements for testing and reporting where water supplies are fluoridated.
Local Government Act 1993	Provides the legal framework for the system of local government for New South Wales. Sets out the responsibilities and powers of councils, councillors and other persons and bodies that constitute the system of local government. Provides for governing bodies of councils that are democratically elected,
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.
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

Regulatory or Formal Requirement	Relevance to Drinking Water Quality
	circumstances is an offence. Water Act 1912 is being progressively phased out and replaced by Water Management Act 2000.
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.
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
Water Supply (Critical Needs) Act 2019	An Act to facilitate the delivery of emergency water supplies to certain towns and localities;
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 Regulatory Assurance Framework for Local Water Utilities	Provides guidelines for managing the provision of water supply and sewerage services by Councils under section 409(6) of the Local Government Act.
NSW Health Drinking Water Monitoring Program 2005 (Updated 2011)	NSW Health provides analysis of drinking water samples for water utilities, providing an independent analysis of water at point of supply.
NSW Health Response Protocol for management of microbial quality of drinking water	Guides Public Health Units and water utilities in their joint response to rapidly changing source water quality, treatment failure or microbial contamination.
NSW Health Response Protocol for management of physical and chemical quality	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.

Table 6: Regulatory Requirements

4. Future Demand

4.1. DEMAND DRIVERS

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

In many cases, new assets are required to meet demands upon a network. Such assets may be donated or constructed. Either way, acquiring new assets commits CTW to ongoing operational, maintenance and renewal costs for the period that the new service is required for. These future costs are identified and considered in developing forecasts of future operations, maintenance, and renewal costs for inclusion in the long-term financial plan.

4.2. DEMAND FORECASTS & MANAGEMENT

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 (DMP) June 2021. From the DMP, there was one (1) management outcome that specifically impacts how CTW manages its asset infrastructure (CTW, 2021):

Water Loss Management (DMP, Item 4.1.3):

- Water trunk and reticulation mains maintenance program to improve the asset condition and minimise the likelihood of mains breaks.
- All free-standing residential premises are separately metered and CTW encourage multi-residential developments to meter each unit separately to improve leak detection.
- CTW will investigate options to minimise water loss through installation of additional flow meters strategically placed on the trunk mains across the network.
- CTW will investigate the use of a drone to visually inspect leaks in trunk mains

The above will be monitored and reported as per the statements within the Demand Management Plan.

4.3. CLIMATE CHANGE ADAPTATION

Climate change is likely to have a significant impact on the assets managed by CTW and the services they provide. In the context of the Asset Management Planning process, climate change is 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 we respond and manage those impacts (IPWEA, 2018). As a minimum, CTW considers how it manages existing assets, given potential climate change impacts for the region.

Risk and opportunities identified to date, associated with climate change, are shown in Table 7: Climate Change Impact on Services.

Climate Change Description	Projected Change	Potential Impact on Assets and Services	Management
1˚C (minimum) rise in average temperatures	Increase evaporation and a reduction in soil moisture	Reduce runoff into Lake Rowlands, and greater water loss due to evaporation	Progress the Belubula Water Security Project for better water security

Increase frequency of days over 35°C	Increase peak demand	To have enough storage and pumping for treated water to cope with increased demand	New 12 ML Clearwater reservoir at Carcoar WTP site
Decrease in average rainfall	Lower yields and higher external demand	Impact on lake levels, ability to meet customer Levels of Service	Monitor effectiveness of water restrictions, potential regional augmentation of water sources. Progress the Belubula Water Security Project to augment Lake Rowlands wall to provide additional water security.

Table 7: Climate Change Impact on Services

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

- Assets can further withstand the impacts of climate change.
- Delivered services can be sustained.
- Potentially lower the lifecycle cost and/or reduce their carbon footprint.

Table 8: Resilience to Climate Change, summarises some asset climate change resilience opportunities.

Opportunity
Replace pump stations pumps (when due for renewal) with more efficient pumps
Design resilience of infrastructure into all future planning.

Table 8: 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 AM Plan.

Central Tablelands Water

5. Lifecycle Management

Lifecycle management details how Central Tablelands Water plans to manage and operate its water infrastructure assets at the agreed levels of service (Refer to Section 3) while managing whole of life costs. Lifecycle refers to a “cradle to grave” approach to assets, which includes the following elements:

- Planning/Design,
- Construction/Acquisition,
- Operation,
- Maintenance,
- Renewal,
- Impairment, Decommission, and Disposal.

5.1. ASSET LIFECYCLE COSTS

Central Tablelands Water maintains an asset register that is updated on a regular basis and includes, among other attributes, the condition and remaining useful life of each asset.

Lifecycle cost (or whole of life costs) represents the average costs required to sustain the levels of service being provided for an asset over its lifetime. Lifecycle costs include operating and maintenance expenditure as well as asset consumption (depreciation expense). The yearly life cycle costs for CTW assets are shown in Table 9: Asset Lifecycle Costs, using 2023/2024 financial year figures.

Asset Type	Maintenance & Operational Costs ($’000)	Depreciation Costs ($’000)	Lifecycle Costs ($’000/year)
Trunk Mains	$173	$835	$1,008
Reticulation Mains	$601	$381	$982
Reservoirs	$101	$381	$482
Pump Stations	$356	$376	$732
Bores	$66	$18	$84
Filtration Plants	$717	$422	$1,139
Telemetry	$49	$41	$90
Dams	$37	$225	$262
Other	$10	$29	$39
Total	$2,110	$2,708	$4,818

Table 9: Asset Lifecycle Costs

For many of the asset types, it is possible to approximate a ‘per unit’ lifecycle cost based on the number of units that are provided. For example: if 376km if trunk mains are operated at an annual lifecycle cost of $1,008,000, then it can be approximated that a trunk main has an annual lifecycle cost of $2,680 per kilometre per year.

The approximate 'per unit' lifecycle costs for each of the CTW asset types are details in Table 10: Per Unit Lifecycle Costs, below. Note: Some asset types (such as water plants) have been deliberately excluded as such a simplistic approach would be detrimental to planning purposes.

Asset Type	Lifecycle Costs ($'000/year)	Units within Portfolio	Annual 'Per Unit' Lifecycle Cost
Trunk Mains	$1,008	376km	$2,680 per km
Reticulation Mains	$982	280km	$3,507 per km
Reservoirs	$482	43 reservoirs	$11,209 per reservoir
Pump Stations	$732	33 stations	$22,181 per station
Bores	$84	7 bores	$12,000 per bore

Table 10: Per Unit Lifecycle Costs

The above table provides a useful reference point for planning for the impacts of the replacement costs.

5.2. ASSET REMAINING LIFE

Maintenance & Capital records are used to assist in the assessment of asset remaining life, serviceability and renewal cycles. An asset's condition 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.

The remaining life profile of the assets included in this Plan are shown in Figure 4: Age Profiles, and represented graphically in Figure 5: Remaining Life Profiles.

Remaining Life (as a % of overall life)	Replacement Cost ($'000)
Pump Stations	**$11,712**
< 10%	$253
< 25% (but > 10%)	$590
< 50% (but > 25%)	$1,791
> 50%	$9,078
Reservoirs	**$26,077**
< 10%	$0
< 25% (but > 10%)	$4,451
< 50% (but > 25%)	$12,595
> 50%	$9,031
Reticulation Mains	**$37,875**

< 10%	$1,523
< 25% (but > 10%)	$2,393
< 50% (but > 25%)	$8,435
> 50%	$25,523
Trunk Mains	**$71,646**
< 10%	$1,456
< 25%	$28,741
< 50%	$7,250
> 50%	$34,199
Other	**$42,335**
< 10%	$343
< 25%	$1,889
< 50%	$23,330
> 50%	$16,773

Figure 4: Age Profiles

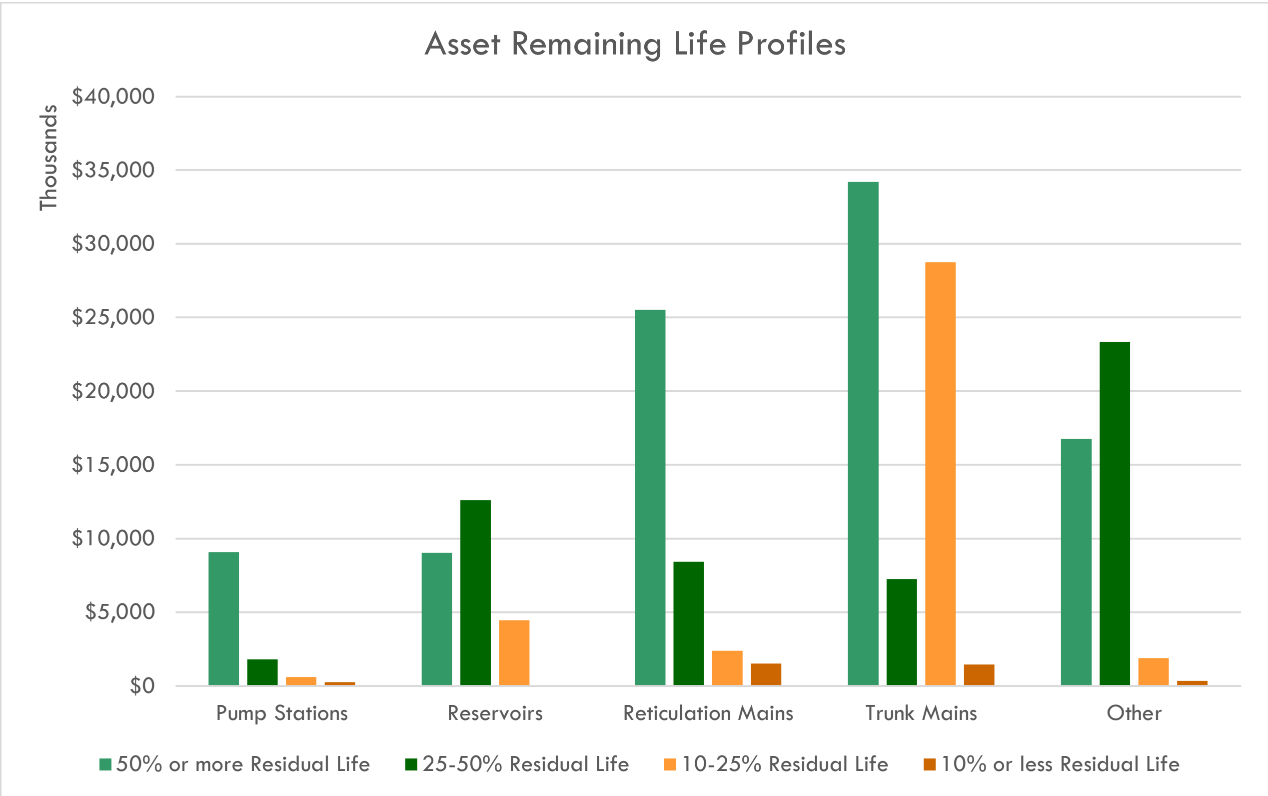


Figure 5: Remaining Life Profiles

5.3. ASSET CONDITION

The condition of CTW assets is monitored throughout their lifecycle to ensure they meet service requirements. Condition is currently monitored annually, via updates being made when assets are renewed or partially renewed. All asset conditions are re-assessed in a revaluation year, which for water assets is due 2026/27 – a comprehensive condition assessment of assets will be completed prior to this.

Condition is measured using a 1 – 5 grading system as detailed in Table 11: Condition Grading System.

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

Table 11: Condition Grading System

For CTW's water reticulation mains network, 87% of the assets are rated as being condition 2 or better. The trunk main network boasts 95% of its assets as being condition 2 or better. Figure 6: Asset Condition, shows the condition of Council's assets, by current replacement cost. Readers should note (as mentioned above) that a comprehensive review of asset condition is planned.

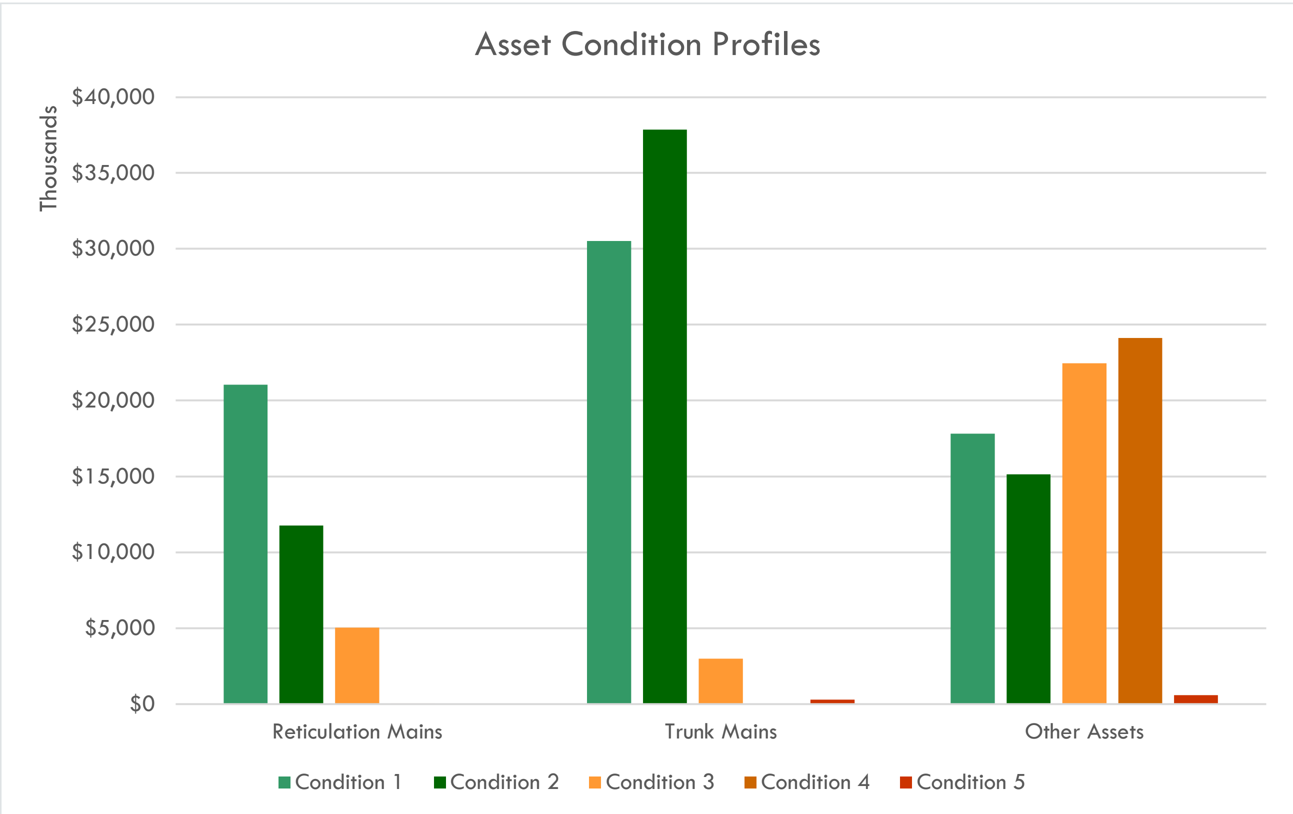


Figure 6: Asset Condition

5.4. OPERATIONS PLANNING

The purpose of the operations planning is to set out system rules and procedures for operating the water supply systems, and their individual sub-systems. CTW has successfully operated 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.

Operations include regular activities to provide services. Examples of typical operational activities include asset inspection, and meter reading. Operational costs (beyond those associated with operational activities) include water licence costs, chemical costs and electricity costs.

5.5. MAINTENANCE PLANNING

The purpose of the maintenance planning is to support the operations planning by ensuring that assets are provided in a "fit for purpose" standard. This translates as actual outputs in terms of quality, reliability and availability of the individual sub-systems and facilities. Appropriate assets maintenance will ensure CTW meets water supply levels of service in the most cost-effective manner. The link between operations, levels of service, maintenance, capital works, and asset register can be seen in the flow chart below:

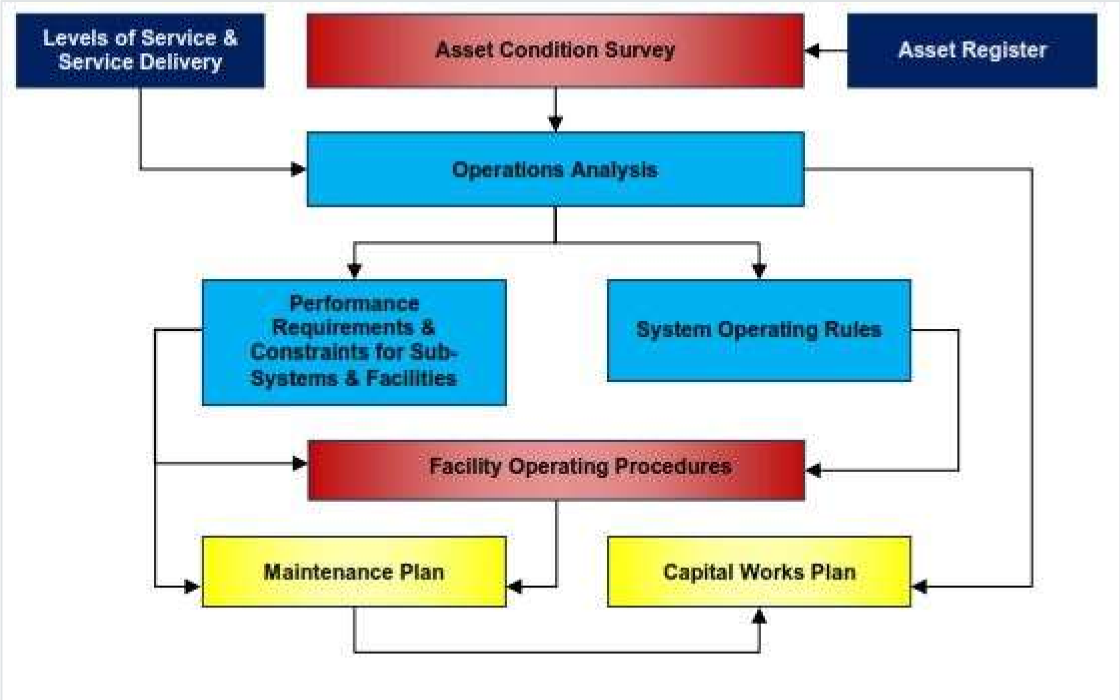


Figure 7: Operations & Maintenance

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.

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 – i.e. renewal. Similarly, if unscheduled maintenance occurs in the same area on a frequent basis, discussions about renewal of the asset would occur.

5.6. MAINTENANCE & OPERATIONAL INSPECTIONS

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. 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.

Table 12: Maintenance & Inspection Schedule details the maintenance and inspection processes undertaken by CTW staff.

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	Weekly Annually/ 3 yearly	Visual Clean out
Trunk Mains	As necessary	Break down maintenance
	Yearly	Flushing
Hydrants	2 yearly	Painting, cleaning, safety inspection
Chlorinators	As per manual	Routine inspections and servicing on an annual basis
Telemetry	Quarterly	Test, calibrate and repair
Meters	As necessary	Replace every 7,500kL for domestic meters
Electrical	As necessary	Repair
Building and Structures	As necessary	Repair

Table 12: Maintenance & Inspection Schedule

5.7. 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 aren't part of the asset plan.

6. Risk Management

One of the key factors in managing 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. Criticality analysis offers a form of risk assessment that focuses on key asset system components.

6.1. GENERAL & METHODOLOGY

To assess the criticality of assets for CTW water supply, a preliminary criticality analysis was performed in September 2014. The following sections describes the methodology and the outcomes of this analysis. See also, the below definitions for terminology used throughout this section.

- **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 Level of Service targets.

6.2. ASSET LEVEL

In Risk Management, 'levels' refer to the approximate level of detail in which the assets are examined. At CTW level 1 would include all CTW water assets, level 7 might be individual valves or reticulation pipes. 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 processes, this approach is considered too complex and detailed.

6.3. DEFINITION OF THE FAILURE EVENT

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

What would be the consequence of failure of the system, for a week in summer?

What is the likelihood of this failure occurring within the system?

Within this question, the following qualifications exist:

- **System**: refers to the Level 3 system being considered for each question.
- **Failure**: means the inability to meet CTW's levels of service or regulatory requirements. The magnitude of such a consequence was assessed as described in Table 13: Consequence of Failure for Water Supply.
- **Consequence**: extends to each level of service element within the system.

- **Likelihood**: was assessed as described in Table 14: Likelihood of Failure.

6.4. CRITICALITY ASSESSMENT

Six consequence factors were considered for CTW's consequence analysis. These are as described below and expanded upon in Table 13: Consequence of Failure for Water Supply:

- Pressure
- Domestic Peak Demand
- Unplanned Supply Interruption
- Fire Fighting supply
- Water Quality
- Environmental Issues

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 (LOS) 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)	Domestic Peak Demand (1.6kL/d)	Unplanned Supply Interruption (3 hours, 10 times/year)	Fire Fighting (Positive Head Fire Flow at 75% Design Peak)	Water Quality (ADWG, 2011)	Environment
Catastrophic (5)	Lose pressure more than 6,500 customers	Not meet peak demand for more than 6,500 customers	Lose supply more than 6,500 customers	Lose supply more than 6,500 customers	More than 6,500 customers boil water	Catastrophic environmental incident
Major (4)	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
Moderate (3)	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
Minor (2)	Lose pressure more than 10 customers	Not meet peak demand for	Lose supply more than 10 customers	Lose supply more than 10 customers	More than 10 customers boil water	Significant impact to the environment

	or major industry	more than 10 customers	or major industry	or major industry		
Insignificant (1)	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 13: Consequence of Failure for Water Supply

6.5. 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. While if the asset is in excellent condition, it would be expected to perform acceptably and be rated as rare.
- **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 14: Likelihood of Failure, 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 14: Likelihood of Failure

6.6. ASSESSMENT RESULTS

The level 3 assets criticality assessments were undertaken with CTW staff at a workshop held in September 2014. Table 15: Risk Matrix, illustrates CTW's risk matrix. Table 16: Theoretical Response, details a theoretical approach in terms of which form of Asset Management actions might be required.

In Table 17 & Table 18 the "Worst Case" Scenario columns (on the right-hand side) combine the highest consequence figures with the highest likelihood to indicate the most critical assets for addressing CTW's levels of service and meeting 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: Worst-Case Scenario.

		Consequence				
Likelihood		Insignificant (1)	Minor (2)	Moderate (3)	Major (4)	Catastrophic (5)
	Rare (1)	Low	Low	Moderate	High	High
	Unlikely (2)	Low	Low	Moderate	High	Very high
	Possible (3)	Low	Moderate	High	Very high	Very high
	Likely (4)	Moderate	High	High	Very high	Very high
	Almost Certain (5)	Moderate	High	Very high	Very high	Very high

Table 15: Risk Matrix

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

Table 16: Theoretical Response

It could be interpreted that according to the water supply Level 3 asset criticality assessment, that CTW only have three critical assets which have very high risk due to failure to meet the water supply Level of Service.

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 focused. This is illustrated in Figure 8: Worst-Case Scenario, where the worst-case consequence and likelihood outcomes are laid out within the theoretical Asset Management action sectors.

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/breakdown maintenance approaches. To address the issues raised by the criticality analysis CTW has several 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 Level of Service impact, then 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.

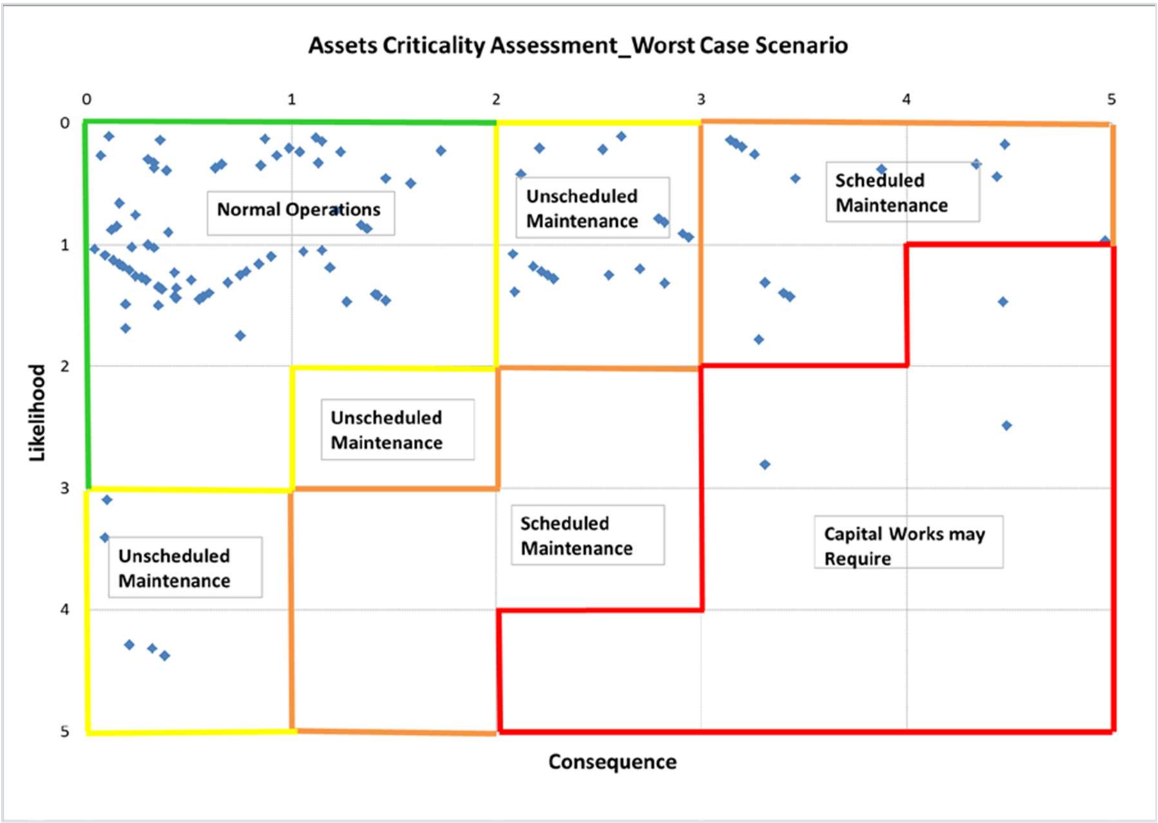


Figure 8: Worst-Case Scenario

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. 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

NOTE: From this, CTW has renewed and upgraded trunk main K (2016-2020), and the higher risk now is the trunk main C feed to trunk main K.

The highest priority assets in each system that required scheduled maintenance are summarised in the table below.

Asset Description	Operating rules and procedures in place	Scheduled maintenance plan in place	Actions included in 10 years capital works program	Worst case scenario Likelihood (L) & Consequence (C)
Blayney WSS				
Lake Rowlands Dam	Yes	Yes	Lake Rowlands Remediation	C=5 L=3
Blayney intake including intake pumps	Work method statement in place	Yes	Annual provision for pumps replacement	C=4 L=1

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
Blayney WTP	Automated telemetry system. Now written which includes troubleshooting and shutdown procedure for Blayney WFP	Yes	Renewal and upgrade in Blayney WTP	C=4 L=2
Chlorinator at Blayney WTP	Work method statement in place	Yes	Renewal work in Blayney WTP	C=4 L=2
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

Table 17: Blayney WSS

Asset Description	Operating rules and procedures in place	Scheduled maintenance plan in place	Actions included in 10 years capital works program
Carcoar WSS			
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
Carcoar WTP	Automated telemetry system. No written down procedure which includes troubleshooting and shutdown procedure for Carcoar WTP	Yes	Renewal work in Carcoar WTP
Chlorinator at Carcoar WTP	Work method statement in place	Yes	Renewal work in Carcoar WTP
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 work allocation
Gooloogong Bore	Work method statement in place	No	Refurbish Gooloogong Bore
Gooloogong chlorinator	Work method statement in place	Yes	Refurbish Gooloogong Bore

Gooloogong pump station (PS)	Work method statement in place	Yes	No capital works allocation
Rising main from Gooloogong PS to Trunk Main "C"	Work method statement for water main repair in place	Yes (yearly flushing, otherwise breakdown maintenance)	Gooloogong bridge trunk main renewal
Trunk main 'K'	Work method statement for water main repair in place	Yes (yearly flushing, otherwise breakdown maintenance)	Trunk main K renewal
McDonalds Lane PS	Booster pump station work method statement in place	Yes	No capital works allocation in next 30 years

Table 18: Carcoar WSS

7. Document History

May 2022: Original document included as a part of the Central Tablelands Water Asset Management Plan.

February 2025: Extracted the Asset Management Plan into a standalone document.

8. Related Policies/Strategies/Plans

The following should be read in conjunction with this Policy:

- Central Tablelands Water Asset Management Policy
- Central Tablelands Water Asset Management Strategy

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Appendix A: Water Supply Assets Criticality Assessment Outcomes

WSS	Ref	Asset System Description (Level 3)	Levels of Service						Likelihood of Failure			Worst Case Scenario		
			Pressure	Peak Demand	Supply Interruptions	Fire Fighting	Water Quality	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/a	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/a	2	1	2	4	2	High
Blayney	5	Blayney Clear Water Tank (CWT)	n/a	n/a	n/a	n/a	n/a	n/a	2	1	1	0	2	Low
Blayney	6	Chlorinator @ Blayney WTP	n/a	n/a	n/a	n/a	5	n/a	1	1	1	5	1	High
Blayney	7	Gravity main from CWT to Hill Street Reservoir	4	4	4	4	n/a	n/a	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/a	2	1	1	3	2	Moderate
Blayney	9	Rising main from Polona Street pumping station (PS) to Patrick's Reservoir	3	n/a	n/a	n/a	n/a	n/a	2	1	1	3	2	Moderate

WSS	Ref	Asset System Description (Level 3)	Levels of Service						Likelihood of Failure			Worst Case Scenario		
			Pressure	Peak Demand	Supply Interruptions	Fire Fighting	Water Quality	Environmental	Condition	Capacity	Technology	Consequence	Likelihood	Risk
Blayney	10	Patrick's Reservoir (0.45 ML)	3	n/a	n/a	n/a	n/a	n/a	2	1	1	3	2	Moderate
Blayney	11	Blayney Reticulation System	2	n/a	n/a	1	n/a	n/a	2	1	1	2	2	Low
Blayney	12	Plumb Street Reservoir (0.91ML)	n/a	n/a	n/a	n/a	n/a	n/a	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/a	2	1	1	0	2	Low
Blayney	14	Blayney Well	n/a	n/a	n/a	n/a	n/a	n/a	2	4	1	0	4	Low
Blayney	15	Blayney Well pumps (0.6 ML/d)	n/a	n/a	n/a	n/a	n/a	n/a	1	1	1	0	1	Low
Blayney	16	Rising main from Blayney Well to Hill Street Reservoir	n/a	n/a	n/a	n/a	n/a	n/a	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/a	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/a	2	2	2	3	2	Moderate
Blayney	19	Browns Creek Reservoir (0.23 ML)	n/a	n/a	n/a	n/a	n/a	n/a	2	1	1	0	2	Low
Blayney	20	Browns Creek PS (2 pumps @ 0.8 ML/d each)	3	3	3	3	n/a	n/a	1	1	1	3	1	Moderate

WSS	Ref	Asset System Description (Level 3)	Levels of Service						Likelihood of Failure			Worst Case Scenario		
			Pressure	Peak Demand	Supply Interruptions	Fire Fighting	Water Quality	Environmental	Condition	Capacity	Technology	Consequence	Likelihood	Risk
Blayney	21	Rising main from Browns Creek PS to Millthorpe Reservoir (length 8.38 km)	3	3	3	3	n/a	n/a	2	2	2	3	2	Moderate
Blayney	22	Millthorpe Reservoir (1.36ML)	n/a	n/a	n/a	n/a	n/a	n/a	2	1	1	0	2	Low
Blayney	23	Millthorpe Reticulation System	1	n/a	n/a	1	n/a	n/a	1	1	1	1	1	Low
Carcoar	24	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	25	Carcoar WTP (9 ML/d)	5	5	5	3	3	3	1	1	1	5	1	High
Carcoar	26	Carcoar Clear Water Tank (CWT) (2.16 ML)	n/a	n/a	n/a	n/a	n/a	n/a	2	4	2	0	4	Low
Carcoar	27	Chlorinator at Carcoar WTP	n/a	n/a	n/a	n/a	4	n/a	1	1	1	4	1	High
Carcoar	28	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	29	Rising main Booster #1 Pump Station to Carcoar CTLX	n/a	3	n/a	n/a	n/a	n/a	2	1	2	3	2	Moderate
Carcoar	30	Pipeline CTLX to Browns Creek -	n/a	n/a	n/a	n/a	n/a	n/a	5	5	5	0	5	Low

WSS	Ref	Asset System Description (Level 3)	Levels of Service						Likelihood of Failure			Worst Case Scenario		
			Pressure	Peak Demand	Supply Interruptions	Fire Fighting	Water Quality	Environmental	Condition	Capacity	Technology	Consequence	Likelihood	Risk
Carcoar	31	Carcoar Reservoir (0.68 ML)	n/a	n/a	n/a	n/a	n/a	n/a	2	1	2	0	2	Low
Carcoar	32	Carcoar Reticulation System	2	n/a	n/a	1	n/a	n/a	1	1	1	2	1	Low
Carcoar	33	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	34	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/a	1	1	1	0	1	Low
Carcoar	35	Mandurama Reservoir (0.91 ML)	n/a	n/a	n/a	n/a	n/a	n/a	1	1	1	0	1	Low
Carcoar	36	Mandurama PS (3 pumps @ 0.1 ML/d each)	3	n/a	n/a	n/a	n/a	n/a	1	1	1	3	1	Moderate
Carcoar	37	Mandurama Reticulation System	2	n/a	n/a	1	n/a	n/a	1	1	1	2	1	Low
Carcoar	38	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	39	Trunk Main 'G' from Trunk Main C to Lyndhurst Reservoir (length 2.13 km)	n/a	3	n/a	n/a	n/a	n/a	1	1	1	3	1	Moderate

WSS	Ref	Asset System Description (Level 3)	Levels of Service						Likelihood of Failure			Worst Case Scenario		
			Pressure	Peak Demand	Supply Interruptions	Fire Fighting	Water Quality	Environmental	Condition	Capacity	Technology	Consequence	Likelihood	Risk
Carcoar	40	Lyndhurst Reservoir (0.68ML)	n/a	n/a	n/a	n/a	n/a	n/a	2	1	2	0	2	Low
Carcoar	41	Lyndhurst Reticulation System	2	n/a	n/a	1	n/a	n/a	1	1	1	2	1	Low
Carcoar	42	Garland PS (one pump @0.1 ML/d)	n/a	n/a	n/a	n/a	n/a	n/a	2	1	2	0	2	Low
Carcoar	43	Garland Reservoir (0.045 ML)	n/a	n/a	n/a	n/a	n/a	n/a	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	45	Sugarloaf Road PS (2 pumps @6.0 ML/d each)	n/a	n/a	n/a	n/a	n/a	n/a	1	1	1	0	1	Low
Carcoar	46	Canomodine PS (2 pumps @1.8 ML/d each)	n/a	n/a	n/a	n/a	n/a	n/a	2	1	2	0	2	Low
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

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			Pressure	Peak Demand	Supply Interruptions	Fire Fighting	Water Quality	Environmental	Condition	Capacity	Technology	Consequence	Likelihood	Risk
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

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			Pressure	Peak Demand	Supply Interruptions	Fire Fighting	Water Quality	Environmental	Condition	Capacity	Technology	Consequence	Likelihood	Risk
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
Carcoar	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

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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
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

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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 from Trunk Main ‘C’ to Eugowra Reservoir (length 20km)	n/a	3	3	n/a	n/a	n/a	2	1	1	3	2	Moderate

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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

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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 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 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