CENTRAL TABLELANDS Water

ASSET MANAGEMENT PLAN

APRIL 2018

"Adopted 13 June 2018"

This document is based upon the March 2015 report completed by HydroScience Consulting.

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 advance 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. It supports Council in meeting the current and future levels of service (LOS) and regulatory requirements at an optimum asset life cycle cost.

WATER SYSTEMS

CTW operates three water supply systems servicing the towns and villages in Blayney, Cabonne and Weddin Shire Council local government areas (LGAs). Central Tablelands Water 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

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

- To provide water supply service to customers in accordance with acceptable LOS
- To build on reputation as a leading utility service provider
- To offer a comprehensive service in the location, treatment, storage, movement and delivery of water and associated services CTW's water supply levels of service targets are summarised below.
- Provide pressure between 20 and 60 m head when delivering water at 15 L/min
- Provide peak day water demand 1.6 kL/d for domestic customers
- Limit unplanned supply interruption to less than two times per year per customer
- Provide fire flows in reticulation systems in compliance with the NSW Water Directorate Water Supply Investigation Manual
- Meet the 2011 Australian Drinking Water Guidelines
- The full water supply LOS descriptions are included in Section 5.

LIFE CYCLE MANAGEMENT AND ASSET CONDITION

Council has an up to date asset register. CTW is currently implementing a computer based asset management system, linked to its existing mapping intranet portal.

In 2017, CTW undertook an asset condition assessment. According to the outcome of this assessment most of the CTW assets are in good condition. The assets identified as in poor condition are included in CTW's 30 year capital works program.

RISK AND CRITICALITY

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 7.2) 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

OPERATIONS AND MAINTENANCE PLANS

The General Manager and Director Operations and Technical Services are responsible for CTW's asset development, operations and maintenance.

The aim of the operations and maintenance plans is to ensure that the service objectives are achieved at the least cost and that the impact of breakdowns or outages is minimised. Council is planning to further develop its operating rules and procedures. It is expected that these procedures will apply to the high priority areas identified from the asset criticality analysis contained in this report.

CTW has developed maintenance management systems and has systems in place for organising and recording scheduled maintenance. Council plans to improve the system in the near future to link to the asset management system. Unscheduled maintenance is carried out in response to customer complaints, alarms and/or requests from operators.

CAPITAL WORKS PLAN

CTW has a 30 year capital works program updated in April 2018. The estimated planned investment in the water supply system over the next 30 years is over $100 million dollars, to account for renewal, growth and improving levels of service.

FINANCE

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 long-term financial plans.

Investment in asset renewal offsets the annual depreciation. That is, renewal investment increases the written down current cost (WDCC) and consequently the asset status. The asset status is the ratio of the depreciated value to the replacement cost.

According to CTW's 2017 annual financial statements, the estimated asset status is 46.4% (in 2016/17) and over the next 30 years Council is planning to invest in renewals to increase this ratio.

CONTENTS

1. INTRODUCTION

1.1 OVERVIEW

All NSW Local Water Utilities (LWUs) are encouraged to continually improve their water supply and sewerage businesses according to the following guidelines prepared by NSW Office of Water (NOW), which from 2017 is called Department of Industry - Water.

- Best-Practice Management Guidelines (2007)
- Strategic Business Planning Guidelines (July 2011)
- Draft Asset Management Guidelines (April 2011)
- Integrated Water Cycle Management Checklist (July 2014)
- Strategic Business Plans Checklist (July 2014)

The Guidelines and checklists which provide a framework for continuing performance improvement include the following key elements that relate to asset management:

- Integrated Water Cycle Management (IWCM) which includes:
    - Total Asset Management Plan (TAMP)
    - Long Term Financial Plan
- Strategic Business Planning (SBP) which includes:
    - Asset Management Plan (includes operations, maintenance and capital work plans)
    - Workforce Plan
    - Financial Plan

This Asset Management Plan (AMP) has been written to comply with the NOW's Strategic Business Planning Guidelines 2011. Further to NOW's Guidelines, Central Tablelands Water (CTW) is also required to develop an Office of Local Government's Integrated Planning and Reporting (IPR) compliant Asset Management Plan. This Asset Management Plan has also been written to comply with:

The NSW Office of Local Government's IPR system requirements which are:

- Element 2.11 - Each Council must prepare an asset management strategy and asset management plan/s to support the community strategic plan and delivery program
- Element 2.15 - Each Council must account for and plan for all existing assets under its control, and any new asset solutions proposed in its community strategic plan and delivery program

1.2. OBJECTIVE

This asset management plan is a key component of an asset management system that is comprised of the asset policy, strategy and plan. Its key objective is to ensure that now and in the future CTW can meet its levels of service (LOS) and regulatory responsibilities through providing fit for purpose assets at an optimum cost.
The aim of this asset management is to provide, operate and maintain physical assets over their whole life cycle to achieve the required levels of service at the least cost, while still satisfying statutory and regulatory requirements.

As described by the IPR Framework, the process will be an ongoing one. When the 'reason' for and 'resources' available to asset management change (as a result of changes in community priorities), Council's asset management plan will be modified to suit. The asset management plan will also be reviewed over time with improved information on assets (conditions and costs) and as asset condition changes over time.

CTW reviewed its strategic Business Plan (SBP) in April 2018 and this plan has identified strategic priorities as:

1. Maintaining a high quality and reliable drinking water supply
2. An efficient, sustainable and customer focused organisation
3. Regional leadership and collaboration

The underlying principle for all asset management activities will be minimisation of life cycle costs – effective, timely maintenance of assets to extend the useful life of assets and optimise renewal spending.

The improvement of asset management performance will refine current planning and strategies, and eventually advance Council past 'core' asset management (prioritising work based on financial returns) into 'advanced' asset management (prioritising work based on detailed risk analysis and optimised decision making).

1.3. CORE AND ADVANCED ASSET MANAGEMENT PLANS

In developing a new asset management plan it is recommended, by the International Infrastructure Management Manual Version 3.0, 2006 (IIMM), to begin by developing a core asset plan. This focuses on current practices and system knowledge available at the time. This asset management plan is a core plan. Following this, CTW will progress towards an advanced asset management plan through continuous cycles of review and improvements.

Asset management planning can be undertaken initially to meet minimum legislative and organisational requirements for financial planning and reporting. This is referred to as the core approach to asset management, and provides basic technical management outputs such as statements on current levels of service, forward replacement programmes and associated cash flow projections.

The IIMM provides a road map for asset management plan as shown in the figure below.

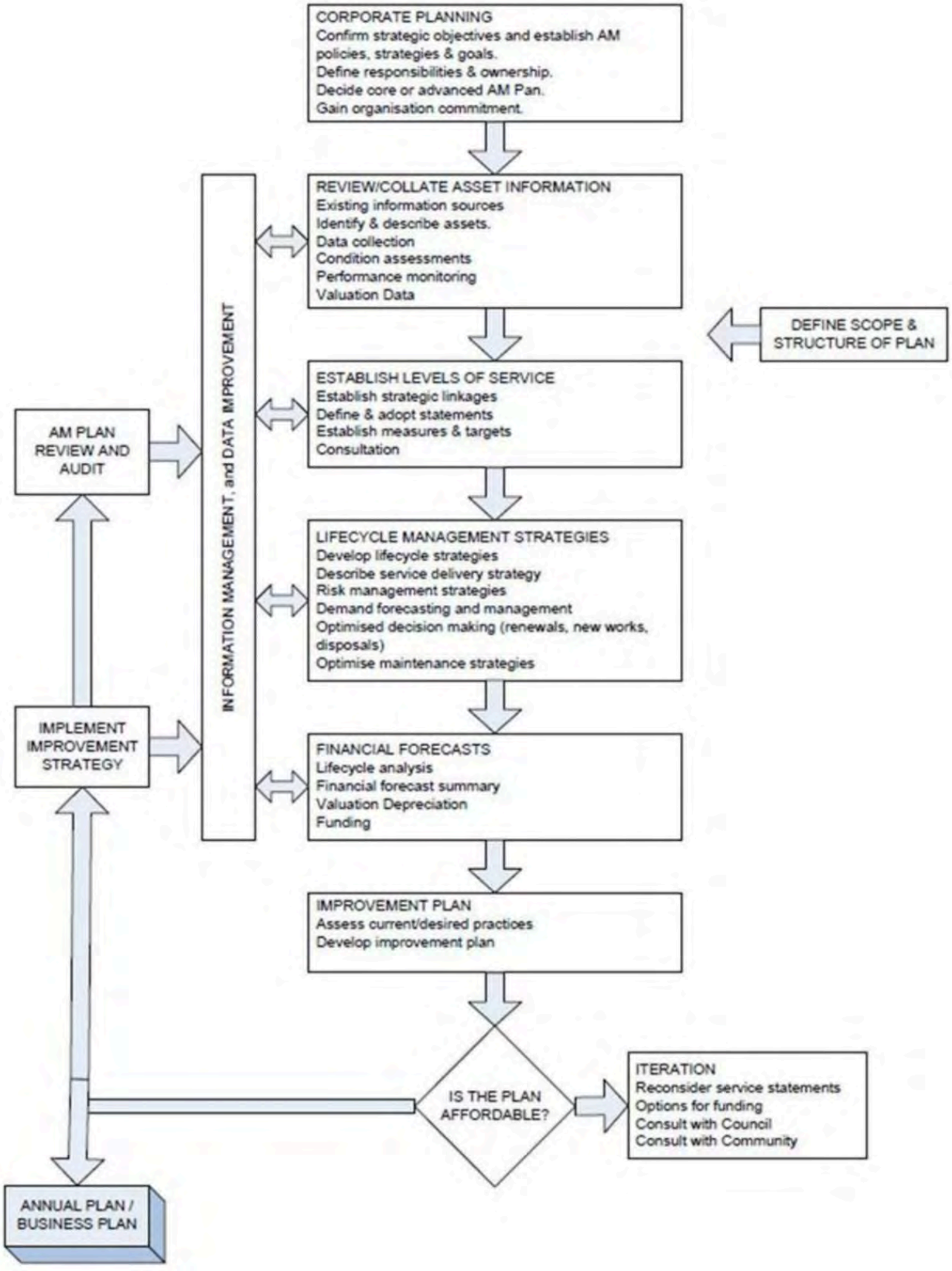


FIGURE 1: ROAD MAP FOR PREPARING AN ASSET MANAGEMENT PLAN

(Source: International Infrastructure Management Manual (IIMM) 2006, Figure 1.5.1, pg. 1.11)

2. ASSET MANAGEMENT POLICY

The asset management policy sets the framework, goals, and objectives for CTW's service delivery. It also sets the context for the asset management systems and identifies key performance measures, timeframes, and responsibilities.

The following asset policy for CTW has been developed to ensure that the asset strategy and asset plan satisfied the NSW Office of Water Best-Practice and NSW Division of Local Government Integrated Planning and Reporting (IPR) requirements. IPR specifically requires an asset policy to be developed that sets the framework for development of asset strategy and asset plan.

CONTEXT

This policy relates to Central Tablelands Water's water supply assets.

Central Tablelands Water uses a large and diverse asset base to deliver water supply to residential, rural, industrial, commercial and municipal customers in the towns and villages of Blayney, Cabonne, Cowra and Weddin Shire Councils.

The water supply is critical to development, economic viability and the quality of life.

INTEGRATION

Asset management is part of Council's integrated planning and reporting and strategic business plan for water supply as well as other business processes.

VISION

Central Tablelands Water vision statement:

An independent regional water authority providing a quality water supply, reliably and sustainably.

VALUES

We value our:

- customers
- independence, sustainability, efficiency and innovation
- skilled and capable workforce in delivering an essential service
- role as a regional collaborative partner and leader

CRITICALITY

The ability of Central Tablelands Water to deliver water supply levels of service is reliant on the effective operation, maintenance and replacement of the existing assets and the development of new assets.

REVIEW AND AUDIT

CTW will use a robust asset management system to manage the assets. The system will be reviewed every two years. Its implementation and the asset performance will be audited every three years.

GOAL

Improve water infrastructure to support Council's strategic direction.

OBJECTIVES

Maintain and enhance Council's assets to standards that support community wellbeing and future growth.

BENEFIT

Central Tablelands Water will maximise value for money by making decisions based on asset life cycle cost and asset performance.

SUSTAINABILITY

Central Tablelands Water assets will continue to support the community, enhance the environment and protect the needs of future generations.

COMMUNITY INPUT

The Asset Management Policy will be included in Central Tablelands Water's community consultation activities, providing opportunity for community input.

RELATIONSHIPS TO OTHER POLICIES

This Asset Management Plan is an integral part of Central Tablelands Water's Long Term Financial Plan, Development Servicing Plan, Delivery Plan, Operational Plan and Strategic Business Plan.

RESPONSIBILITY

The Councillors are responsible for adopting the policy and ensuring that sufficient resources are applied to manage the assets.

The General Manager has overall responsibility for developing an Asset Management Strategy, plans and procedures and reporting on the status and effectiveness of asset management within Council. The Director Operations & Technical Services is responsible for the delivery of services and the implementation of the asset plan.

3. ASSET MANAGEMENT STRATEGY

The purpose of an asset management strategy is to detail where 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 advanced asset management.

The strategy also sets out performance targets for the asset management plan. The asset management strategy and future performance targets for CTW are included below.

3.1. CURRENT STATUS

WATER SUPPLY

Central Tablelands Water assets includes a dam, bores, water treatment plants, reservoirs, pumping stations, trunk and reticulation pipelines, telemetry system, buildings, operational land and plant & equipment.

Council asset's current replacement cost (CRC) and written down value (WDV) of system assets as shown in the 2017 annual financial statements (2016/17 note 9) are $141.21 million and $67.96 million respectively.

ASSET CONDITION

Central Tablelands Water maintains an asset register that is updated regularly and includes the estimated life of each asset. The conditions of the above ground structures are adequate or better.

Central Tablelands Water's number of water main breaks in 2015/16 was 8 per 100 km, which is below the state-wide median (9 per 100 km). (2015/16 NSW Water Supply Performance Monitoring Report).

COST OF OPERATIONS

The operation maintenance and administration cost of the assets are listed in Council's annual financial statements.

Central Tablelands Water's water supply operation maintenance and administration cost in 2015/16 was $1.73 per kL, higher than the state-wide median ($1.20 per kL). (2015/16 NSW Water Supply Performance Monitoring Report).

ASSET UTILISATION

All of Central Tablelands Water assets are utilised to provide services to customers. When assets are no longer required, they are decommissioned and, where appropriate, disposed of.

CUSTOMER SATISFACTION

The customer water quality complaints (4 per 1000 properties), slightly higher than the state-wide median (3 per 1000 properties) which indicates moderate level of customer satisfaction (2015/16 NSW Water Supply Performance Monitoring Report). The customer water supply complaints (17 per 1000 properties), lower than the state-wide median (26 per 1000 properties) which indicates a good level of customer satisfaction (2015/16 NSW Water Supply Performance Monitoring Report).

ASSET SIZING

Central Tablelands Water assets are sized to supply current demand for services. The assets will be augmented as required to meet the future demand. Each project is assessed to optimise the total life cycle of the assets.

MEETING NEEDS

Central Tablelands Water generally meets the levels of service, which are typical of NSW water utilities. To ensure that the assets continue to deliver the levels of service, Central Tablelands Water will manage the existing assets and implement new assets as defined in the AMP.

FUNDING

Central Tablelands Water has a long-term financial plan that demonstrates the financial sustainability of the organisation, and its ability to meet the funding of the asset management plan. As of March 2018 Council had approximately $2.02 million in loans for the water supply fund.

PROCEDURES AND SYSTEMS

Central Tablelands Water has operation and maintenance procedures for the water supply infrastructure.

Council reviews asset management procedures and plans regularly and where appropriate provide training and reviewing or updating of the existing procedures.

ASSET RENEWAL

Central Tablelands Water maintains a rolling 30 year capital works program, including forecast renewal investment. The renewal program is constantly being refined based on new information on asset condition and performance. Central Tablelands Water maintains a detailed 10 year capital works program including evidence based renewal plan.

ASSET GROWTH

Central Tablelands Water maintains a rolling 30 year capital works program, including investment forecast for growth.

3.2. PERFORMANCE TARGETS OF THE ASSET MANAGEMENT PLAN

PERFORMANCE TARGETS

Performance measures in the recently updated CTW Delivery Plan 2018-2022 under Strategic priority 1 – Providing a high quality and reliable water supply, state a key result area 1.3 – best practice asset management. This relates to the activity where assets are managed strategically, using whole of life methodology to improve delivery of services and financial management and has a performance measure of TAMP and systems hierarchy and processes are in place, and constantly reviewed.

SAFE WATER

Council has developed a Drinking Water Management System (DWMS) which demonstrates Central Tablelands Water's compliance with the NSW Public Health Act 2010 requirement to develop a Quality Assurance Plan in accordance with the "Framework for Management of Drinking Water Quality" in the Australian Drinking Water Guidelines 2011 (ADWG).

Assets support Councils actions to meet Australian Drinking Water Guidelines (ADWG, 2011) requirements.

ENVIRONMENTAL PROTECTION

Assets support Councils actions to protect and enhance the environment.

RELIABILITY

The condition of all assets is reviewed every year.

Critical assets have appropriate level of redundancy.

Assets are operated and maintained in accordance with documented operation and maintenance rules and procedures

COST OPTIMISATION

Council achieves the lowest "whole of life cycle" cost through optimisation of asset management practices (breakdown maintenance, scheduled maintenance and asset renewal). This is also achieved by applying "value for money" procurement.

3.3. GAP ANALYSIS

ENVIRONMENTAL PROTECTION

Manage the water supply system in an environmentally responsible and ecologically sustainable manner.

Meet energy reduction targets in Council's plan.

Reduce and minimise Council's exposure to Greenhouse gas emissions and Council's carbon footprint.

RELIABLE WATER SUPPLY

Council has:

- Partially documented operating rules and procedures
- Partially documented maintenance rules and procedures
- High level assessment of criticality
- Water Supply assets condition assessment was completed in 2017 and will be reassessed every five years in the revaluation process
- No asset replacement plan based on condition and criticality

COST OPTIMISATION

Lack of clear life cycle costing and balancing of maintenance and replacement costs - (including implication on levels of service).

LEVELS OF SERVICE

Regular levels of service monitoring (other than water quality and delivery) to be introduced, and linked to assets.

ACTION PLAN

Generally address the gaps.

3.4. FUTURE DIRECTION

SHORT TERM TARGETS

Central Tablelands Water asset management to meet the requirements of the "core" asset management system (IIMS) by June 2019.

RISK IDENTIFICATION OF CRITICAL ASSETS

Council will utilise criticality assessment to concentrate its asset management resources on critical assets.

ASSET CONDITIONS

Council will continue to assess and electronically document the asset condition in its asset management system. This will focus on gathering hard data for critical assets and will be updated regularly.

CAPITAL DECISION MAKING

Apply cost benefit analysis for major capital investment options.

ASSET PERFORMANCE

Monitor the historical performance of assets to support accurate asset decisions.

LONG TERM TARGET

Council will consider actions required to develop an "advanced" asset management system.

4. WATER SUPPLY SYSTEM

4.1. OVERVIEW

Central Tablelands Water (CTW) is located in the central west of NSW and services population in the area ranging from Blayney in the east, to Grenfell and Quandialla in the west. CTW operates three drinking water supply systems which are mainly sourced from Lake Rowlands. Lake Rowlands is a unique slab and buttress dam constructed across the Coombing rivulet, a tributary of the Belubula River. Groundwater bores supplement Lake Rowlands water during summer.

4.2. SOURCE WATER CATCHMENT

LAKE ROWLANDS

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 shown in Figure 2.

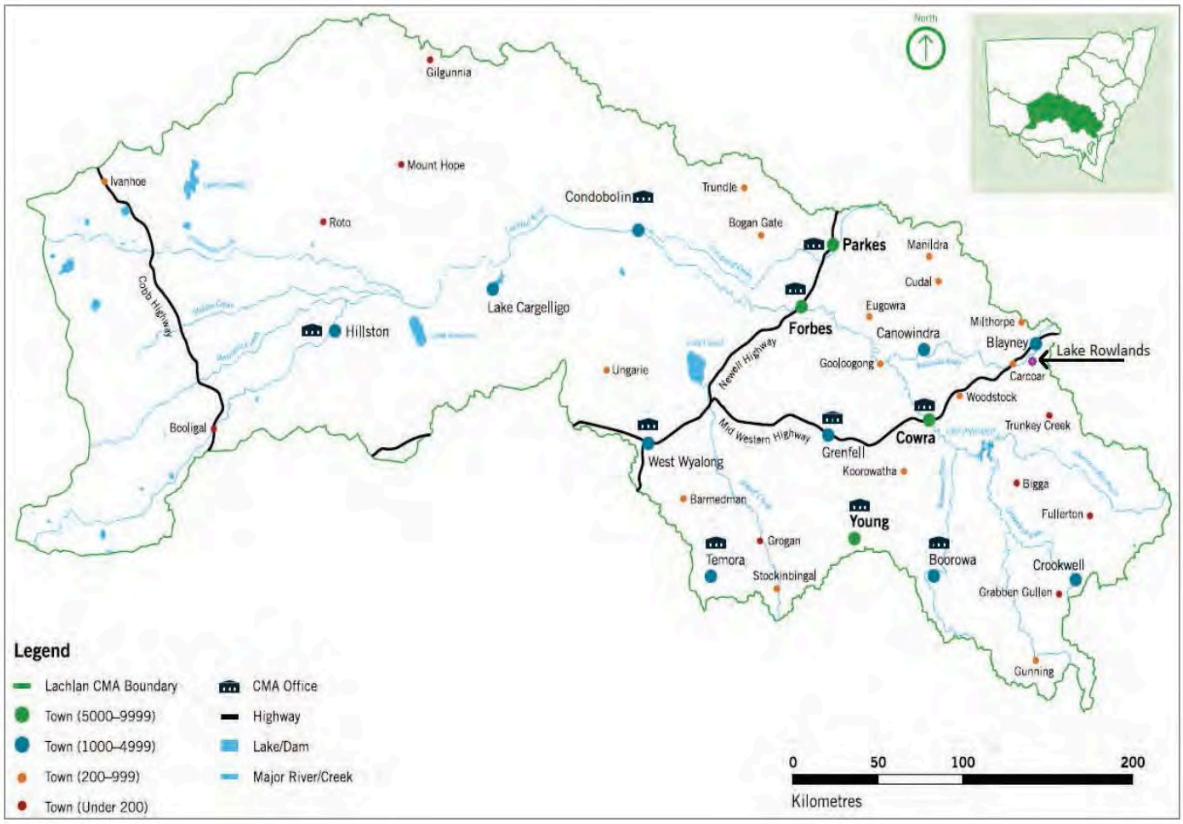


FIGURE 2: LACHLAN CATCHMENT

(Source: Lachlan Catchment Management Authority, 2013)

The Lachlan catchment covers an area of approximately 90,000 km2 in central NSW, west of the Great Dividing Range. Lake Rowlands is located 16 km south-west of Blayney township and 7 km south- east of Carcoar township. The lake has a catchment area of 197 km2 (Source: CTW Drinking Water Management System, Sept 2015).

Livestock grazing is the most significant land use surrounding the Lake Rowlands catchment. Significant livestock grazing can impact water quality in the lake through faecal contamination, nutrient-rich run-off, erosion and salinity. Gold mining within the catchment area also has the potential to contaminate drinking water supplies, whilst residential, industrial, commercial and rural development can introduce litter and pollutants. (Source: CTW Drinking Water Management System, Sept 2015).

GROUNDWATER

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. Blayney Well, Gooloogong, Bangaroo and Cudal bores draw from this aquifer, although only the Gooloogong bores are in regular use during peak demand periods. The bores located in the fractured rock aquifer have moderate water quality; with Total Dissolved Solids (TDS) between 500 - 1500 mg/L. NSW Office of Water have classified this water as suitable for domestic, stock and some irrigation purposes.

Groundwater for the Quandialla drinking water supply system is drawn from the Lachlan inland alluvial aquifer, located in the Upper Lachlan Alluvium management area. According to the NSW Office of Water, Quandialla Bores are considered to have fresh water, with total dissolved solids less than 500 mg/L, suitable for municipality use. (Source: CTW Drinking Water Management System, Sept 2015).

4.3. EXISTING WATER SUPPLY SYSTEMS

CTW operates three water supply systems servicing for the towns and villages in Blayney, Cabonne and Weddin Shire Councils. Central Tablelands Water also supplies bulk water to Cowra Shire Council to service the villages of Woodstock and Gooloogong.

As stated in the 2015/16 TBL performance report CTW has connected 5,520 properties and provides potable water to population of approximately 14,400 consumers in 14 towns and villages through 318 kilometres of transfer and trunk mains and 267 kilometres of reticulation mains. CTW water supply schematic diagram is given in Figure 3.

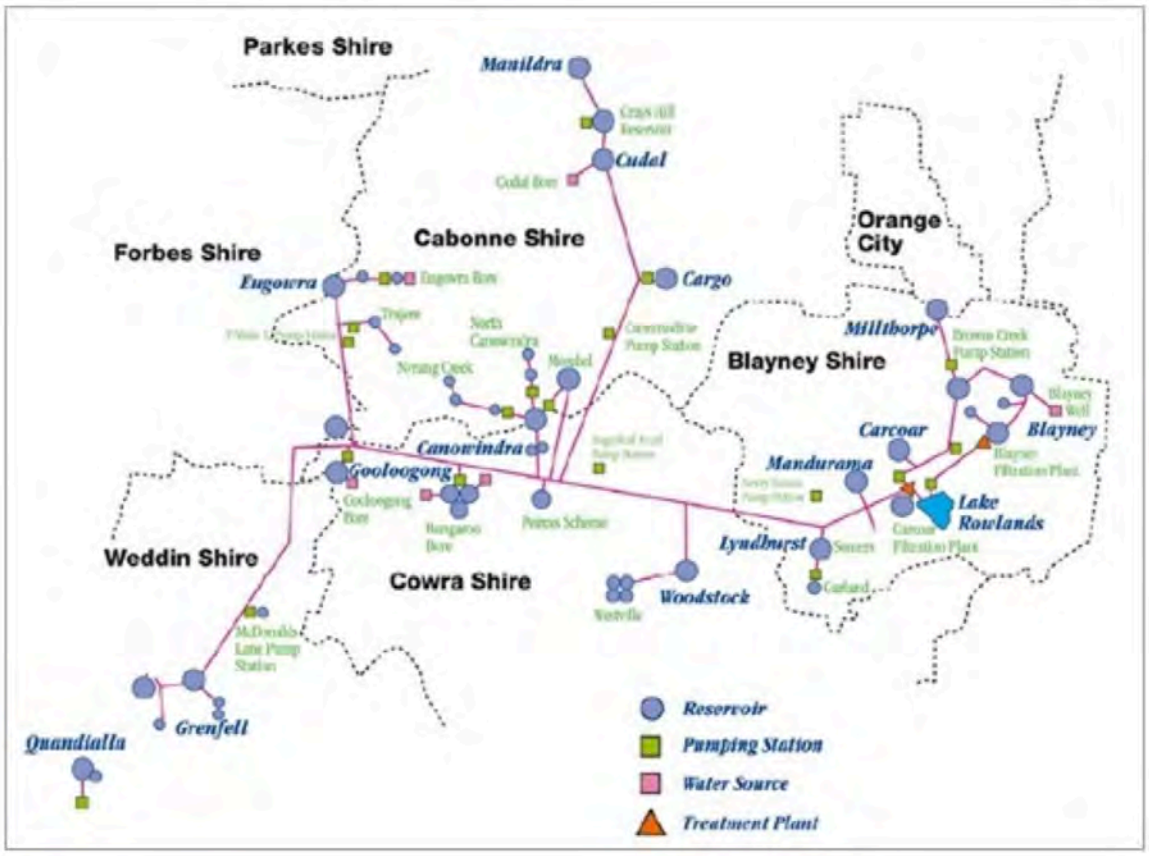


FIGURE 3: CTW WATER SUPPLY SCHEMATIC DIAGRAM

A summary of existing water supply systems is provided in the table below.

TABLE 1: A SUMMARY OF CTW WATER SUPPLY SYSTEMS			
	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)	• Lake Rowlands (primary) • Blayney Well (emergency)	• Quandialla Bore
Water Treatment	Carcoar Water Filtration Plant	Blayney Water Filtration Plant	Disinfection only
Reservoirs	33 reservoirs in the Carcoar drinking water supply system	5 reservoirs in the Blayney drinking water supply system	6 reservoirs in the Quandialla drinking water supply system
Service Area	Blayney Shire: • Carcoar - 300 people • Lyndhurst-250 people • Mandurama-200 people Cabonne Shire: • Canowindra-1,700 people • Cargo - 300 people • Cudal - 400 people • Eugowra-550 people • Manildra - 600 people Weddin Shire: • Grenfell-3,000 people Cowra Shire: • Gooloogong • Woodstock	Blayney Shire: • Blayney-3,000 people • Millthorpe–800 people	Weddin Shire: • Quandialla – 80 people

Source: CTW Drinking Water Management System, Sept 2015

1. CARCOAR WATER SUPPLY SYSTEM

GENERAL

The Carcoar water supply system was the first water supply system constructed by CTW. As a result, this system serves the majority of the area covered by CTW. The plant was upgraded in 2002, with the commissioning of a Dissolved Air Flotation Filtration (DAFF) plant at Carcoar water treatment plant (WTP).

Lake Rowlands is the primary supply source for the Carcoar water supply system (WSS). Water from Lake Rowlands gravitates via a 375 mm transfer main to the Carcoar WFP where it is treated by a DAFF process and distributed to eleven townships within the Blayney, Cabonne, Weddin and Cowra Shire Council areas.

During the summer periods where demand is high, Gooloogong Bores are used to supplement supply and pressurise the western end of the Carcoar system. The Cudal Bores are maintained in operational condition as they are used for emergency drought situations.

WATER FILTRATION PLANT

The Carcoar Water Treatment Plant (WTP) is located on Fell Timber Road near the township of Carcoar. The plant has a designed capacity of 9 ML/day. During periods of high demand, the Carcoar WTP has been able to produce up to 13 ML per day potable water.

The Carcoar WTP consists of the following main facilities:

- Chemical dosing pit
- Six settling lagoons
- Settled water pumping station
- Two rapid gravity sand filters and associated pumps and air scour blower for filter backwashing
- Clear water tank and pumping station

- Chemical dosing facilities to meter alum, polyelectrolyte, chlorine, fluoride and powder activated carbon
- Compressed air facilities
- Filtered water pumping station

As stated in CTW's Drinking Water Management System Plan (Sept 2015), the treatment process at Carcoar WTP comprises of the following process steps:

- Raw water is gravitated from Lake Rowlands (capacity: 4,500 ML) to Carcoar WTP (9 ML/d) via 375 mm main
- Chemical dosing to promote coagulation and flocculation
- The water is gravitated to two DAFF chambers where floccs are floated off and the water is filtered
- Water is pumped from the DAFF chambers to the clear water storage tank (2.16 ML)
- Chlorine is dosed for disinfection and the water is fluoridated at the clear water tank outlet before transfer to the service reservoirs and entering the reticulation system
- Sludge from the DAFF and backwash water from the filters is transferred to a wastewater storage tank where it is subsequently clarified and sent to six sludge lagoons. Supernatant from the sludge lagoons is stored in the supernatant storage tank and pumped back to head of works. Sludge from the lagoons are dried and used as landfill on-site

TRANSFER AND RETICULATION SYSTEM

The treated water from Carcoar WTP is distributed to 31 reservoirs via approximately 260 km of trunk mains that service the townships of Carcoar, Lyndhurst, Mandurama, Canowindra, Cargo, Cudal, Eugowra, Manildra and Grenfell.

Re-chlorination facilities are located at Grays Hill, Eugowra, Grenfell reservoirs, as well as Old River Pumphouse and TM L Booster pump stations.

For the operational purposes CTW water supply system has been divided into nine sub-systems, these subsystems are shown in Figure 4.

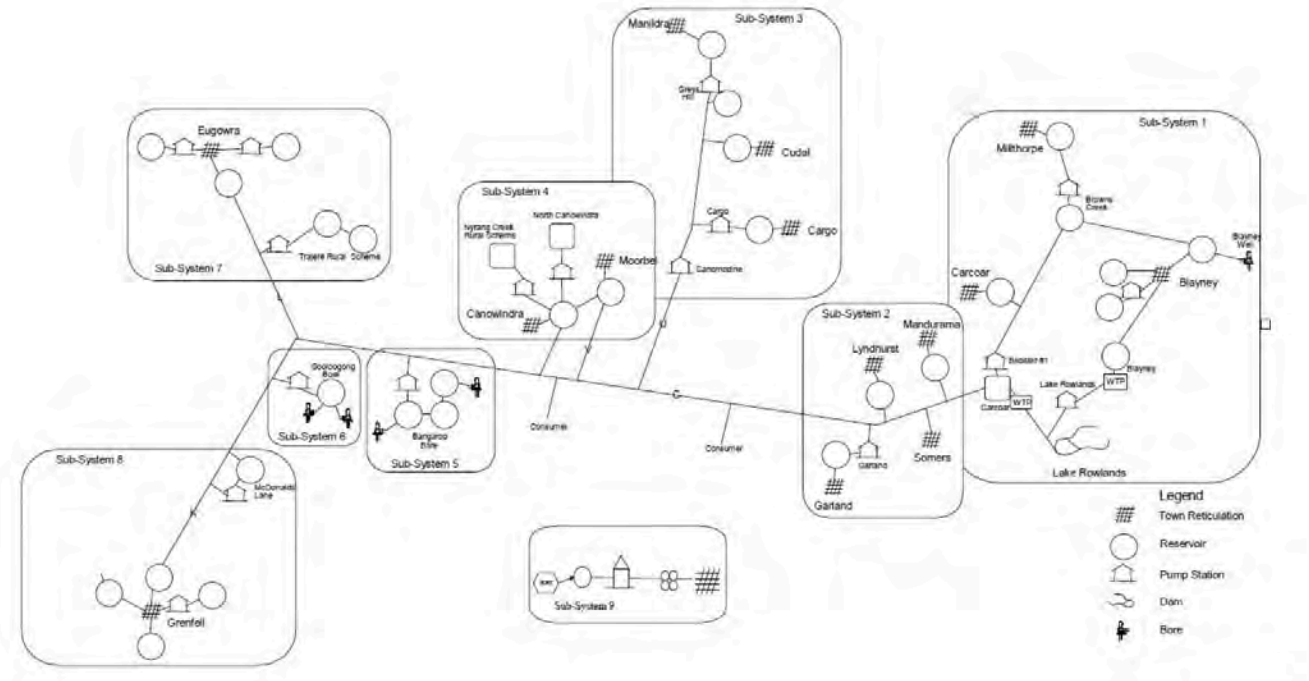


FIGURE 4: CTW WATER SUPPLY SUB-SYSTEMS

(Source: CTW 2013 Operations Management Plan)

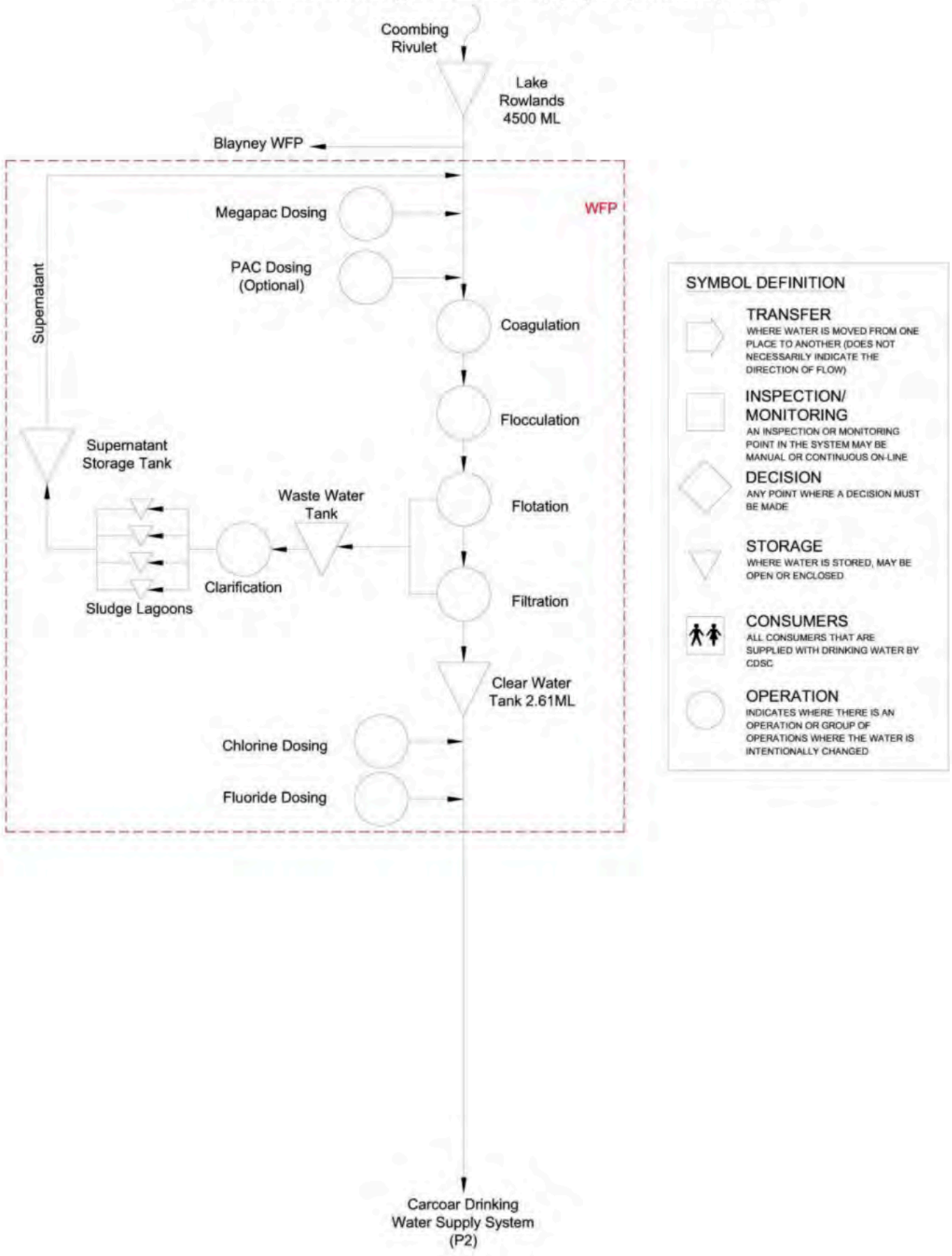
The main reservoirs in Carcoar water supply system and their capacities are summarised in Table 2 and Carcoar WSS process flow

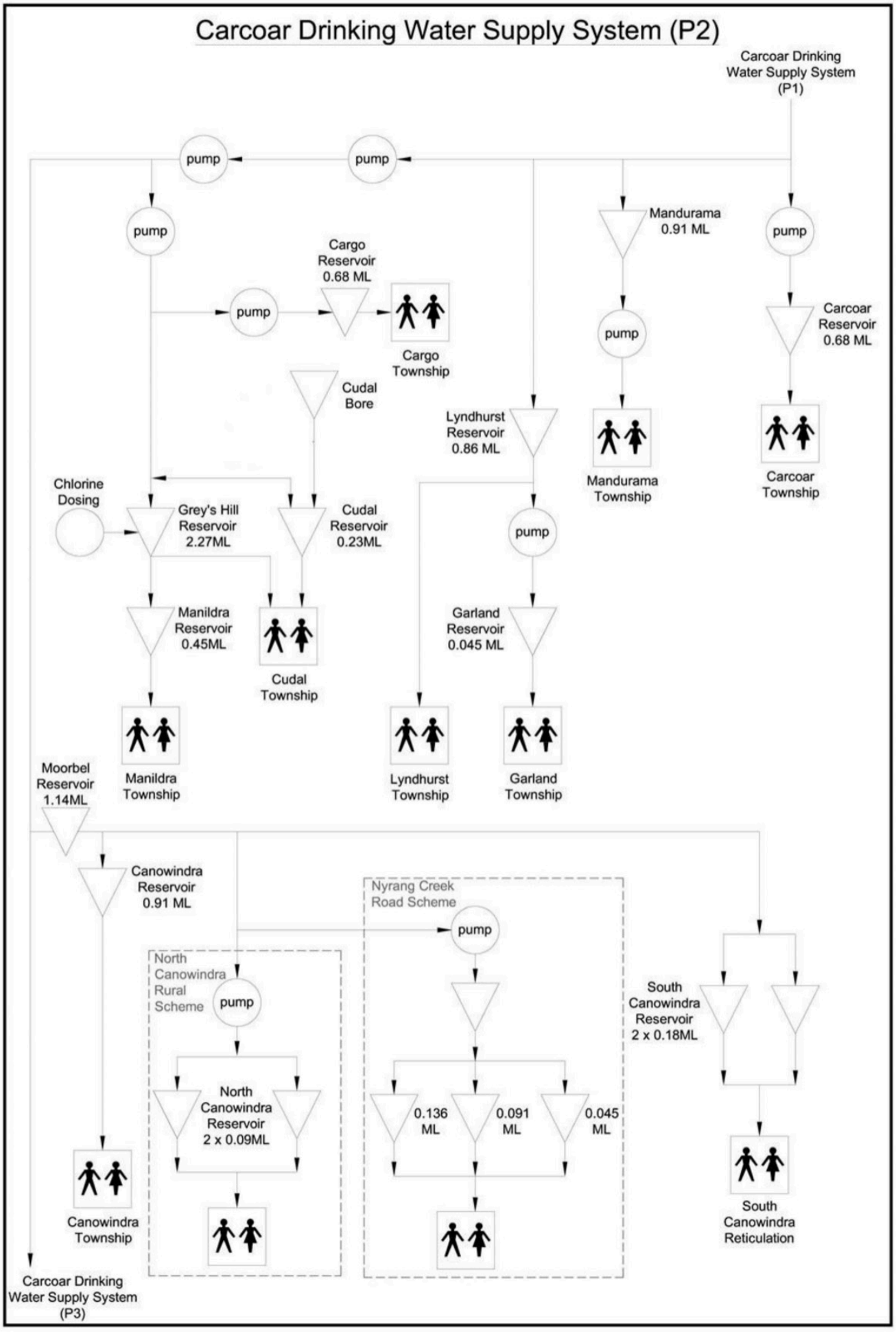
TABLE 2: CARCOAR SERVICE RESERVOIRS

SUB-SYSTEMS	SERVICE RESERVOIRS	Capacity (ML)
Sub-System 1	Carcoar Reservoir	0.68
Sub-System 2	Mandurama Reservoir	0.91
	Lyndhurst Reservoir	0.68
	Garland Reservoir	0.045
Sub-System 3	Cargo Reservoir	0.68
	Cudal Reservoir	0.23
	Grays Hill Reservoir	2.27
	Manildra Reservoir	0.045
Sub-System 4	Moorbel Reservoir	1.14
	Canowindra Reservoir	0.91
	South Canowindra Reservoir	2 x 0.18
	North Canowindra Reservoir	2 x 0.09

SUB- SYSTEMS	SERVICE RESERVOIRS	Capacity (ML)
Sub-System 4	Nyrang Ck North Reservoir	0.045
	Nyrang Ck South	0.091
	Nyrang Ck East	0.136
Sub-System 5	Bangaroo Reservoirs	3 x 0.18
Sub-System 6	Gooloogong Reservoir	0.18
Sub-System 7	Trajere Reservoir	0.14
	Pyes Gap Reservoir	0.14
	Eugowra Reservoir	1.36
	Eugowra Reservoirs	0.5
Sub-System 8	Grenfell North Reservoir	4.55
	Grenfell Western Reservoir	1.36
	Grenfell Eastern Reservoirs	0.45 0.27
	Grenfell South Reservoir	0.09

Carcoar Drinking Water Supply System (P1)




Carcoar Drinking Water Supply System (P2)
Carcoar Drinking Water Supply System (P1)
pump
pump
pump
pump
Mandurama 0.91 ML
pump
Cargo Reservoir 0.68 ML
pump
Cargo Township
pump
Carcoar Reservoir 0.68 ML
Cudal Bore
Lyndhurst Reservoir 0.86 ML
Mandurama Township
Carcoar Township
Chlorine Dosing
Grey's Hill Reservoir 2.27ML
Cudal Reservoir 0.23ML
pump
Manildra Reservoir 0.45ML
Cudal Township
Garland Reservoir 0.045 ML
Moorbel Reservoir 1.14ML
Manildra Township
Lyndhurst Township
Garland Township
Canowindra Reservoir 0.91 ML
Nyrang Creek Road Scheme
pump
North Canowindra Rural Scheme
pump
South Canowindra Reservoir 2 x 0.18ML
North Canowindra Reservoir 2 x 0.09ML
0.136 ML
0.091 ML
0.045 ML
Canowindra Township
South Canowindra Reticulation
Carcoar Drinking Water Supply System (P3)

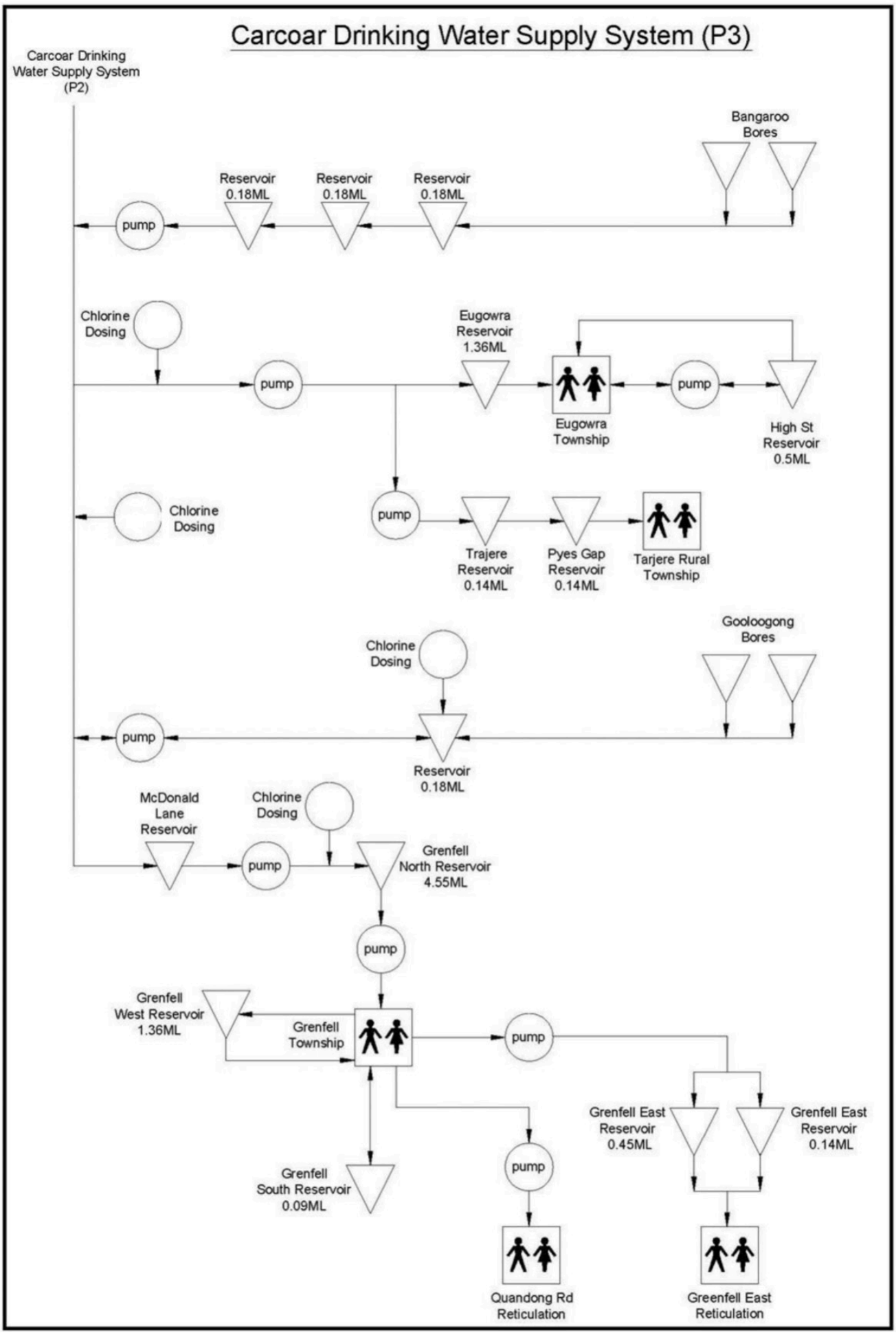


FIGURE 5: CARCOAR WATER SUPPLY SYSTEM PROCESS FLOW

(Source: CTW Drinking Water Management System, Aug 2014)

2. BLAYNEY WATER SUPPLY SYSTEM

GENERAL

The Blayney water supply system (WSS) was established in the late 1950s and Blayney Water Treatment Plant (WTP) was constructed in 1966. The Blayney WTP is a conventional water treatment plant that provides drinking water that has undergone filtration, disinfection and fluoridation.

Lake Rowlands is the primary supply source for the Blayney water supply system. Water from Lake Rowlands is pumped to Blayney WTP via a 300/375 mm transfer main and treated water is distributed from the WTP to the townships of Blayney and Millthorpe, within the Blayney Shire Council.

In emergency drought situations, Blayney Well can be used to supplement water in the Blayney water supply system, however this is not the preferred option as the water quality from Blayney Well is unknown and the only current treatment available is chlorination.

WATER FILTRATION PLANT

The Blayney Water Treatment Plant (WTP) is located on Hills Lane, is conventional manually operated dual media filter plant with a capacity to deliver 6 ML/day of water.

The Blayney WTP consists of the following main facilities:

- Chemical dosing pit
- Three settling lagoons
- Four gravity sand filters and associated pumps and air scour blower for filter backwashing
- Clear water tank and pumping station
- Chemical dosing facilities to meter alum, polyelectrolyte, chlorine, fluoride and powder activated carbon
- Compressed air facilities
- Filtered water pumping station

As states in CTW's Drinking Water Management System plan (Sept 2015), the treatment process at Blayney WTP comprises of the following process steps:

- Water from Lake Rowlands (capacity: 4,500 ML) is pumped via a 300/375 mm rising main to Blayney WTP (capacity: 6 ML/day) by two 132 kW pumps in a duty/stand-by configuration
- Chemical dosing to promote coagulation and flocculation
- The water is gravitated to two up flow clarifiers
- After clarification, the water is decanted to four gravity sand filters
- Filtered water is dosed with chlorine for disinfection and fluoridated before flowing to the clear water storage tank (4.55 ML)
- Backwash water from the filters and sludge from the clarifiers go to sludge lagoons. Supernatant from the sludge lagoons are used to irrigate tree plantations located next to Blayney WTP. Sludge from the lagoons is sent to landfill.

TRANSFER AND RETICULATION SYSTEM

The treated water from Blayney WTP is distributed to 5 reservoirs via approximately 55 km of trunk mains that service the townships of Blayney and Millthorpe.

The main service reservoirs and their capacities are summarised in Table 3 and Blayney water supply system process flow from catchment to consumer is shown in Figure 6.

TABLE 3: BLAYNEY SERVICE RESERVOIRS

SUB-SYSTEMS	SERVICE RESERVOIRS	Capacity (ML)
Sub-System 1 (see Figure 4)	Hill Street Reservoir	1.14
	Patrick's Reservoir	0.45
	Plumb Street Reservoir	0.91
	Browns Creek Reservoir	0.23
	Millthorpe Reservoir	1.36

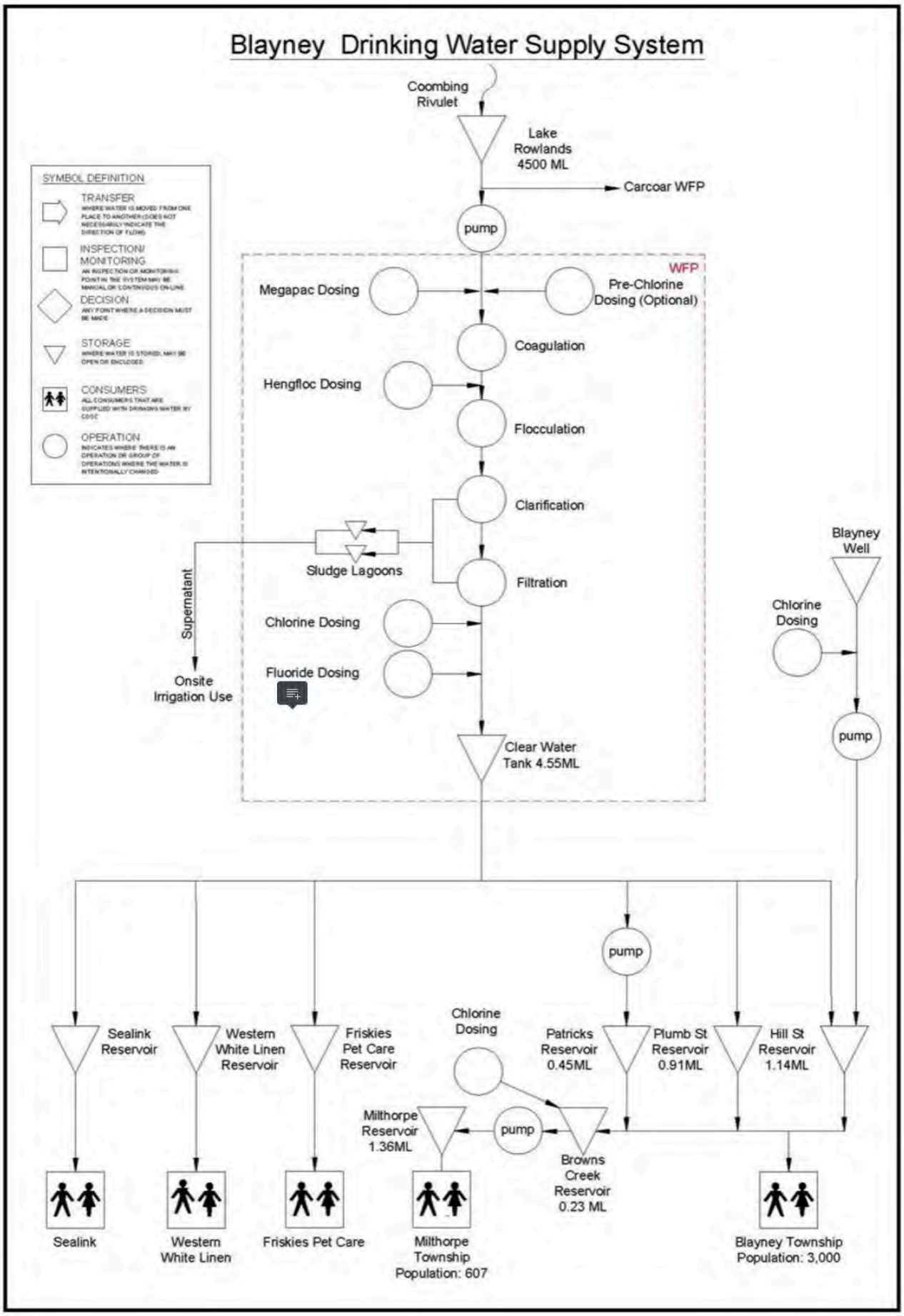


FIGURE 6: BLAYNEY WATER SUPPLY SYSTEM PROCESS FLOW

(Source: CTW Drinking Water Management System, Aug 2014)

3. QUANDIALLA WATER SUPPLY SYSTEM

GENERAL

The Quandialla drinking water supply is a groundwater system that was established in 2002 and supplies the village of Quandialla. Water from Quandialla Bores undergoes chlorination prior to transfer to the reticulation system.

WATER TREATMENT

The treatment process at the Quandialla drinking water supply system comprises of the following steps:

- Groundwater is pumped to the surface by two 11 kW bore pumps in a duty/stand-by configuration
- Raw water is stored in the Quandialla reservoir (20 kL)
- Prior to entering the distribution system, water flows through the chlorinator for disinfection where gas chlorine is dosed at 2 mg/L

TRANSFER AND RETICULATION SYSTEM

Chlorinated groundwater is pumped to four on-ground storage reservoirs of 45 kL capacity each, and further pumped to the Quandialla elevated reservoir of 20 kL. Water is then distributed via reticulation main to the consumers in Quandialla.

Quandialla water supply system process flow from catchment to consumer is shown in Figure 7.

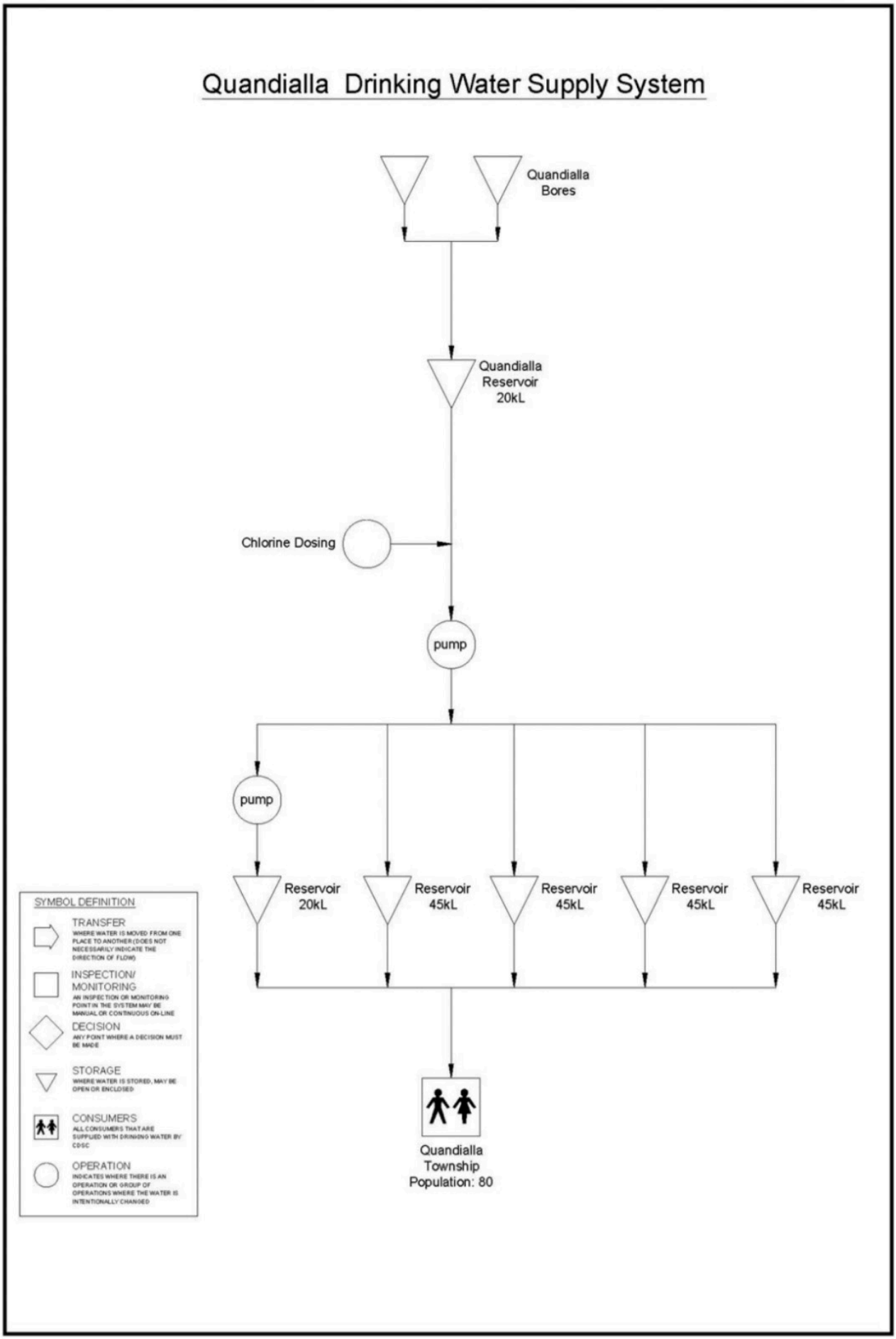


FIGURE 7: QUANDIALLA WATER SUPPLY SYSTEM PROCESS FLOW

(Source: CTW Drinking Water Management System, Aug 2014)

4.4 REGULATORY REQUIREMENTS

4.4.1. LEGISLATIVE REQUIREMENT

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 4.

TABLE 4: LEGISLATIVE REQUIREMENTS

LEGISLATIVE REQUIREMENT	CTW ACTIVITY
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	CTW has water supply levels of service.
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 (BPM) of Water Supply and Sewerage Guidelines (Aug 2007). Under s64 of the Act, in conjunction with the Water Management Act it facilitates the levying of developer charges.	CTW has fulfilled the six criteria as states in the BMP guidelines:
Environmental Planning and Assessment Act 1979 The Act requires that the environmental impact of projects be studied at all stages on the basis of scale, location and performance. This Act is applicable to approvals for subdivision and major redevelopments including water services. 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.	The Blayney, Cabonne and Weddin LEPs apply to all lands within their respective council areas.
Protection of the Environment Operations Act 1997 (POEO Act) Requires licences for activities with potentially significant environmental impacts. Prosecution may be carried out under this act for any chemical leak-age, spill, and disposal of wastes or similar.	CTW is handling chemicals according to the WHS protocols.
Water Management Act 2000 Provides a legal 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.	

TABLE 4: LEGISLATIVE REQUIREMENTS	
LEGISLATIVE REQUIREMENT	**CTW ACTIVITY**
Work Health and Safety Act 2011 (WHS Act) All Councils Operational activities are affected by this Act.	CTW is undertaking all the operational activities according to the WHS requirements
Independent Pricing and Regulatory Tribunal Act 1992 Independent Pricing and Regulatory Tribunal (IPART) have developed a set of consistent pricing principles/guidelines to be adopted by local government authorities.	CTW has adopted water pricing and charging policy with the purpose to implement Best-Practice pricing tariff which complies with IPART's 1996 Pricing Principles
Public Health Act 2010 *Public Health Regulation 2012* Requires all water authorities to develop Drinking Water Management Systems. Bestows certain powers on NSW Health with respect to provision of safe drinking water, including ability to enter treatment facilities, order mandatory testing or obtain information about the drinking water and powers to close a water supply. Council is required to issue public advice regarding the water supply when directed by the Chief Health Officer of NSW Health.	CTW has developed Drinking Water Management Systems in Aug 2014, which was updated in Sept 2015. Water samples are sent to NSW Health for testing at a frequency recommended in the Australian Drinking Water Guidelines 2011.
Fluoridation of Public Water Supplies Act 1957 *Regulation and Code of Practice* Requirements for testing and reporting where water supplies are fluoridated.	Carcoar and Blayney filtered water from the treatment plants is fluoridated and tested at regular intervals.
Dam Safety Act 1978 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

Several other acts and policies also affect CTW's water supply services.

4.4.2. BEST-PRACTICE MANAGEMENT

According to the NSW Best-Practice Management of Water Supply & Sewerage Guidelines (Aug 2007) Councils are encouraged to maintain effective, efficient and sustainable water supply and sewerage businesses. The key elements in the best-practice management are:

TABLE 5: COMPLIANCE WITH BEST-PRACTICE REQUIREMENTS

BEST-PRACTICE REQUIREMENT	CTW STATUS
1. Strategic Business Planning	Currently updating 2015 Strategic Business Plans for water supply
2. Pricing	• Development servicing plan for water has been adopted in April 2013 • Water supply pricing compliance with Pricing guidelines
3. Water Conservation and Demand Management Plan	Demand Management Plan adopted in January 2010
4. Drought Management Plan	Drought Management Plan adopted in November 2011
5. Performance Reporting	Comply annually
6. Integrated Water Cycle Management (IWCM)	Integrated Water Cycle Management Strategy Study – NSW Office of Water approval received in October 2014

NSW Office of Water has issued new Integrated Water Cycle Management Strategy and Strategic Business Plan checklists in July 2014. According to these new checklists Councils do not require to prepare separate water conservation and drought management plans.

4.4.3. WATER EXTRACTION LICENCES

Central Tablelands Water holds NSW Office of Water's 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 Lake Rowlands water during summer or under emergency conditions. Quandialla water supply system extracts water from two bores which were commissioned in 2002.

Water extracted from rivers and boreholes must be monitored under NSW Office of Water's NSW Water Extraction Policy (2007). CTW is required to meet all licence requirements. CTW water sources and extraction licences are summarised in the table below.

TABLE 6: CTW WATER SOURCES AND EXTRACTION LICENCES

WATER SOURCE	CAPACITY	LICENCE LIMIT (ML/YEAR)	COMMENT
Lake Rowlands Dam	4,500 ML	3,150	Supplies for Blayney and Carcoar WSSs
Gooloogong Bore (No.1) Gooloogong Bore (No.2)	Bore pump capacity: 3.8 ML/d Bore field rated capacity: 5.0 ML/d	400 (Total)	Secure yield (Long term yield) - 4.3 ML/d. NOW licence specifies 400 ML/year (average 1.1 ML/d)
Quandialla Bore (No.1) Quandialla Bore (No.2)	Bore Pump: 1.3 ML/d	266 (Total)	Only supplies the town of Quandialla

TABLE 6: CTW WATER SOURCES AND EXTRACTION LICENCES			
WATER SOURCE	**CAPACITY**	**LICENCE LIMIT (ML/YEAR)**	**COMMENT**
Cudal Bore	Well: 4 L/s (i.e. 0.35 ML/d) Bore pump: 0.35 ML/d	100	Emergency supply only
Bangaroo Bore (No.1) Bangaroo Bore (No.2)		472	Not in use Not in use
Blayney Well	Well: 0.6 ML/d Surface Pump: 1.0 ML/d	250	Emergency supply only
Total Extraction Limit		**4,638**	

(Source: 1. CTW Drought Management Plan, Jan 2012; 2. CTW Operations Management Plan, 2013)

4.4.4.WATER SHARING PLAN

The State Government normally manages water allocations in river regulated valleys under water sharing plans. Water sharing plans are developed for rivers and groundwater systems across New South Wales following the introduction of the Water Management Act 2000. Water sharing plans are in place for 10 years, providing certainty of access for environmental health and for all licensed water users during the life of the plan.

The following water sharing plans are relevant to the CTW water supply systems:

- Belubula Regulated River Water Sources
- Lachlan Regulated River Water Source
- Lachlan Unregulated and Alluvial Water Sources
- Macquarie Bogan Unregulated and Alluvial Water Sources

The above water sharing plans are commenced from end of 2012.

WATER SHARING PLAN FOR BELUBULA REGULATED RIVER WATER SOURCES

The water sharing plan for Belubula regulated river water sources has established rules for protecting the environment, water extractions, managing licence holders' water accounts and water trading, which commenced from October 2012. The regulated Belubula River is located in the headwaters of the Lachlan catchment. The water sharing plan for the regulated Belubula River includes the Belubula River and relevant anabranches from the upper limits of Carcoar Dam storage at full supply level, to its confluence with the Lachlan River as shown in Figure 8.

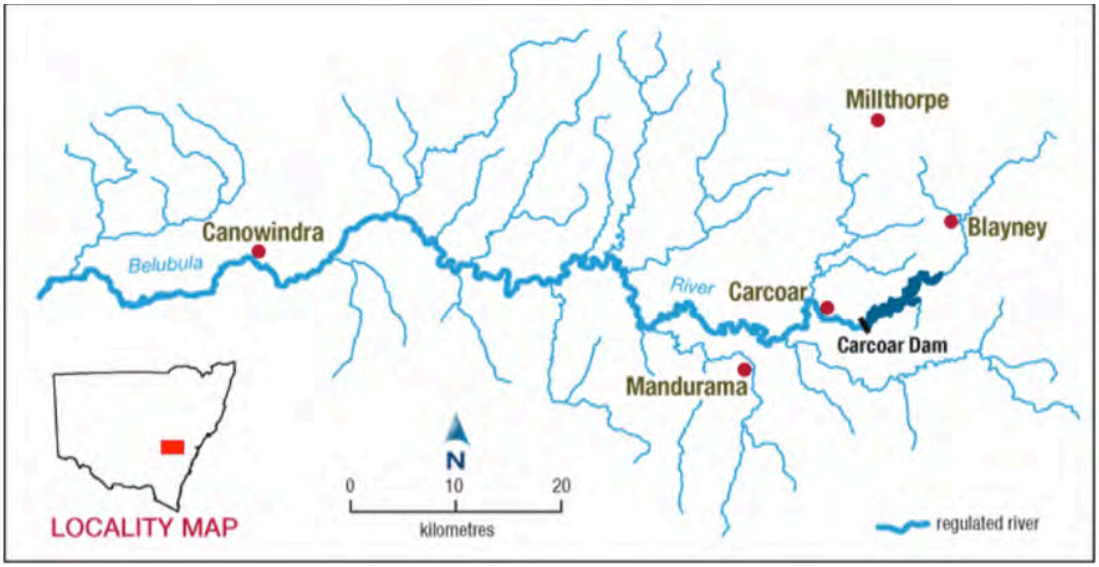


FIGURE 8: BELUBULA REGULATED RIVER WATER SOURCES AREA

(Source: Water Sharing Plan, NSW Office of Water)

WATER SHARING PLAN FOR LACHLAN REGULATED RIVER WATER SOURCE

The Lachlan Regulated River plan commenced on 1 July 2004, subsequently suspended due to the extreme drought and recommenced in September 2011. The Plan applies to the regulated portions of the Lachlan River (see Figure 9). These include the Lachlan River from the upper reaches of Wyangala Dam to its junction with the Murrumbidgee River, a number of creeks in the Condobolin area, including Bumbuggan Creek, parts of Goobang and Island Creeks and Willandra Creek from its off take to Willandra Homestead Weir. It does not apply to the regulated portion of the Belubula River.

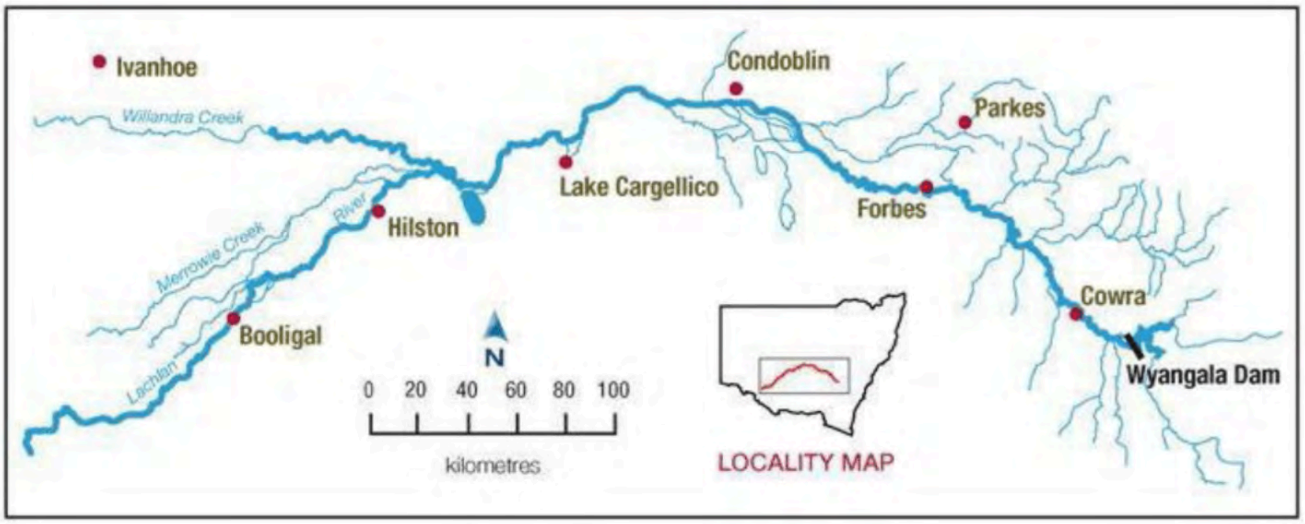


FIGURE 9: LACHLAN REGULATED RIVER WATER SOURCE AREA

(Source: Water Sharing Plan, NSW Office of Water)

WATER SHARING PLAN FOR LACHLAN UNREGULATED AND ALLUVIAL WATER SOURCES

The Water Sharing Plan for Lachlan Unregulated and Alluvial Water Sources includes proposed rules for protecting the environment, water extractions, managing licence holders' water accounts, and water trading is commenced from September 2012. The plan area comprises 22 unregulated water sources and two alluvial groundwater sources within the Lachlan River catchment as shown in Figure 10.

FIGURE 10: LACHLAN UNREGULATED AND ALLUVIAL WATER SOURCES AREA

(Source: Water Sharing Plan, NSW Office of Water)

WATER SHARING PLAN FOR MACQUARIE BOGAN UNREGULATED AND ALLUVIAL WATER SOURCES

The Water Sharing Plan for the Macquarie Bogan unregulated and alluvial water sources includes proposed rules for protecting the environment, water extractions, managing licence holders' water accounts, and water trading commenced in October 2012. The plan area comprises 30 surface water and four groundwater sources in the Macquarie and Bogan River catchments in the central- west of the state as shown in Figure 11.

FIGURE 11: MACQUARIE BOGAN UNREGULATED AND ALLUVIAL WATER SOURCES AREA

(Source: Water Sharing Plan, NSW Office of Water)

4.4.5. WATER QUALITY

CTW is responsible for the supply of safe and reliable drinking water to its customers. CTW is committed to managing its water supply systems effectively to meet the Australian Drinking Water Guidelines (ADWG) 2011 requirements according to the Public Health Act 2010 and Public Health Regulations 2012.

NSW Health has committed funds to assists Local Water Utilities (LWUs) to develop risk based drinking water management system plans (DWMS). CTW has developed a risk based drinking water management system plan in Aug 2014. CTW performs regular water sampling and testing to meet the ADWG (2011) requirements and monitors and acts on test results.

4.4.6. WORKPLACE, HEALTH & SAFETY

CTW has a range of workplace, health & safety (WHS) responsibilities in administering the organisation to supply water to its customers. CTW undertakes a hazard analysis and risk assessment before commencing any job.

CTW has a WHS policy to provide a safe and healthy workplace for employees and contractors to work and for people to visit.

CHEMICAL USE

CTW purchase water treatment chemicals through reputable suppliers. The chemical use, including transport and storage, of chemicals listed as "Dangerous Goods" under the Work Health and Safety Regulation 2012 (NSW), including chlorine and fluoride, is dictated by the provisions of the Work, Health and Safety Regulation and Work Cover. Storages and trucks are licensed according to the Work, Health and Safety Regulation.

NSW Health also recommends that all chemical deliveries are attended by a trained water treatment plant operator, and that the following procedures are followed:

- A certificate of analysis is provided by the supplier at the time of delivery for each batch of chemical supplied and that the chemical satisfies the criteria specified in Chapter 8 of the ADWG, prior to the commencement of unloading
- The operator needs to check and confirm the correct chemical is being delivered into the appropriate storage
- If relevant, the operator is to check that the correct concentration has been supplied

Material Safety Data Sheets (MSDS) and appropriate chemical signs are displayed in a MSDS register at the WTP and within the vicinity of chemical storage areas in CTW's water supply systems. Personal Protective Equipment (PPE), first aid kits, chemical spills kits, safety showers and eye wash stations are located at the Carcoar WTP, Blayney WTP and Quandialla chlorinator in the event of an emergency.

Chemicals used in the supply of drinking water in the Carcoar, Blayney and Quandialla drinking water supply systems are listed Table 7.

TABLE 7: CHEMICALS USE IN WATER TREATMENT PLANTS

CARCOAR WATER SUPPLY SYSTEM

CHEMICAL	PURPOSE	STORAGE
Megapac (Aluminium chlorohydrate)	Coagulation	30 kL chemical storage tank Dosing plant contains: • batching system • 200 L maturation tank • 200 L dosing tank
Powdered Activated Carbon (PAC)	Taste, odour, algae removal	Roofed store batching system 100L tank and dosing pump
Chlorine gas	Disinfection at WFP and Gooloogong Bores	Chlorine dosing room with heater and chlorine gas alarm Two 920 kg chlorine cylinders at Carcoar WFP 70kg chlorine cylinders at bore sites (Gooloogong)
Sodium silicofluoride	Fluoridation	Stored as 25 kg bags in storage area inside fluoride dosing room Prominent dosing system with batching tank

BLAYNEY WATER SUPPLY SYSTEM

CHEMICAL	PURPOSE	STORAGE
Megapac Hengfloc	Coagulation Flocculation	30 kL chemical storage tank Stored as 25 kg bags in storage area inside dosing room Dosing plant contains: • batching system • 200 L maturation tank • 200 L dosing tank

TABLE 7: CHEMICALS USE IN WATER TREATMENT PLANTS BLAYNEY WATER SUPPLY SYSTEM cont...		
CHEMICAL	**PURPOSE**	**STORAGE**
Chlorine gas	Optional pre-chlorine dosing Disinfection at clear water tank Disinfection at Re- chlorination facility	Chlorine dosing room with heater and chlorine gas alarm One 920 kg chlorine cylinders at Blayney WFP 70 kg chlorine cylinders at bore sites
Sodium silicofluoride	Fluoridation	Stored as 25 kg bags in storage area inside fluoride dosing room Prominent dosing system with batching tank
QUANDIALLA WATER SUPPLY SYSTEM		
CHEMICAL	**PURPOSE**	**STORAGE**
Chlorine gas	Disinfection at Reservoir	Two 70 kg chlorine gas cylinders

4.5 CONTRACTUAL OBLIGATIONS

CTW and Cowra Shire Council hold a bulk and emergency water supply agreement dated 17 January 2013. The bulk water supply agreement is executed according to the terms and conditions stated in the agreement.

5. LEVELS OF SERVICE

5.1. 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 targets and current performances are summarised in Table 8.

TABLE 8: CTW LEVELS OF SERVICE FOR WATER SUPPLY

DESCRIPTION	UNIT	LEVEL OF SERVICE	
		CURRENT	FOUR YEARS TARGET
AVAILABILITY OF SERVICE			
Normal Quantity Available			
Domestic Peak Day	L/tenement/day	1,600	1,400
Domestic Annual	kL/tenement/year	179	190
Total Annual Average Consumption	ML/year	1,525	1,500
Total Annual Average Consumption	ML/year	10	10
Fire Fighting			
Compliance with The Water Supply Investigation Manual* (AS 2419.1 classifications 2,3,5 & 9 with floor area less than 1000 m2)	% area served	100	100
Pressure			
Min. pressure when delivering 15 L/min	metres head	20	20
Max. static pressure	metres head	60	60
Flow Rate			
Domestic (non-rural customers)	L/min	25	25
Rural Customers	L/min	6.3	6.3
CONSUMPTION RESTRICTIONS IN DROUGHTS			
LEVEL OF RESTRICTION APPLIED THROUGH A REPEAT OF THE WORST DROUGHT ON RECORD			
Average duration of restrictions	% Normal Usage	0	0
Average frequency of restrictions	No./ 10 year period	1	0

DESCRIPTION	UNIT	LEVEL OF SERVICE	
		CURRENT	FOUR YEARS TARGET
Supply Interruptions to Consumers **Planned (95% of Time)**			
Notice given to domestic customers	Hours	48	48
Notice given to commercial customers	Hours	48	48
Notice given to major industrial and institutional customers	Days	7	7
Unplanned			
Maximum duration	Hours	12	12
Frequency	No. /year/customer	2	>2
REPONSE TIME TO CUSTOMER COMPLAINTS (Defined as time to have staff on-site to rectify problem) **Supply Failure** **Priority 1: (Defined as failure to maintain continuity or quality of supply to a large number of customers or to a critical use at a critical time)**			
During working hours	Hours	1	1
Out of working hours	Hours	2	2
Priority 2: (Defined as failure to maintain continuity or quality of supply to a small number of customers or to a critical use at a non-critical time)			
During working hours	Hours	3	3
Out of working hours	Hours	4	4
Priority 3: (Defined as failure to maintain continuity or quality of supply to a single customer)			
	Working days	1	1
Priority 4: (Defined as a minor problem or complaint, which can be dealt with at a time convenient to the customer and the Council)			
	Weeks	1	1

DESCRIPTION	UNIT	LEVEL OF SERVICE	
		CURRENT	FOUR YEARS TARGET
CUSTOMER COMPLAINTS **Note: Times apply for 95% of occasions**			
Personal/Oral	Working days	5	5
Written	Working days	5	5
WATER QUALITY **(Should meet drinking water quality guidelines of Australia (ADWG), NHMRC&NRMMC 2011)** **Microbiological Parameters**			
Total Coliforms	Cfu/100 mL	2	2
Thermo-tolerant coliforms	Cfu/100 mL	0	0
Sampling Frequency	Samples/month	22	22
Physical-Chemical Parameters			
pH	Unit	7.5	7.5
Turbidity	NTU	1	< 1.0
Fluoride	mg/L	1.0	1.0
Free Available Chlorine at WTP	mg/L	2	2
Free Available Chlorine at reticulation system	mg/L	0.6	0.6
Sampling Frequency	Samples/year	365	365
Percentage Compliance with 2011 ADWG			
Physical Parameters	%	100	100
Chemical Parameters	%	100	100
Total Coliforms	%	98	98
Thermo-Tolerant Coliforms	%	100	100

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

(Source: 1. CTW Stratgic Business Plan, 2015; 2. Asset Criticality Assessment Workshop, 11 Sep 2014)

5.2 DESIGN CRITERIA

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 25 L/min
- Design criteria for water supply system pressure: Hydraulic design will aim to achieve a minimum of 20 m head at the tapping point under peak summer demand

Elements of design criteria will be incorporated in the respective adopted operational plans as conditions of supply and the development servicing plan (DSP) as a basis for S64 contributions.

6. FUTURE DEMAND

6.1 BASELINE DEMAND FORECASTS

The future water demand requirements of CTW have been identified through the impacts of the following factors:

- Demographic
- Climatic
- Economic
- Demand management
- Pricing
- Technology

6.1.1 DEMOGRAPHIC

CENSUS POPULATION

CTW mainly services townships and villages of Blayney, Cabonne and Weddin Shire Councils. The growth in services of CTW will be dependent on the growth of these constituent Shire Councils. The historical population of constituent Shire Councils are provided in the table below.

TABLE 9: CTW CONSTITUENT SHIRE COUNCILS POPULATIONS

Local Government Area (LGA)	ABS Census Data 2001	2006	2011	2016	Average Annual Growth (%)
Blayney	6,120	6,593	6,985	7,257	1.24
Cabonne	11,864	12,396	12,821	13,386	0.85
Weddin	3,653	3,641	3,665	3,664	0.02
Total	**21,637**	**22,630**	**23,471**	**24,307**	**0.82**

(Source: Australian Bureau of Statistics (ABS))

According to the above Census data Weddin Shire Council population growth is mostly steady and there is a trend for increasing population in Blayney and Cabonne Shire Councils. However the overall population growth which could impact CTW's service growth is approximately 0.8%.

SERVED AREAS GROWTH

CTW serviced population growth as stated in the 2015 CTW Strategic Business Plan is 0.7%. The plan estimated 2016 service population is 11,066. However according to the CTW water supply 2015/16 TBL report the serviced population is indicated as 14,400. Figure 12 and Figure 13 below show the historical CTW serviced population and service population forecast over the next 25 years according to the approximate growth rate of 0.7%.

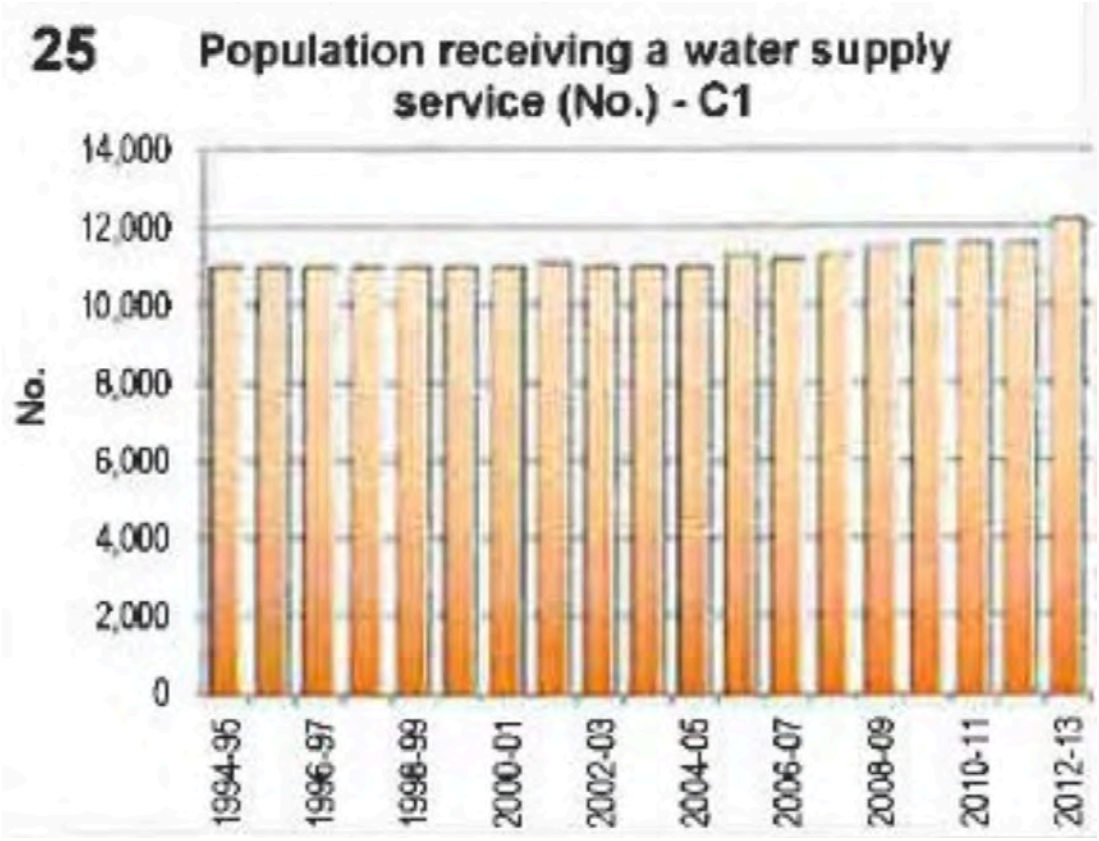


FIGURE 12: HISTORICAL POPULATION SERVED

(Source: CTW Water Supply Planning Data, NOW, Sep 2014)

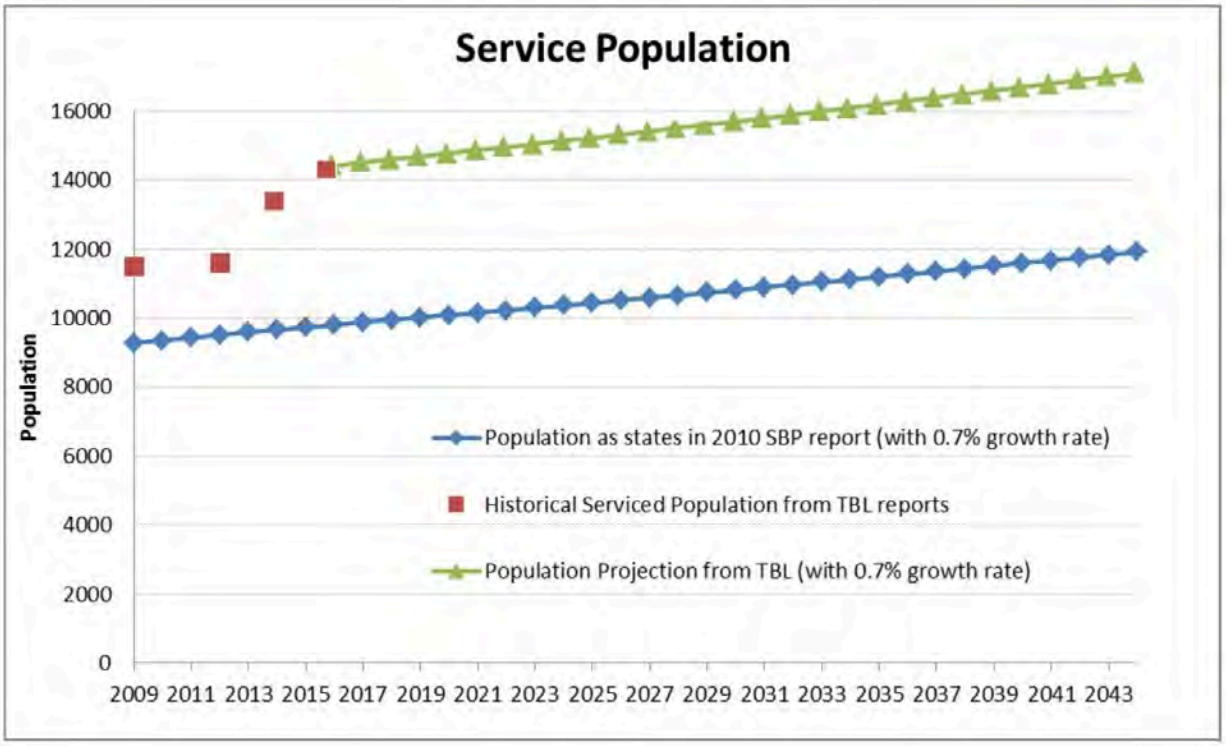


FIGURE 13: CTW SERVICED POPULATION FORECAST

UNSERVED AREAS

CTW 2010 Demand Management Plan states "CTW's 2010 Strategic Business Plan recognises the need to provide potable water supplies to villages within Blayney, Cabonne and Weddin local government areas serviced by CTW". However the extension of service to unserved areas is dependent of several factors such as:

- The growth in rural settlement
- The impact of levels of service to existing customers
- The environmental impact
- Cost to customers associated with extending services

Based on the further studies, CTW may consider extending its service to the areas such as:

- Blayney Shire - The villages of Newbridge, Neville and Barry
- Wedding Shire – The villages of Bimbi and Caragabal

The extension of potable water supply into the unserviced villages (additional 1,280 Equivalent Tenements) may stress out the existing headwork capacities.

According to the CTW baseline demand projection and SMEC's Lake Rowlands safe yield analysis (Nov 2010), Central Tablelands water demand would be expected to exceed Lake Rowlands water supply in 2013 (see Figure 14). Currently, CTW is using Gooloogong bores as supplementary water source during summer peak days.

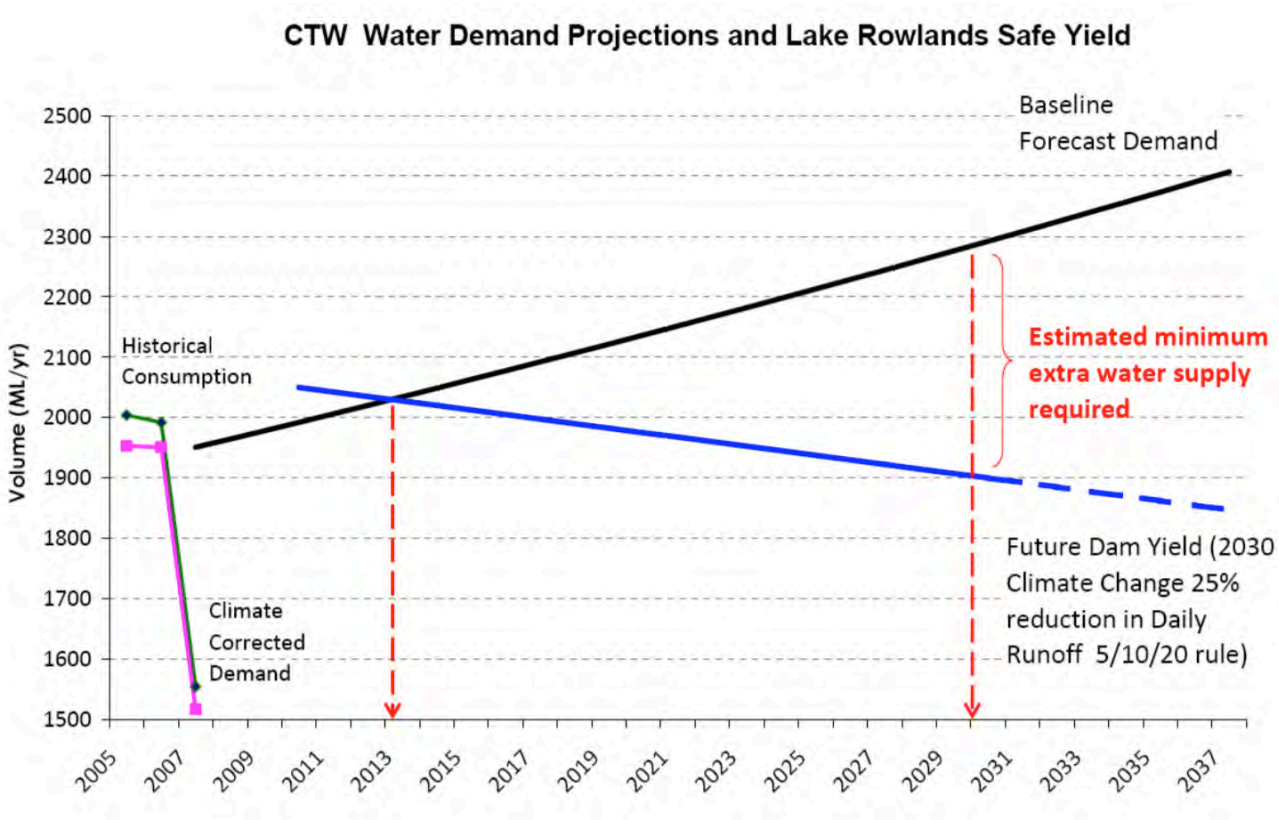


FIGURE 14: CTW WATER DEMAND FORECAST AND LAKE ROWLAND SAFE YIELD

6.1.2 CLIMATE CHANGE IMPACT

Studies done by CSIRO on sustainable yield in the Lachlan Valley state "The best estimate of climate change by 2030 would reduce surface water availability by 11%". CSIRO and the Australian Bureau of Meteorology (BOM) long term climate change projections indicate that by 2030, temperatures will rise by about 1 0C over Australia. Further the study identified, there will be changes in temperature extremes, with fewer frosts and substantially more days over 35 0C. The repost also states that although there will be more dry days, when it does rain, rainfall is likely to be more intense.

The future climatic changes will impact CTW water demand as below:

- Minimum 1 degree rise in temperature – increase evaporation and reduce soil moisture
- More days over 35 0C – This will increase peak day demand
- Decrease average rainfall – lower yields and higher external demand
- Rainfall more intense – capture will need to be more opportunistic and may require large storage
- Evaporation rate increase - demand will be increased, greater losses of surface water storage (e.g. Lake Rowlands)

(Source: 2010 CTW Demand Management Plan)

6.1.3 ECONOMIC

Future economic (commercial and industrial) development within the next 30 year forecast period is likely to be sporadic and difficult to predict. Isolated developments will have both initial and sustained impacts on the supply area in the form of:

- Spikes in population for high intensity phases such as construction with an ongoing employment demand dependant on development type
- Increased demands on water services in regional centres as a result of population increase

The current water supply infrastructure has enough capacity to service any increased load due to any new developments in the foreseeable future.

(Source: 2010 CTW Demand Management Plan)

6.1.4 DEMAND MANAGEMENT

CTW adopted a demand management plan (DMP) in 2010 and completed its Integrated Water Cycle Management Strategy in 2014. The annual and peak day demand management outcomes are shown in Figure 15 and Figure 16. CTW will use the demand management plan with the appropriate assessment of demand management measures to reflect existing situation, as a guide to assist CTW in implementing feasible demand management measures appropriately. CTW's Integrated Water Cycle Management Strategy Study also recommends some demand actions and headwork capacity improvements to secure CTW water supply system all time of the year (see Figure 15).

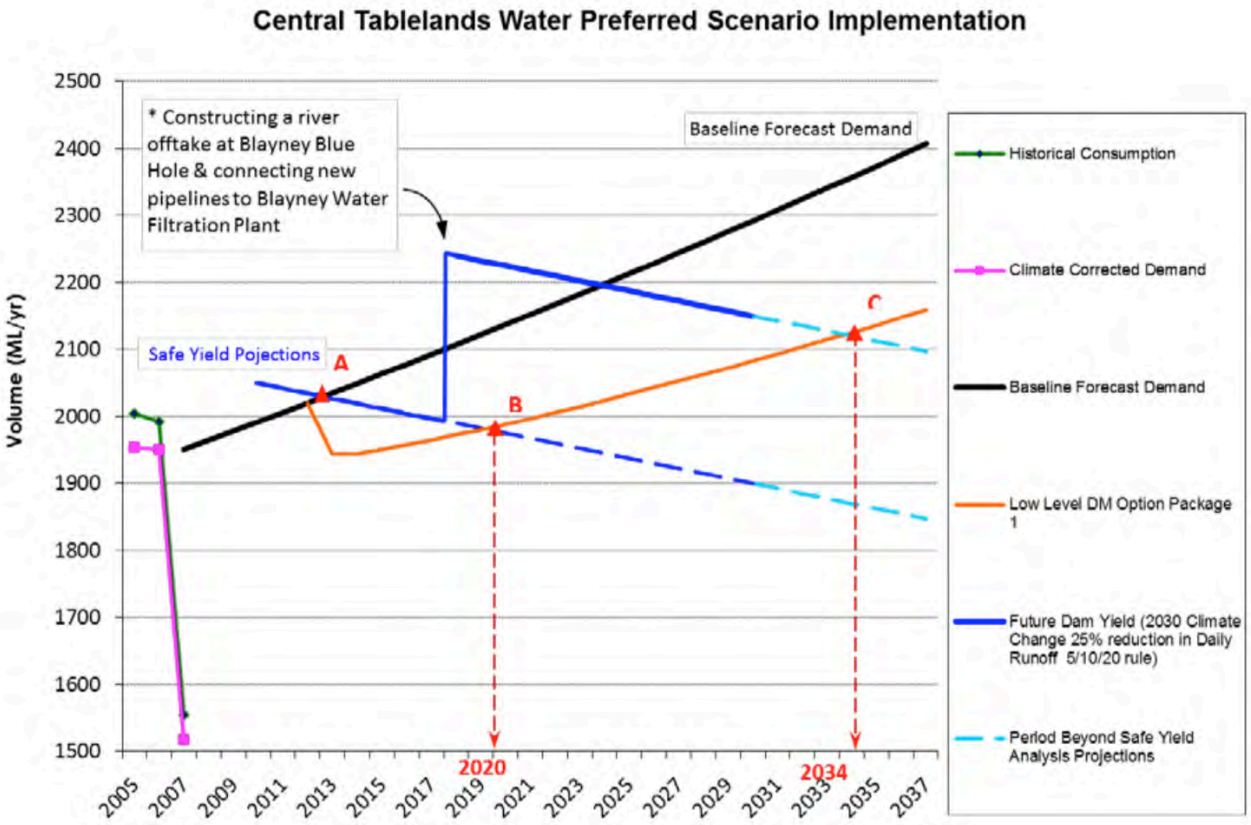


FIGURE 15: BASELINE ANNUAL DEMAND FORECAST AND FUTURE SECURE YIELD

(Source: IWCM Strategy Study, 2013)

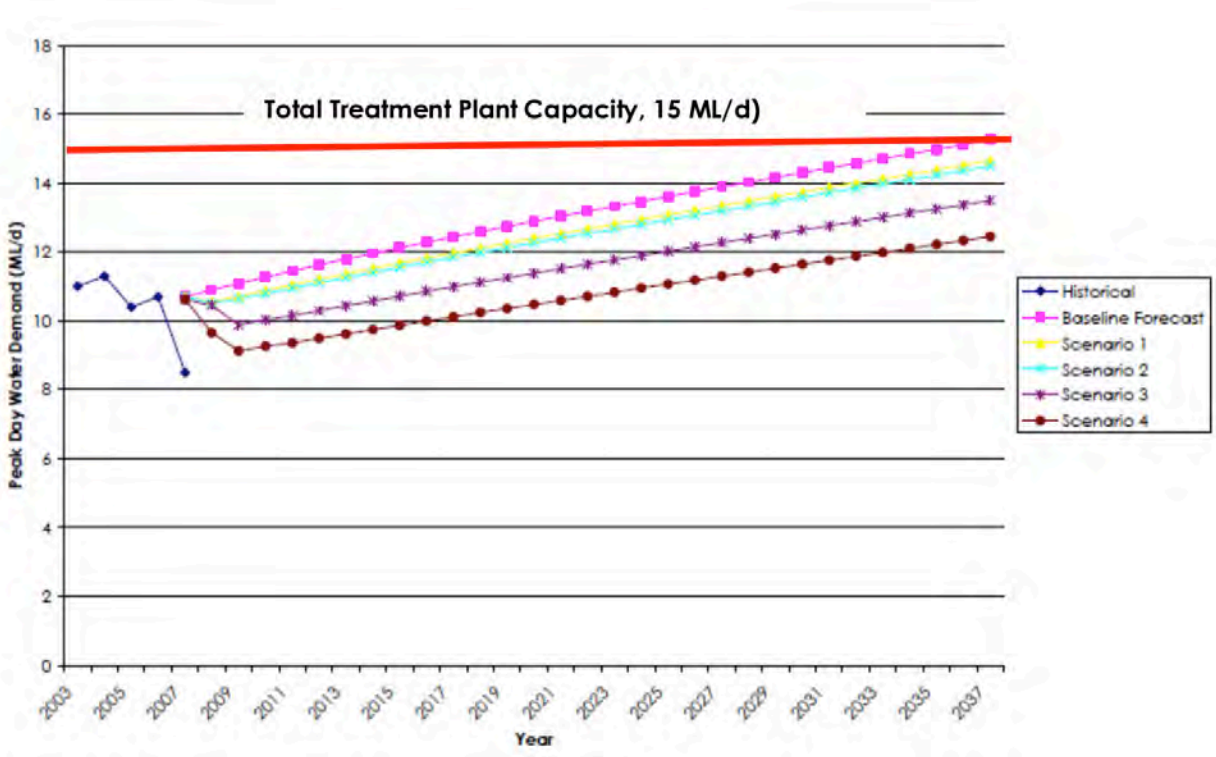


FIGURE 16: CTW PEAK DAY DEMAND FORECAST

(Source: CTW Demand Management Plan, 2010)

CTW's main operation is the two water treatment plants (WTP) at Blayney and Carcoar which have a total capacity of 15 ML/d (Carcoar WTP - 9 ML/d; Blayney WTP - 6 ML/d). Figure 15 shows that the baseline forecast peak day water demand for 2037 is approximately 15 ML/d. This means that, even though water conservation measures are applied, the current water filtration plants have the capacity to satisfy the future demand, subject to modifications in the distribution pipes.

Currently, Blayney WTP only services Blayney reticulation system. According to the demand forecast undertaken in the CTW IWCM evaluation study Blayney WTP has enough capacity for the future growth and Carcoar WTP may not have sufficient capacity (9 ML/d) to meet future demand (2037). However if Council implements appropriate operational actions to optimise both WTPs and shares capacity from both plants across the CTW system there is enough capacity to meet future estimated peak day demand (15 ML/d in 2037).

The baseline demand forecast in the IWCM and the IWCM Evaluation Study has identified that the following trunk mains require upgrades to supply the future estimated peak day demand:

- Trunk Main 'F' (Millthorpe pipeline) current PDD already exceeds trunk main capacity by 0.2 ML/d. The PDD in 2037 will exceed the capacity of Trunk Main 'F' by 0.6 ML/d
- Trunk Main "C" current PDD just satisfies trunk main capacity. The PDD in 2037 will exceed the capacity of Trunk Main 'C' (downstream of sub-system 9) by 3.1 ML/d
- If Gooloogong Bores are not operating, the PDD in 2037 will exceed the capacity of Trunk Main 'K' (Grenfell pipeline) by 0.1ML/d

CTW's existing capital works has included allocations for the above pipelines and Trunk Main F will be replaced once the new 300mm diameter CICL pipe as part of the Orange to Carcoar regional pipeline project is commissioned.

6.1.5 PRICING

CTW last three years water rates and typical residential bill variation are summarised in the table below.

Table 10: CTW Water Tariff

Year	TRB	Access Charge	Usage Charge	Average Residential Water Supplied per Property (kL/ property)	Comment
2013/14	613	$200	$2.15	179	
2014/15	620	$200	$2.25	187	
2015/16	633	$200	$2.36	192	Since 2012 CTW increased its water usage charge by 8% per annum. However annual residential water supply per property has increased.

As discussed in the table above, the water usage charge increased by 8%, however this did not reflect in savings in residential water usage.

6.1.6 TECHNOLOGY

The water industry has (over the last 10 years) been subject to rapid changes in technology. These changes are expected to accelerate over the next 30 years. There is a clear issue of existing technology becoming obsolete due to changes in standards.

WATER QUALITY

Technology used in the area of water quality has been changed dramatically in the last 10 years. More advanced water quality monitoring which has seen a greater ability to identify water quality performance, particularly in the area of pathogens. Based on this data health authorities have changed their assessments from a focus on E. coli monitoring to include assessment of other pathogens such as viruses and oocysts e.g. Cryptosporidium.

International changes in treatment technologies particularly filtrations have led to an increased technological capacity for removal of oocysts by greater log removals of particulates and pathogens.

7. LIFECYCLE MANAGEMENT

Optimisation of the lifecycle costs of CTW's water assets while meeting or exceeding CTW's responsibilities is the core aim of the asset management plan. Lifecycle refers to a "cradle to grave" approach to assets: Plan, design, construct, operate and maintain, decommission and dispose of.

7.1 OVERVIEW

7.1.1 EXISTING ASSET MANAGEMENT SYSTEM

CTW has divided its assets into the following categories:

- Water - Dams and Well, Bores
- Water - Filtration Plants
- Water - Pump Stations
- Water - Reservoirs
- Water - Trunk Mains
- Water - Reticulation
- Water -Telemetry
- Buildings
- Operational land

In 2017, CTW has completed asset condition assessment for all the water assets identified under the above categories. Asset condition is graded as:

- Very Good (1)
- Good (2)
- Fair (3)
- Poor (4)
- Very Poor (5)

Currently, CTW is in the process of implementing a computer-based asset management system.

7.1.2 LISTS OF EXISTING ASSETS

The section below describes the major assets which are used in the CTW's water supply system.

DAMS AND WELL AND BORES

CTW mainly extracts water from Lake Rowlands to service Carcoar and Blayney WSSs. Quandialla system obtains water from Quandialla Bores. There are other stand-by bores maintained by CTW as an emergency supply.
A list of water sources and their asset condition are given in Table 11. Asset conditions were assessed as part of the 2016/17 revaluation of water assets.

Table 11: CTW Dams and Well and Bores					
Asset Name	**Description**	**Construction Date**	**Asset Condition in 2017**	**Useful Life**	**Capacity**
Lake Rowlands	Concrete Dam	1/7/1954	Fair	100 years	4,500 ML
Blayney Well	Well and pipework	1/7/1930	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	
Cudal Bore	Civil	30/6/1994	Good	30 years	Bore pump - 0.35 ML/d
	Mechanical	1/7/1994	Good	25 years	
	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	
	Electrical	1/6/1998	Good	25 years	
Bangaroo Bore	Civil	30/6/1968	Good	25 years	Bore pump 2 - 3.0 ML/d
	Mechanical	30/9/1991	Good	25 years	
	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	Fair	40 years	Bore pump 2 - 3.8 ML/d
	Mechanical	30/6/1987	Good	35 years	
	Electrical	30/6/1987	Fair	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	29/2/2008	Very Good	30 years	Bore pump - 1.3 ML/d
	Mechanical	29/2/2008	Very Good	25 years	
	Electrical	29/2/2008	Very Good	25 years	

WATER TREATMENT PLANTS

CTW operates two water treatment plants. A summary of WTPs is provided in Table 12.

Table 12: CTW Water Treatment Plants

Asset Name	Description	Construction Date	Asset Condition in 2017	Useful Life	Capacity
Blayney WTP	Sedimentation Tank - Civil	1/7/1966	Poor	80 years	6 ML/d
	Filter Plant - Civil	1/7/1976	Good	80 years	
	Chlorinator		Very Good	20 years	
	Fluoride Plant	1/7/2005	Very Good	20 years	
	Control	1/7/2015	Good	15 years	
	Clearwater Tank - Civil	1/7/1966	Fair	80 years	
Carcoar WTP	DAFF System - Civil	1/1/2002	Very Good	60 years	9 ML/d
	Chlorinator	1/1/2002	Good	30 years	
	Fluoride Plant	1/1/2002	Very Good	30 years	
	Control	1/1/2002	Very Good	15 years	
	Clearwater Tank - Civil	1/7/1953	Poor	100 years	

A FULL LISTING OF OTHER WATER ASSETS SUCH AS PUMPING STATIONS, RESERVOIRS AND TRUNK MAINS CAN BE FOUND IN APPENDIX A

According to the outcomes of the 2017 CTW assets condition assessment, most of the water supply assets are in good condition from an operational prospective. In 2012 Council identified a few assets from the condition assessment that will need to be replaced within the next 10 to 15 years. These were:

- The roof of Canowindra Reservoir
- Trunk main C
- Trunk main F
- Trunk main K
- Only corroded pipe sections in Trunk Main U

All of these assets are either in the process of being replaced or will occur in the next 6-7 years.

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 Clearwater tank – civil
- Bangaroo bore north – 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 offline, if they are to be used again they will need to be brought back to a satisfactory condition for operation. Old River pumphouse is a corrugated iron shed that only houses a chlorinator. Hines Lane is a brick pit with a small pump inside it. Studies are underway for installing a new 12ML Clearwater tank at Carcoar WTP. Planning has commenced for the replacement of the 100mm pipe in Canowindra St, Canowindra.

7.1.3 ASSET MANAGEMENT RESPONSIBILITIES

CTW's asset development, operation and maintenance are the responsibility of the General Manager and Director Operations and Technical Services and are executed by Water Systems Manager, Water Quality Manager and Asset Officer. CTW's organisational chart is shown in Figure 17.

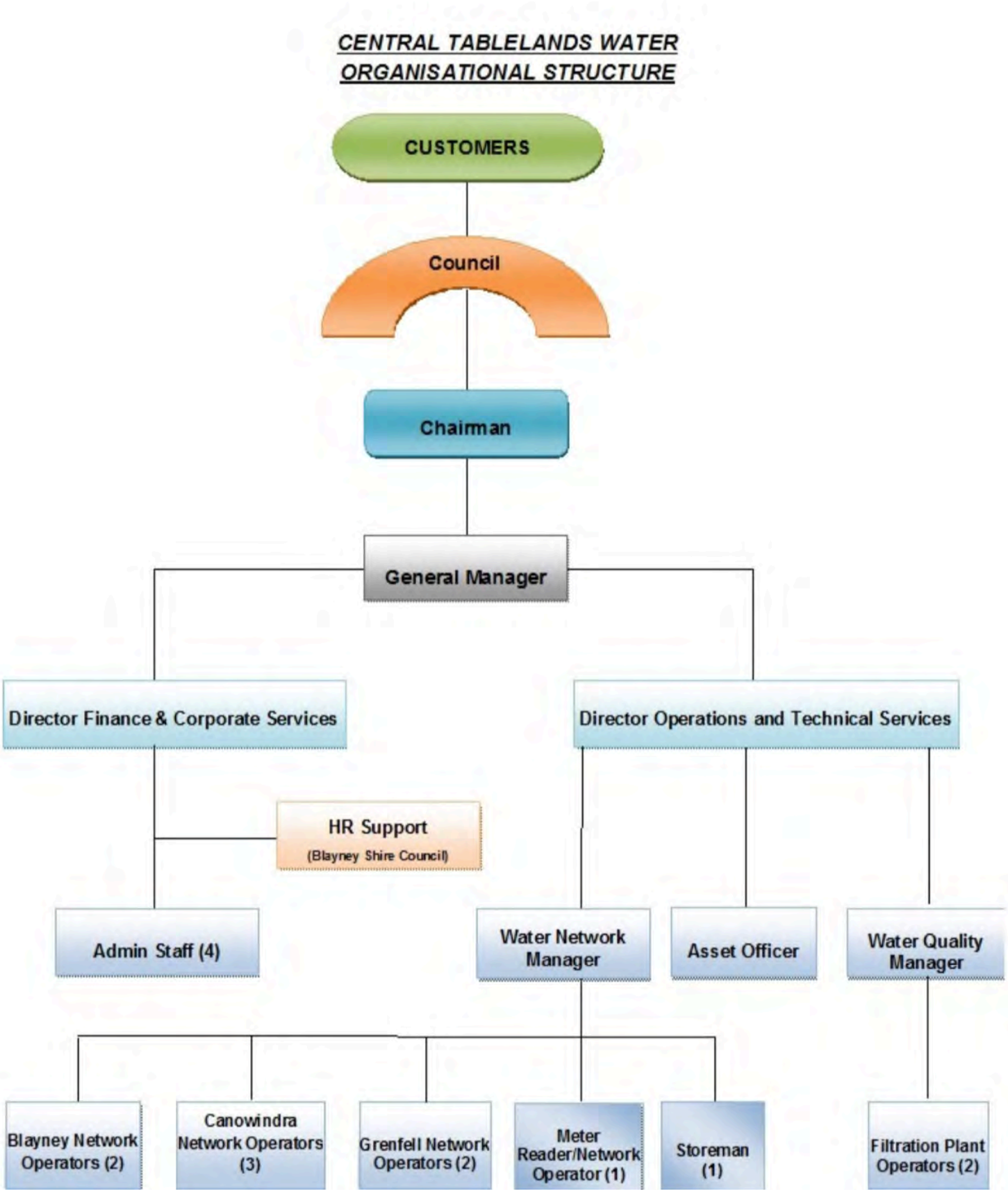


FIGURE 17: CTW ORGANISATIONAL STRUCTURE

7.2 RISK MANAGEMENT

7.2.1 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 sorts of asset failures need to be considered to identify criticality. Usually in a preliminary criticality assessment a fairly major failure would be assumed to throw asset importance into higher relief.

7.2.2 METHODOLOGY

The following definitions have been used 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

ASSET LEVEL

For the preliminary criticality analysis at CTW, it was decided to examine CTW's Level 3 water supply assets. Some example will illustrate this:

- **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 probabilistic 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 it is unlikely that such data is available and this approach is considered too complex and detailed for a core asset management plan.

The criticality risk assessment for water supply assets are described in Section 7.2.3.

DEFINITION OF THE FAILURE EVENT

For this criticality analysis the standard form of event that was considered was for each Level 3 asset sub-system 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 Table 13
- What is the likelihood of this failure occurring in this level 3 asset system? The likelihood was assessed as described in Table 14

7.2.3 CRITICALITY ASSESSMENT

CONSEQUENCE OF FAILURE FOR WATER SUPPLY

Six consequence factors for CTW's consequence analysis were used as described below:

- Pressure (20-60 m)
- Domestic Peak Demand (3 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.

TABLE 13: CONSEQUENCE OF FAILURES						
	LEVELS OF SERVICE					
CONSEQUENCE OF FAILURE	Pressure (12 - 90 m)	Peak Demand (Domestic, 2.2kL/d)	Unplanned Supply Interrupt (3hrs, 10 times/y)	Fire Fighting (Positive Head Fire Flow at 75% Design Peak)	Water Quality 2011 ADWG	ENVIRONMENTAL
5 - Catastrophic	Lose Pressure (P) more than 6,000 Customers (C)	Not Meet Peak Demand for more than 6,000 Customers (C)	Lose Supply more than 6,000 Customers (C)	Lose Supply more than 6,000 Customers (C)	More than 6,000 Customers (C) Boil Water (BW)	Catastrophic Environmental Incident
4 - Major	Lose P more than 1,000 C	Not Meet Peak Demand for more than 1,000 C	Lose Supply more than 1,000 C	Lose Supply more than 1,000 C	More than 1,000 C BW	Long term negative impact to the environment
3 - Moderate	Lose P more than 100 C or Major Hospital	Not Meet Peak Demand for more than 100 C	Lose Supply more than 100 C and Major Hospital	Lose Supply more than 100 C and Major Hospital	More than 100 C BW	Serious impact to the environment but reversible
2 - Minor	Lose P more than 10 C or Major Industry	Not Meet Peak Demand for more than 10 C	Lose Supply more than 10 C or Major Industry	Lose Supply more than 10 C or Major Industry	More than 10 C BW	Significant impact to the environment
1 - Insignificant	Lose P 1 to 10 C or Minor Industry	Not Meet Peak Demand for 1 to 10 C	Lose Supply 1 to 10 C or Minor Industry	Lose Supply 1 to 10 C or Minor Industry	1 to 10 C BW or aesthetic	On-site minor environment impact

Note: Customers (C) means people

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 14.

TABLE 14: LIKELIHOOD OF FAILURES DEFINITIONS

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)

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

Figure 18 illustrates CTW's risk matrix and a theoretical approach in terms of which form of asset management actions might be required.

LIKELIHOOD	CONSEQUENCE				
	1 Insignificant	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 18: THEORETICAL ASSET MANAGEMENT ACTIONS

In Table 15 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 19 on page 70.

TABLE 15: 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)*

WSS	Reference No	Asset Description Level 3 Assets	Levels of Service						Likelihood of Failure			Worst Case Scenario		
			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/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 Resevoir	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
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
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

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	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
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
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	47	Trunk Main 'U' from Trunk Main C to Greys Hill Reservoir (length 55 km)	n/a	3	n/a	n/a	n/a	n/a		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 & g 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)					
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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

7.2.4 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 cconsequence and llikelihood outcomes are laid out within the theoretical asset management action sectors.

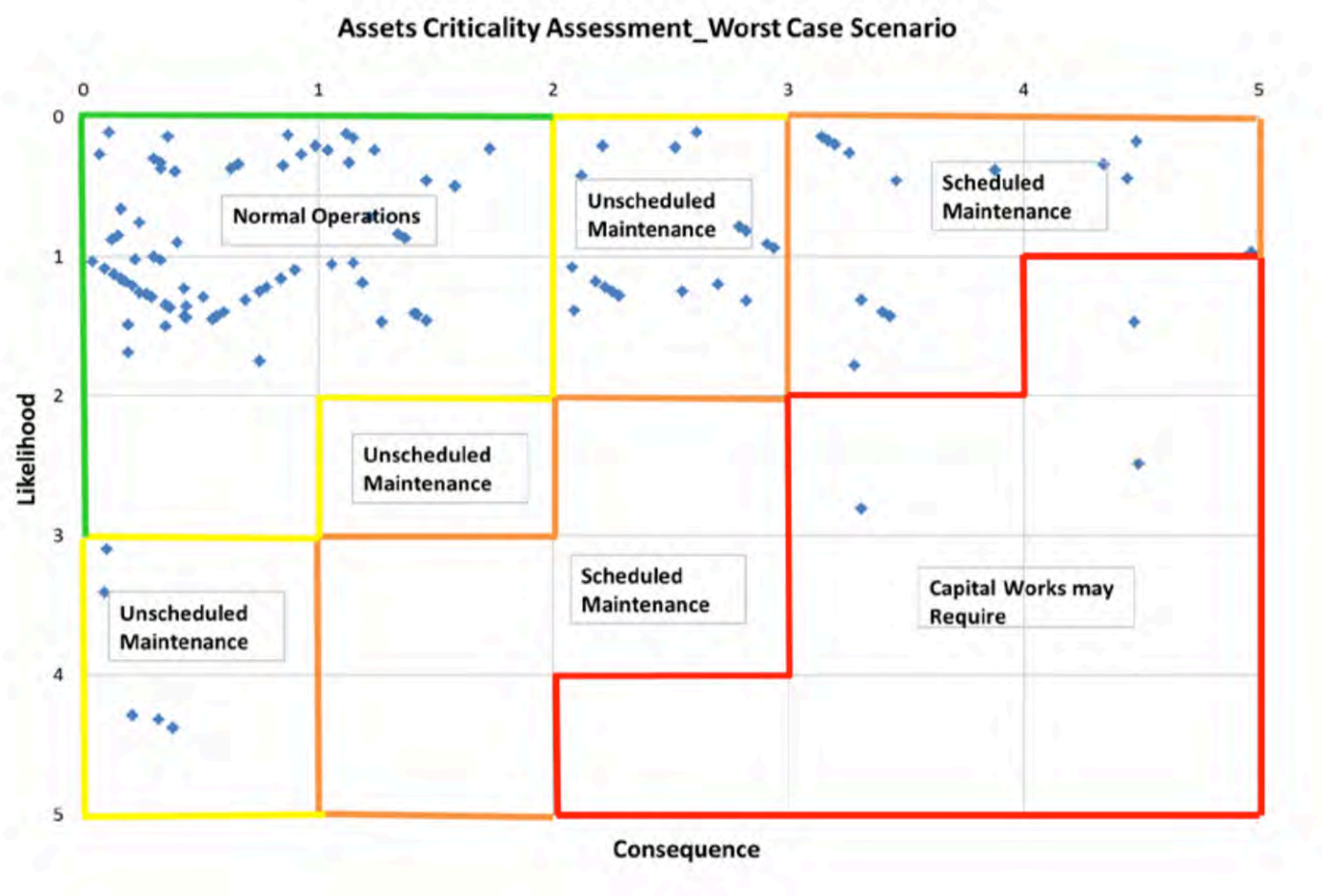


FIGURE 19: ASSET CRITICALITY ASSESSMENT – WORST CASE SCENARIO

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. CTW has only identified three assets that come under this category, such as:

- Lake Rowlands Dam
- Gravity main from Lake Rowlands to Carcoar WTP
- Trunk main “K” transfer water from trunk main “C” to Grenfell North

For the asset systems with high risk ratings, 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.

7.3 OPERATIONS PLAN

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.

7.3.1 OPERATIONS ANALYSIS

Key to managing asset systems is the identification of system, subsystem, asset section performance requirements. These requirements take the form of:

- Outputs
- Reliability
- Availability

Operations staff need to be able to move to operate equipment and systems and find whether the existing systems are capable of economically meeting their water supply levels of services with minimum negative impact.

7.3.2 SYSTEMS OPERATION RULES & PROCEDURES

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 implies to CTW's water treatment plants are listed below:

- WTP repairs and maintenance: regular maintenance and repairs on pumps and valves
- Daily logs and WTP inspections: daily plant checks and performance to be recorded in daily log
- Chlorine cylinder change-over: connecting new 920 kg chlorine cylinder into disinfection system
- Fluoride control: load up fluoride hopper with 25 kg fluoride bags
- Laboratory testing: perform comprehensive sampling and lab tests on a daily basis
- Weekly WTP maintenance: scheduled cleaning of plant and checking plant equipment is clean and operational
- Fortnightly WTP maintenance: fortnightly maintenance required to maintain efficient plant operation
- Monthly WTP maintenance: monthly maintenance required to maintain efficient plant operation
- Water main repairs safe operating procedure
- Water sampling procedure
- Fluoride meter safe operating procedure
- Algae count/type determination safe operating procedure

A full list of work method statements and existing operating procedures is included in Appendix B.
CTW is in the early stages of documenting operational procedures for its systems and sub-systems. As part of the development of CTW's asset management system key duty statements will be established for asset systems beginning with the most critical systems.

THE OPERATIONAL PLANNING PROCESS

Normal operational costs are funded from the operational budget. However if the existing asset systems are inadequate to meet current and future levels of service targets, the operation plan outputs should include a schedule of required capital works and maintenance plan. The costs should be included in the capital works budget.

The extensive water supply schemes operated by CTW are operated under a set of rules identified and implemented by CTW staff over many years of operations or according to the procedures setup in the manufacture's manuals e.g. Carcoar WTP manual. Many of these rules are documented in individual procedures or work method statements listed above.

From a managing prospective, the CTW water supply system has been divided into nine sub-systems and shown in Figure 3. As stated in CTW's water supply operations management plan CTW has setup certain rules to operate its assets systems (nine sub-systems) in different situations (see Table 16) such as:

- Normal operation condition – Carcoar and Blayney systems are being satisfactorily supplied with water from Lake Rowlands
- Peak day demand condition - Carcoar and Blayney systems are unable to satisfactorily be supplied with water from Lake Rowlands. Stand-by sources and facilities are utilised to supplement supply from Lake Rowlands

TABLE 16: OPERATION PROCESS OF SUB-SYSTEMS		
Sub-System	**Normal Condition**	**Peak Day Demand Condition**
Sub-System 1	• Monitor raw water quality in Lake Rowlands, WFP's and reticulation systems in accordance with schedule • Keep level of Lake Rowlands at maximum. Only open scour valve to prevent over-topping and meet the requirements of NOW Licence • Operate destratification system only during spring/summer • Maintain Millthorpe, Carcoar and Blayney area Reservoirs at adequate levels • At Browns Creek Pump Station, use Pump #1 as duty pump • At Booster #1 Pump Station, use either Pump #1 or #2 as duty pump. • Adhere toroutine and preventative maintenance schedules.	• According tothe storage level at Lake Rowlands apply water supply side actions (see Appendix C) • According to the storage level at Lake Rowlands apply demand side actions (See Appendix D)
Sub-System 2	• Maintain Lyndhurst, Mandurama and Garland Reservoirs at adequate levels. • Ensure sufficient flow throughTrunk Mains 'U', 'V' and 'C'. • Adhere to routine and preventative maintenance schedules.	• Monitor all reservoir levels and adjust feed set-ups where necessary
Sub-System 3	• Maintain Cargo, Cudal, Grays Hill and Manildra Reservoirs at adequate levels • Single pump operation of Cargo Pump Station • Adhere to routine and preventative maintenance schedules.	• Operate Pumps at Canomodine Pump Station if level of Grays Hill Reservoir is below 50% • Operate both pumps at Cargo Pump Station • If demand in Cudal is very high then operate Cudal Pump Station • Monitor all reservoir levels and adjust feed set-ups where necessary • Monitor chlorine residuals maintain at or near 1.0 mg/l
Sub-System 4	• Maintain Moorbel Reservoir full • Feed supply for whole sub-system via Trunk Main 'V' and Moorbel Reservoir • Maintain all other Reservoirs at an adequate level • Adhere to routine and preventative maintenance schedules	• Take in water through Trunk Main 'V' and Canowindra off-take if Bangaroo Bore/ Gooloogong Bore is being used to supplement supply to Canowindra • Adjust PRV 9 to allow sufficient flow into Trunk Main 'U' • Monitor all reservoir levels and adjust feed set-ups where necessary
Sub-System 5	• Adheretoroutineandpreventative maintenance schedules.	• Boost supply to Canowindra and Eugowra, use Pump #1 OR #2 • Boost supply to Canowindra only - if demand in Canowindra is very high, use Pumps #1 and #2 • Boost supply to Grenfell only - use Pumps #1 and #2
Sub-System 6	• Adheretoroutineandpreventative maintenance schedules.	• Boost supply to Grenfell ONLY - use Pump #1 OR Pump #2. • Boost supply to Eugowra ONLY - use Pump #1 or Pump #2. • Boost supply to Grenfell AND Eugowra - use Pump #1 OR #2
Sub-System 7	• Keep operation of Broad Street and Trajere Pump Stations to a minimum • Maintain Eugowra, Hill Street, Trajere and Pyes Gap Reservoirs at an adequate level • Adhere to routine and preventative maintenance schedules.	• Adjust flow into Trunk Main 'L' at Old River Pump House • Operate Trunk Main 'L' booster as require • Monitor all reservoir levels and adjust feed set-ups where necessary • Operate Broad Street Booster as require • Monitor Chlorine residuals maintain at or near 1.0 mg/l

Sub-system	Normal Condition	Peak Day Demand Condition
Sub-System 8	• Maintain all Grenfell Reservoirs at an adequate level • Adhere to routine and preventative maintenance schedules	• Boost supply via Trunk Main 'K' by operating McDonalds Lane Pump Station • Monitor all reservoir levels and adjust feed set-ups where necessary • Monitor Chlorine residuals maintain at or near 1.0 mg/l
Sub-System 9	• Monitor water quality from bores. • Monitor SWL in bores. • Maintain Quandialla reservoirs at an adequate level. • Adhere to routine and preventative maintenance schedules.	• Supply and boost water to Quandialla via TM 'Q' • Monitor all reservoir levels and adjust feed set-ups where necessary • Monitor Chlorine residuals maintain at or near 0.5 mg/l

Source: CTW Operations Management Plan,2013

CTW has a telemetry system available for all the critical control devices. This telemetry information is closely monitored by Duty Operators and 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.

The systems operation rules and procedures may need to provide details on how the total system and sub-systems are operated during normal operation and during breakdown conditions.

7.3.3 DUE DILIGENCE PROGRAM

LWUs should have a Due Diligence Strategy to manage all risks to the environment.

The NSW Protection of the Environment Operations Act 1997 (POEO) assigns substantial liability in the event of environmental harm. Due Diligence should be incorporated in the operation plan since it is one of the few defences available to both individuals and corporations under the Act.

Due diligence implies that efforts should be made to anticipate hazards which may harm the environment and take all feasible steps to prevent, control and mitigate the potential of their occurrence.

CTW has certain protocols to operate its water supply systems in a disaster situation:

- Lake Rowlands dam failure – A disaster plan as stated in the Blayney Shire EMPLAN document
- Chemical accidents – regulations of Dangerous Goods' and/or 'Hazardous Substances
- Severe drought – If the water level of Lake Rowlands falls to below the middle-level draw-off point of the outlet tower, then it is considered an emergency. The lower level draw-off point is too close to the floor of the dam to be used. A portable, barge-mounted pump is used to move water from the dam to the outlet works

Section 7.2 in this asset management plan analyses the risk of failure of major assets and the impact on meeting regulatory requirements and LOS targets.

7.3.4 DEVELOPMENT OF THE OPERATING PROCEDURE SYSTEMS

Operating procedures can take a number of forms. Incident plans need to be developed for handling emergencies. Procedures for system operations tend to be focused on start-up, operation and troubleshooting, shutdown and quality analysis.

Operating procedures usually specify the "fit for purpose" condition the assets need to be in to allow appropriate operation to take place. This can be to meet the levels of service or to ensure that the operator is safe.

An example of this is the operation of a gaseous chlorine water treatment system. The pre-operation condition check should ensure that the asset is "fit for purpose" i.e. safe and fully operable to achieve water quality levels of service. This operational definition of "fit for purpose" provides the maintenance staff with a clear target for their work. If the maintenance staff cannot achieve the "fit for purpose" condition then capital works or renewal may be required.

Where the criticality assessment has shown that systems are more critical and their likelihood of failure is higher than other assets, this allows Council to prioritise the development of incident plans and operating procedures to address this. If operating procedures cannot address this and what is known as operational "work around" can be identified to overcome "fit for purpose" shortfalls then changes in maintenance procedures and further capital works may be required.

CTW will update the critical assets operating rules and procedure to reflect the following requirements

- Assets normal operating condition
- Emergency operating condition
- Start-up procedure
- Troubleshooting procedure
- Shutdown procedure

It would be expected that these procedures will be applied for the high priority areas/assets identified from the assets criticality analysis in section 7.2.3 in this report.

7.4 MAINTENANCE PLAN

The purpose of the maintenance plan is to support the operations plan by ensuring that the 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, facilities. The Appropriate assets maintenance will ensure Council meets water supply levels of service in the most cost effective manner.

Maintenance is necessary to keep assets operating economically and efficiently while performing their functions as required by the operating plan. Generally there are two overarching types of maintenance:

- Planned scheduled maintenance and
- Un-scheduled reactive maintenance

A great deal has been documented about the importance of the ratio between planned and breakdown maintenance. Although the ratio varies from organisation to organisation the general theory is that there is an optimum balance between the two maintenance forms that delivers the required levels of service at optimum cost.

7.4.1 SCHEDULED MAINTENANCE

Scheduled or planned/preventative maintenance is work identified and managed through a maintenance management system (MMS) which is usually carried out with advance notice. Scheduled maintenance can include regular condition based maintenance, time based maintenance or operating time based maintenance.

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 17).

TABLE 17: OVERVIEW OF CTW SCHEDULED MAINTENANCE FOR WATER SUPPLY ASSETS		
Asset Type	**Frequency**	**Task**
Dams	Annually	DSG 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

The significant scheduled maintenance/replacement is documented in the capital works budget and most of these are item replacements or contract works. There are very few other types of significant scheduled maintenance work worth capitalising. Normal maintenance with less significant costs is funded from the operational budget.

DEVELOPMENT OF THE SCHEDULED MAINTENANCE PROCEDURE SYSTEM

Based on the overview at Table 17 and the criticality assessment's (7.2), identified priorities of which a program of scheduled maintenance system enhancements will be developed.

As discussed in Section 7.2 high criticality areas of the asset system will be focused onto achieve levels of service. If the operational incident 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.

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.

For lower priority assets a less frequent scheduled maintenance approach involving inspection may suffice to achieve levels of service. For very low priority assets where the impacts of failure on levels of service are minor un-scheduled maintenance approaches may be appropriate.

As CTW moves from a “core” asset management approach to “advanced” asset management the use of maintenance databases will allow reports from maintenance activities on condition, failure cause, mean time between failures, length of time the system or asset failed which will allow CTW to balance levels of service performance and costs.

Un-scheduled maintenance may also be of a repetitive nature and standard maintenance procedures can be developed with equally useful data gathering inputs to the maintenance database. The databases allow GIS breakdown information that shows up where a problematic asset is requiring frequent call outs.

As the maintenance database is populated with GIS locational data and criticality focused performance and cost information decisions regarding asset renewal, replacement, water supply systems design will be more informed with commensurate savings.

CTW is in the process of implementing a GIS linked asset management system, with a maintenance database component.

7.4.2 UN-SCHEDULED MAINTENANCE

Un-scheduled or reactive/breakdown maintenance is repair work carried out in response to customer complaints, alarms or requests from operators sometimes with little notice. Items are covered by breakdown response when scheduled maintenance is not necessary or feasible e.g. trunk mains are critical.

Most breakdown call outs are generated from three sources:

- Alarms and SCADA
- Staff observations
- Customer complaints

This is in addition to routine or non-routine attendances by operators and other staff. Improvements could be made by scheduling comprehensive (incl. structure) inspections of fixed assets.

Whichever source identifies the requirement for breakdown maintenance the work is passed to the responsible managers to define priority and assign responsibility in the request handling system. Staff then either make the repairs or organise contractor assistance to perform the repairs.

CTW staff have advised that they have appropriate spare parts and pumps available within the Council for the critical assets.

CTW provides a 24 hour call out service for breakdown maintenance. Operators are designated “on- call” to perform emergency (breakdown) maintenance when required. (Source: CTW Asset Maintenance Plan, May 2014).

7.5 CAPITAL WORKS PLAN

The purpose of the capital works plan is to document anticipated future capital works requirements and expenditures to meet levels of service and to provide a basis for financial planning and capital budgeting. A capital works plan is comprised of a series of projected annual capital expenditures for either new works or the renewal and replacement of existing assets.

7.5.1 NEW CAPITAL WORKS

New capital works including extensions or augmentation for growth or for improved standards may become necessary when the existing water supply system does not have capacity to meet the specified level of service or other operational objective.

7.5.2 RENEWAL AND REPLACEMENT OF EXISTING ASSETS

Renewal and replacement of existing assets may be required due to their criticality, age, condition or inadequate performance.

A capital works plan may also include disposal of obsolete assets which might have a residual market value.

7.5.3 30 YEAR CAPITAL WORKS PROGRAM

CTW has recently updated the 30 year capital works program which is included in Appendix E. 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 over a financial threshold are assessed against other projects in terms of how they address improvements in CTW's levels of service or reduce operational or maintenance costs.

This process can be improved by developing a business case format for significant capital works projects.

7.5.4 CRITICAL ASSETS THAT MAY REQUIRE CAPITAL WORKS

To address the issues raised by the criticality assessment (see Section 7.2.3) Council has a number of management options. The highest priority assets in the 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 that CTW has identified capital investments for most of these critical assets (see Table 18).

TABLE 18: A SUMMARY OF KEY ASSETS REQUIRED ACTIONS

Ref No.	Asset Description	Operating Rules and Procedures In Placed	Scheduled Maintenance Plan In Placed	Actions Included in 30 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 placed	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 placed	Yes (yearly flushing, otherwise breakdown maintenance)	Trunk main X renewal	C=4 L=2
4	Blayney WTP	Automated telemetry system. No written down procedure 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 placed	Yes	Renewal work in Blayney WTP	C=5 L=1
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 in next 30 years	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=1
27	Chlorinator at Carcoar WTP	Work method statement in placed	Yes	No capital works allocation in next 30 years	C=4 L=1

TABLE 18: A SUMMARY OF KEY ASSETS REQUIRED ACTIONS

Ref No.	Asset Description	Operating Rules and Procedures In Placed	Scheduled Maintenance Plan In Placed	Actions Included in 30 Years Capital Works Program	Worst Case Scenario Likelihood (L) &. Consequence (C)
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 work allocation in next 30 years	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	No capital works allocation in next 30 years	C=4 L=1
85	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	C=4 L=1
96	Trunk main 'K'	Work method statement for water main repair in place	Yes (yearly flushing, otherwise breakdown maintenance)	Trunk main K renewal	C=4 L=3
97	McDonalds Lane PS	Booster pump station work method statement in place	Yes	No capital work allocation in next 30 years	C=4 L=2

CTW needs to expand its work method statements or operating procedures to reflect start up, troubleshooting and shutdown procedures for the high priority assets.

An unscheduled breakdown maintenance approach is appropriate with the low priority asset systems (see Section 7.2.3).

7.6 NEW ASSETS FOR GROWTH

New assets required for growth have been reviewed in Councils capital works program (2018). The new assets identifies for next 30 years are:

- Trunk main 'U' – Trunk main 'C' to Cudal upgrade for growth 150mm to 200mm
- Trunk main 'K' – Trunk main 'C' to Grenfell North Reservoir for growth 200mm to 250mm
- Trunk main 'C' – Mandurama to Trunk Main 'U' for growth 225mm to 300mm
- Trunk main 'B' – Carcoar WTP to Mandurama for growth 250mm to 300mm
- Trunk main 'C' –Trunk Main 'U' to Gooloogong for growth 225mm to 300mm
- Trunk main 'D' – Carcoar WTP to Browns Creek reservoir for growth 200mm to 300mm
- Trunk main 'F' –Browns Creek reservoir to Millthorpe for growth 150mm to 300mm

The upgrade of Trunk Mains 'D' & 'F' was announced in February 2015 as a State Government funded Water Security for Regions Project between CTW and Orange City Council (OCC).

In summary, the joint project consists of the construction of a large diameter water main from Orange to Blayney and Carcoar Water Filtration Plant (CWFP) in five (5) Stages. The benefits to CTW are a new 300mm DICL pipeline to replacetrunk mains D & F, and 2 new pump stations at Carcoar WTP and Plumb St, Blayney.

Ultimately, the project would connect CTW and OCC water systems and allow the two way movement of water. In times when CTW is short of water, potable supplies could be transferred from Orange. In the event of system failure in the Orange System, potable water could be transferred from the CTW system to Orange.

Council is planning to perform the above capital works actions to meet LOS needs impacted by future growth. The graph below illustrates the 30 years capital expenditures for growth, renewals and improves levels of service. Council will also need to consider operating and maintenance cost increases due to future new assets.

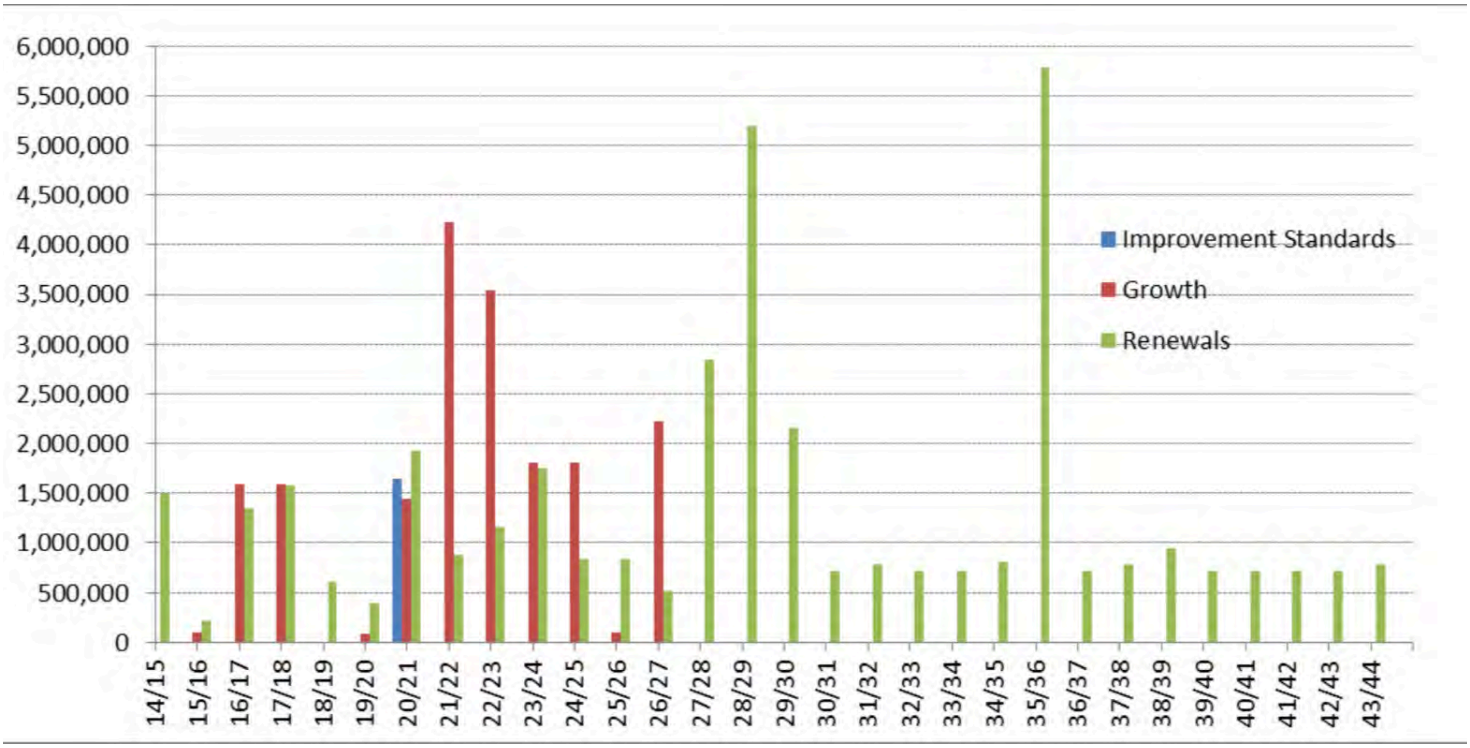


TABLE 19: CTW 30 YEARS CAPITAL EXPENDITURE

7.7 ASSET DISPOSAL

Asset disposal includes any activity associated with disposal of a decommissioned asset including sale, demolition or relocation.

CTW needs to develop a process for disposal or mothballing of all decommissioned water supply assets.

This disposal process has two different aspects where CTW can divest itself of assets that are truly surplus to needs with a financially positive outcome, this is expected to take place. Care should be taken to ensure that, from a risk perspective, assets are not essential (e.g. are such as spare pipe lengths will definitely not be required in a pipe burst incident?)

The other key reason to dispose of assets is where they represent a liability to CTW from either a public safety, environmental or financial basis. In this case the transfer of assets to other organisations or the removal and/or making safe may represent positive financial and legal opportunities.

8 FINANCIALSUMMARIES

8.1 INTRODUCTION

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 some time intervals, depending on the type of assets. Life cycle costs include income from asset disposal, but this is seldom available to water assets, except in the occasional sale of surplus land.

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.

8.2 ASSETS FINANCIAL SITUATION

The section uses the figures compiled in 2013 and 2014, which will be reviewed over the next 18 months, particularly in light of new assets coming on board from the Water Security for Regions Project between CTW and Orange City Council as well as associated disposals.

8.2.1 DEPRECIATION AND RENEWALS

The future depreciation of the assets is made up of two components:

- Depreciation of existing assets: In 2013/14 the annual depreciation of water supply assets were $1,554 K. It is expected that this annual depreciation will continue in the future (in 2013/14 dollars) i.e. 30 year total depreciation is $46.65 M
- Depreciation of future assets: This is assumed to be straight line depreciation over 70 years

Investment in asset renewal offsets the accumulated depreciation. That is, renewal investment increases the written down current cost (WDCC) and consequently increase the financial stability of the assets.

The section below describes the asset status (in financial prospective) with the key indicators of the asset depreciation and renewals from CTW 2014 financial plan. However at the stage of developing this Asset Management Plan, Council has revised its water supply capital works program. Therefore it is recommended CTW to update its financial plans to reflect the current situation.

8.2.2 ASSET STATUS

The asset status is the ratio of the depreciated value of the asset to their replacement cost. While this is an accounting term, it can be used as a general measure of the status of the entire asset portfolio. A low asset status (say below 50%) may indicate that significant renewal costs will be required and high asset status is a sign of a general good condition of assets. Table 20 indicates that the current (2013/14) and future (2042/43) status of CTW water supply assets.

TABLE 20: ASSET STATUS IN 2013/14			
No.	Item	Water Supply	
		2013/14*	2042/43**
1	Current replacement costs (CRC) (2013/14 $'000)	119,125	139,686
2	Written down current cost (WDCC) (2013/14 $'000)	53,038	64,354
3	Asset status (WDCC/CRC)	45%	46%
4	Total Renewal over 30 years (2013/14 $'000)		42,579

(Source: * 2013/14 Special Schedule 4

**FinancialPlansBasecaseData,March2014; CTWwatersupplycapitalworksprograms,March2014)

According to the above analysis, Council is planning to invest in renewals almost same as the depreciation amount during the next 30 years (renewals $42.58 M against depreciation of $45.87 M). Therefore at the end of 30 years, the asset status is expected to be almost same as the current financial status of the assets.

Figure 20 shows the projected asset depreciated cost over the planning period in 2013/14 dollar values.

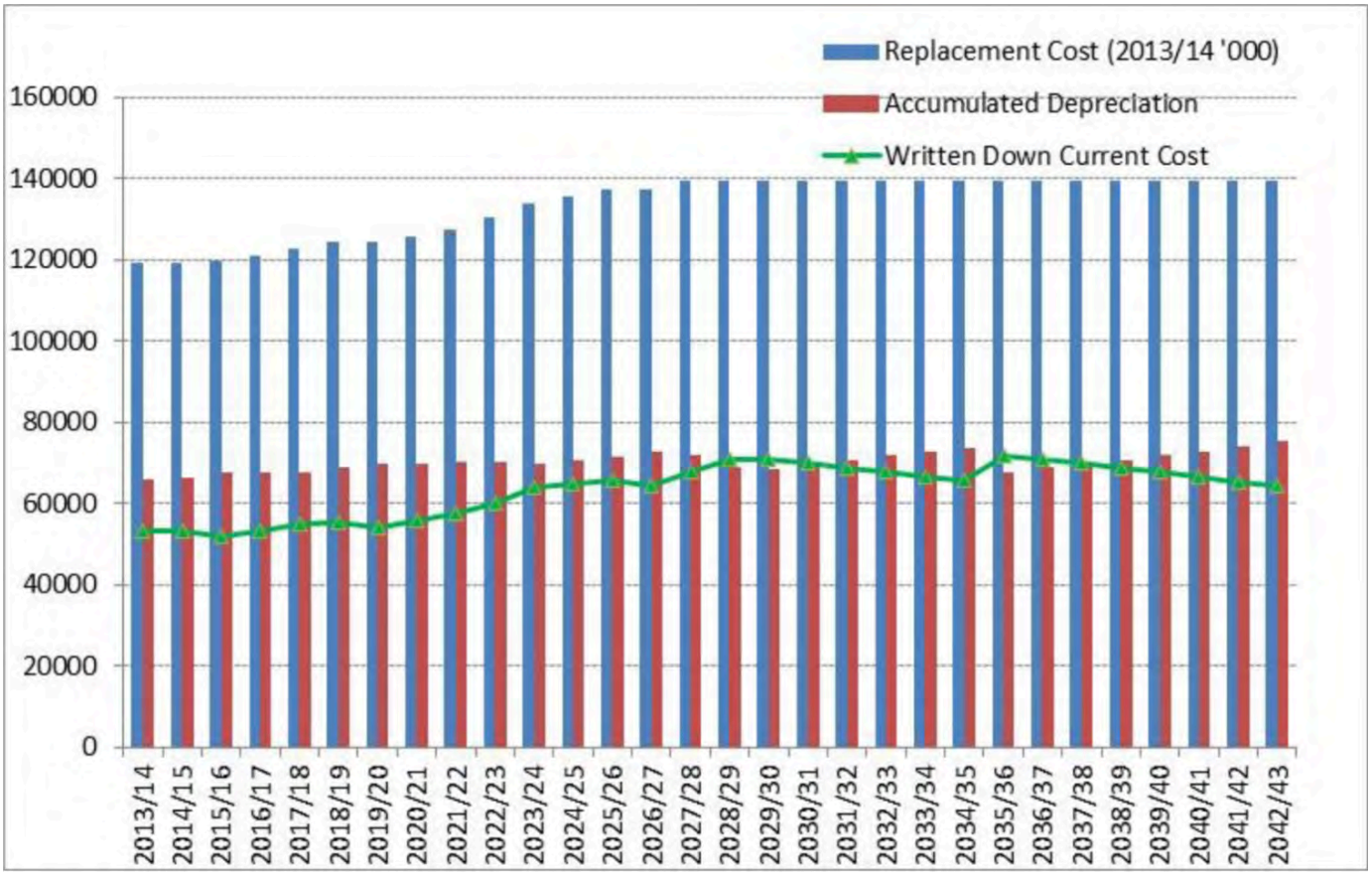


FIGURE 20: PROJECTED ASSET DEPRECIATED COST (WRITTEN DOWN CURRENT COST)

(Source: CTW Financial Plan, March 2014)

The projected asset status (i.e. WDCC/CRC) over the planning horizon is shown in Figure 21.

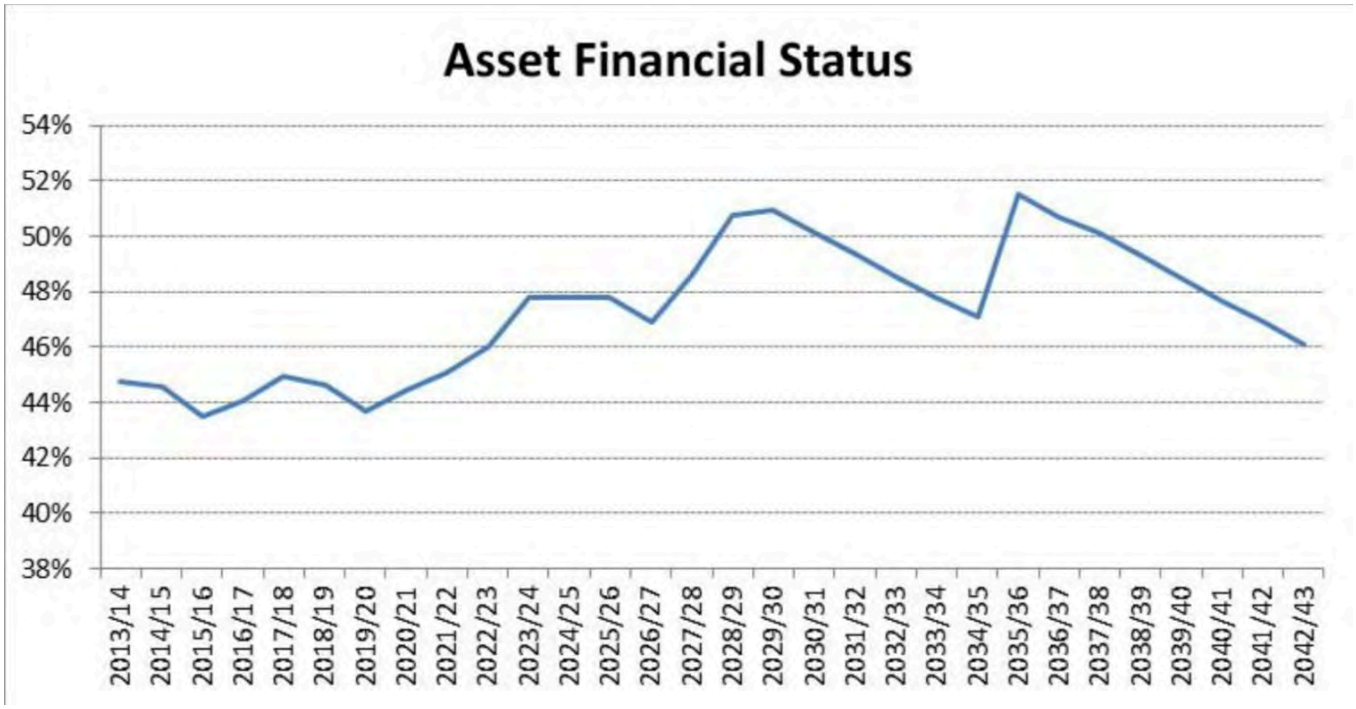


FIGURE 21: ASSET STATUS

The figure below also summarises the financial projections of water supply asset as states in CTW Financial Plans, March 2014.

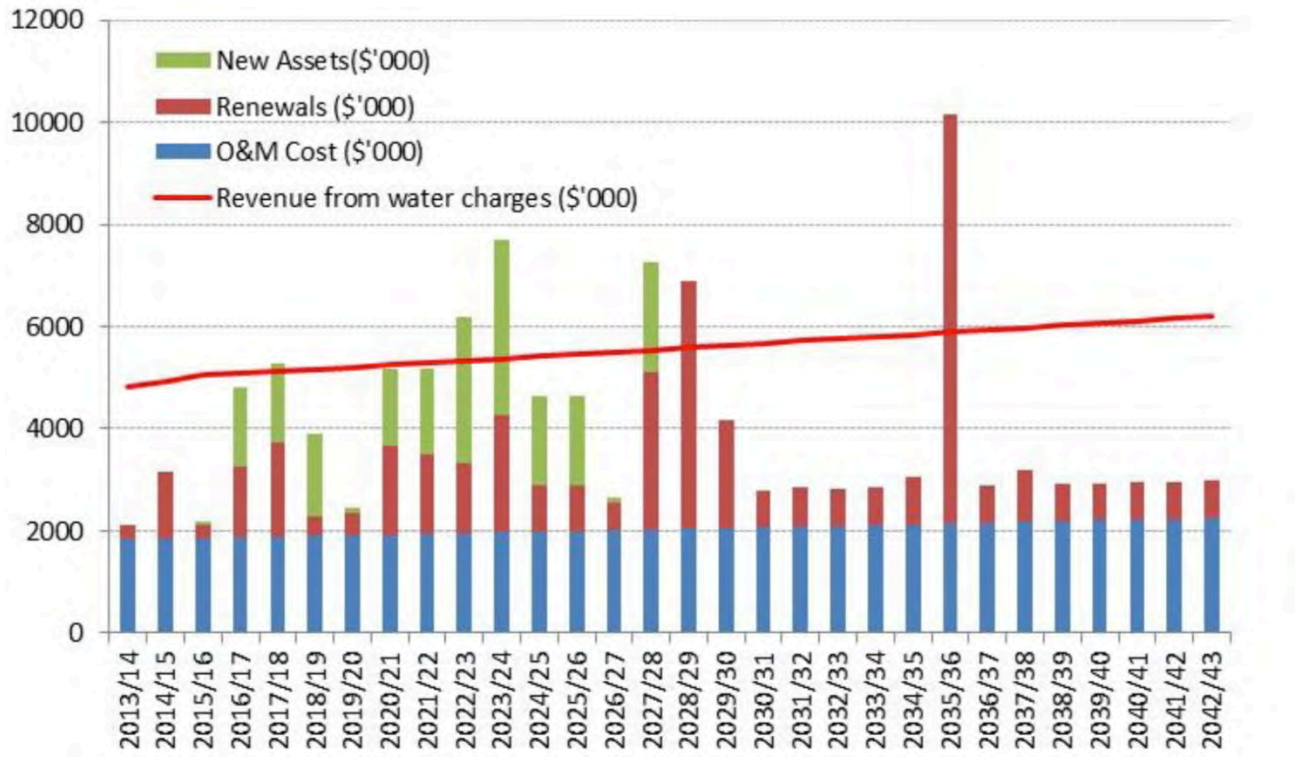


FIGURE 22: PROJECTED O&M, CAPITAL EXPENDITURE AND REVENUE FROM WATER CHARGES

(Source: CTW Financial Plan, March 2014)

According to the figure above, CTW has additional funding or loans requirement to implement the planned infrastructure in 2022/23, 2023/24, 2027/28, 2028/29 and 2035/36.

8.3 OPTIMISED LIFE CYCLE COSTS

8.3.1 DRIVERS FOR CAPITAL WORKS

As discussed previously, there is a trade-off between capital and recurrent cost. Typically, capital works will be initiated by one or more of the following reasons:

- Inability, or high risk, to meeting the levels of service, including:
  - Growth,whichmaycauseassetstooperatebeyondtheircapacity
  - Breakdownofcriticalassetsorsystems
  - Changingenvironmental,socialorregulatoryrequirements
  - Operatingand/ormaintenancecannotoperateassetseffectively,reliablyorsafely
- Cost optimisation: Cost of operation and maintenance exceeds the cost of replacing assets

8.3.2 NEW ASSETS

The framework for planning and design of major new assets, such as a treatment plant, a reservoir or a major pumping station includes life cycle cost optimisation of the asset or the system. Issues such as energy optimisation, automation and equipment redundancy are typically addressed as part of the project design.

CTW will continue to assess individual projects and systems before they are implemented in order to achieve minimum life cycle cost at acceptable reliability.

8.3.3 ASSET RENEWAL AND UPGRADE

Water supply infrastructure assets renewal selection is managed by the uses of Council's method of prioritising projects based on assets criticality (see Section 7.2) utilising available funds. This addresses the question of how capital works are required to meet the levels of service.

Where capital works are required to address cost optimisation, the decision of when to implement capital projects depends on the availability of cost data.

Determining the investment in cost optimisation can be initiated by one of two typical drivers:

- Optimisation projects: For example an energy audit or automation assessment throughout the organisation or for a specific system. This would result in identification of projects that have a positive financial impact, for example replacing inefficient motors. This type of project will identify the costs and benefits, and will be able to determine when the benefits exceed the cost
- Ongoing monitoring of maintenance costs of assets such as pumps or pipes: When the cost of replacing the assets is lower than the cost of continued maintenance, the asset should be replaced. For example, it may be appropriate to estimate the NPV of maintenance costs over the next 10 years, and compare it to the costs of asset replacement. This system should also identify the maintenance cost after replacement to ensure that only the additional cost is considered in the calculation

9 ASSET MANAGEMENT PRACTICES

9.1 INTRODUCTION

Asset management practices are combinations of processes, data, software and hardware applied to provide the essential outputs for effective asset management thereby reducing risks and optimising investment on assets.

In general computer based asset management information systems are used to store and analyse the significant quantities of asset data collected for asset management purposes.

The benefits of having good asset management practices will provide:

- A thorough assessment of current performance and future assets requirement
- An understanding of how the asset management system will interface with other Council practices such as financial practices
- The resources requirement (budgets and system specialists) to maintain suitable asset management systems.

9.2 ASSET MANAGEMENT SYSTEMS

CTW is in the process of developing databases to record maintenance accomplishments for the water supply assets. The database will be integrated with Geographic Information System (GIS) and provide live updates of spatial data integration.

CTW's financial section is responsible for keeping CTW financial asset register up to date. Entries and updates are applied based on capital expenditure. Council has an up to date asset register. The details of the existing asset register have been discussed in Section 7.1.2.

9.3 STANDARDS AND GUIDELINES

- SBP Guidelines, NSW Office of Water, July 2011
- NSW Division of Local Government's Integrated Planning and Reporting (IPR)
- International Infrastructure Management Manual,2006
- ISO 55001 Asset Management – Management systems - Requirements
- NSW Treasury Total Asset Management (TAM) policies

10 PLAN IMPROVEMENT

10.1 PLAN IMPROVEMENT

CTW will progress towards an advanced asset management plan through continuous cycles of review and improvements. CTW will use a robust asset management system to manage the assets. This will involve a number of steps:

- Establish prioritised system asset criticality actions
- Establish detailed operational plan components for critical systems to identify fit for purpose requirements
- Further develop detailed maintenance processes for planned and unplanned maintenance

The following section describes Council's actions on monitoring performance of the critical assets identified in Section 7.2.

10.2 PLAN REVIEW

The asset management system will be reviewed annually through the annual budget planning process. Its implementation and the asset performance will be audited every three years.

The Asset Plan will be formally reviewed every four years as part of the Strategic Business Planning or Integrated Water Cycle Management Strategy process.

10.3 PERFORMANCE MONITORING

Performance monitoring provides an indication of CTW water supply assets performance against the levels of service. The performance measurement procedures should be able to report the results against the targets in the future. The outcomes will support the decisions such as:

- Develop & implement effective operating procedures and training
- Develop & implement schedule maintenance programs
- Identify capital works requirement through assets replacement

Council will develop performance monitoring procedures/measures and reporting system for the most critical assets recognised in this report (see Table 15). The table below provides guidance for development of an asset performance and monitoring reporting system.

TABLE 21: PERFORMANCE MEASUREMENT OF CRITICAL WATER SUPPLY ASSETS						
Ref. Line No.1	**Asset Description**	**Performance Measure**	**Monitoring Frequency**	**Past Failure Results per Year**	**Target Unplanned**	**Comments**
1	Lake Rowlands Dam	• Frequency of water supply failure from dam	• Developquarterly progress report	None	2 times per year	
2	Blayney intake including intake pumps	• Pumps ability to supply peak day demand, 6 ML/d • Number of breakdowns occurred per year	• Daily visual and SCADA system monitoring and develop monthly progress reports	None	Not more than 24 hours duration, 4 times in one month	SCADA alarm system activates when any of the operational failures occurred in the pumping station
3	Raw water transmission main from Blayney intake to Blayney WTP (Trunk main 'X')	• Pumps ability to supply peak day demand, 6 ML/d • Number of breakdowns occurred per year	• Develop monthly progress reports	None	Not more than 24 hours duration, 4 times in one month	Note: Breakdown maintenance will be carried out as required
4	Blayney WTP	• Average duration of plant shutdown • Frequency of plant shutdown	• Daily monitoring and develop monthly progress report	None	Not more than 2 days duration, 2 per year	Note: SCADA alarm system activates when any of the following operational failures occurred in the treatment plant: • Power failure • Chlorinatorfailure • High turbidity or turbidity meter failure • Chemical dosing system failure • Fluoride plant failure
6	Chlorinator at Blayney WTP	• Number of events recorded for less than alert level of chlorine residual (1.0 mg/L) per month • Average duration of failure	• Daily monitoring and develop monthly progress report	None	1 per year	Note: The telemetry system chlorinator failure alarms are activated on due to: • Power failure • Residual chorine level is less than the target level • Chlorine leaks • Chlorinator malfunctioning
7	Gravity main from Blayney Clear Water Tank to Hill Street Reservoir	• Number of breakdowns occurred per year	• Monthly monitoring and develop quarterly reports	None	Not more than 24 hours duration, 4 times in one month	Note: Breakdown maintenance will be carryout
24	Gravity main from Lake Rowlands to Carcoar WTP (Trunk Main 'A')	• Number of breakdowns occurred per year	• Monthly monitoring and develop quarterly reports	None	Not more than 24 hours duration, 1 times in one month	Note: Breakdown maintenance will be carryout
25	Carcoar WTP	• Peak day supply 9 ML/day • Average duration of plant shutdown • Frequency of plant shutdown	• Daily monitoring and develop monthly progress report	None	Not more than 2 days duration, 2 per year	Note: SCADA alarm system activates when any of the following operational failures occurred in the treatment plant: • Power failure • Chlorinatorfailure • High turbidity or turbidity meter failure • Chemical dosing system failure • Fluorideplantfailure

TABLE 21: PERFORMANCE MEASUREMENT OF CRITICAL WATER SUPPLY ASSETS						
Ref. Line No.1	**Asset Description**	**Performance Measure**	**Monitoring Frequency**	**Past Failure Results per Year**	**Target Unplanned**	**Comments**
27	Chlorinator at Carcoar WTP	• Number of events recorded for less than alert level of chlorine residual (3.0 mg/L- summer, 2.0 mg/L - winter) per month • Average duration of failure	• Daily monitoring and develop monthly progress report	None	1 per year	Note: The telemetry system chlorinator failure alarms are activated on due to: • Power failure • Residual chorine level is less than the target level • Chlorine leaks • Chlorinator malfunctioning
57	Trunk main from Grays Hill Reservoir to Manildra Reservoir	• Number of breakdowns occurred per year	• Monthly monitoring and develop quarterly reports	None	Not more than 24 hours duration, 1 times in one month	Note: Breakdown maintenance will be carryout
81	Gooloogong Bore	• No. of failure events occurred supply peak day demand	• Monthly monitoring and develop quarterly progress report	None	Must be ready to operate when needed	Note: Poor electrical infrastructure leads to power outages during peak summer periods
83	Gooloogong chlorinator	• Number of events recorded for less than chlorine residual per month • Average duration of failure	• Monthly monitoring and develop quarterly progress report	None	Must be ready to op-erate when needed	Note: Manual operation system
84	Gooloogong pump station (PS)	• Pumps ability to supply peak day demand, 3 ML/d • Number of breakdowns occurred per year	• Monthly monitoring and develop quarterly progress repor	None	Must be ready to operate when needed	
85	Rising main from Gooloogong PS to Trunk main 'C'	• Number of breakdowns occurred per year	• Monthly monitoring and develop quarterly reports	None	Not more than 24 hours duration, 1 times in one month	Note: Breakdown maintenance will be carryout
96	Trunk main 'K'	• Number of breakdowns occurred per year	• Monthly monitoring and develop quarterly reports	None	Not more than 24 hours duration, 1 times in one month	Note: Breakdown maintenance will be carryout
97	McDonalds Lane PS	• Pumps ability to supply peak day demand, 2.6 ML/d • Number of breakdowns occurred per year	• Monthly monitoring and develop quarterly progress report	None	Must be ready to operate when needed	

Appendix A

CTW - List of Assets

CTW List of Assets – Pumping Stations					
Asset Name	Description	Construction Date	Asset Condition in 2017	Useful Life	Capacity
Lake Rowlands	Civil	1/7/66	Good	60 years	6.0 ML/d
	Mechanical	1/7/88	Good	40 years	132 kW
	Electrical	1/7/10	Good	30 years	
Browns Creek - Booster 2	Civil	25/5/2007	Very Good	50 years	0.8 ML/d
	Mechanical	25/5/2007	Very Good	25 years	30 kW
	Electrical	25/5/2007	Very Good	25 years	
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	
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 Well	Civil	30/6/1994	Good	50 years	No pump
	Mechanical	30/6/1994	Very Poor	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 - Booster 1	Civil	14/9/2002	Very Good	50 years	1.6 ML/d
	Mechanical	6/1/2015	Very Good	25 years	30 kW
	Electrical	14/9/2002	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	

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	
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	
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	
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	

CTW LIST OF ASSETS – RESERVOIRS

Asset Name	Description	Construction Date	Asset Condition in 2017	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	
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	30/6/1990	Good	40	
North Canowindra #1	Civil	30/6/1967	Good	100	0.09
	Roof	30/6/1989	Good	40	
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(Eastern)	Civil	1/1/1969	Good	100	0.136
	Roof	30/6/1989	Good	40	
Nyrang Creek #2 (Southern)	Civil	1/1/1969	Good	100	0.091
	Roof	30/6/1989	Good	40	
Nyrang Creek #3 Northern)	Civil	1/1/1969	Good	100	0.045
	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

CTW LIST OF ASSETS – TRUNK MAINS					
Asset Name	Description	Year of Construction	Asset Condition in 2017	Length	Diameter and material
Trunk Main A	Lake Rowlands to Carcoar WTP	1955	Good	4.7 km	375mm cast iron
Trunk Main B	Carcoar WTP to Mandurama reservoir	1955	Good	6.6 km	250mm cast iron
Trunk Main C	Manurama reservoir to Trunk Main K	1955	Good	20.1 km	200 - 225mm cast iron
		1955	Good / Fair	54.7 km	200 - 250mm steel
		1980-2015	Very Good	2.5 km	200mm uPVC, 300mm Polyethylene
Trunk Main D	Carcoar WTP to Browns Creek reservoir	1955	Good	20.3 km	200mm cast iron
Trunk Main E	Browns Creek reservoir to Hill St reservoir Blayney	1954	Good	3.2 km	150mm cast iron
Trunk Main F	Browns Creek Reservoir to Millthorpe	1954	Good	8.3 km	150mm cast iron
Trunk Main G	Trunk Main C to Lyndhurst	2007	Very Good	2.3 km	100mm uPVC
Trunk Main K	Trunk Main C to Grenfell West reservoir	1946	Good / Fair	38.4 km	200-225mm cast iron
		2005	Good / Fair	4.5 km	200mm ductile iron
		2002	Very Good	2.3 km	250mm uPVC
Trunk Main L	Trunk Main C to Eugowra	1980	Good	21.7 km	150mm AC
Trunk Main P	Trunk Main B to Somers Lane	1955	Fair	1.6 km	100mm AC
		1990	Very Good	1.8 km	100mm uPVC
Trunk Main Q	Quandialla bore to Quandialla town	2002	Very Good	16.4 km	100mm uPVC
Trunk Main U	Trunk Main C to Manildra	1957	Good	39.4 km	100 - 150mm cast iron
		1957	Good	2.2 km	100mm AC
		1957	Good	5.5 km	100mm steel
		2004	Very Good	12.7 km	150mm uPVC
Trunk Main V	Trunk Main C to Moorbel reservoir	1990	Very Good	4.1 km	200mm uPVC
Trunk Main X	Lake Rowlands to Hill St reservoir Blayney	1966	Good	20.2 km	300 - 375mm AC
		1966	Good	870 m	375mm cast iron

Appendix B

A List of Work Methods (WMS) and Existing Procedures

WMS No./Procedure No.	Item	Date
1	Meter Reading	
2	Meter Repairs	
3	Meter Replacement	
4	Water Main Construction	
5	Water Main Repair (Split Length)	
6	Water Main Repair (Repair Clamp)	
7	Installation of Stop Valves, Hydrants and Fittings	
8	Water Service Construction	
9	Water Service Replacement	
10	Water Service Repair	
11	Flushing And Purging of Water Mains	
12	Confined Spaces	
13	Filtration Plant Repairs/Maintenance - Carcoar	
14	Filtration Plant Repairs/Maintenance - Blayney	
15	Fencing	
16	Vegetation Control (Incl. Noxious Weeds) by Chemical Spraying	
17	Public Tours	
18	Daily Logs and Inspections (Water Filtration Plant)	
19	Reservoirs Cleaning	
20	Chlorine Changeover – (Water Filtration Plant)	
21	Fluoride Control (Water Filtration Plant)	
22	Laboratory Testing (Water Filtration Plant)	

WMS No./Procedure No.	Item	Date
23	Mowing & Ground Maintenance (Water Filtration Plant)	
24	Mowing & Ground Maintenance (Depots)	
25	Mowing & Ground Maintenance (Pump Stations/Reservoir Sites)	
26	Weekly Maintenance (Water Filtration Plant)	
27	Fortnightly Maintenance (Water Filtration Plant)	
28	Monthly Plant Maintenance (Water Filtration Plant)	
29	Booster Pump Station and Other Pump Stations Inspection (Water Filtration)	
30	Lake Rowlands Pump Station	
31	Booster Pump Stations	
32	Gooloogong Bore/Bangaroo Bore/Cudal Bore	
33	Water Sampling	
34	Laboratory Operations	
35	Laboratory Report of Results	
36	Electric Jack Hammer	
37	Wacker Vibrating Plate	
38	Concrete & Pipe Cutting Saw (Standard)	
39	Rigid Hydraulic Cutter	
40	Tapping Machine	
41	Pump (Petrol)	
42	Generators – Portable	
43	Oxy Acetylene Set	
44	Risk Management on Worksites	

WMS No./Procedure No.	Item	Date
45	Regulatory Sign	
46	Makita Drill	
47	Chain Saw	
48	Standard Back Pack Ba Unit	
49	Bearing Puller Kit	
50	Bench Grinder and Wire Buff	
51	225mm (9") Angle Grinder	
52	Workplace Safety Lead Testing Program	
53	Council Depots – Repairs and Maintenance Electrical	
54	Traffic Control	
55	Pressure Cleaner	
56	Fire Extinguishers	
57	Battery Charger	
58	Angle Grinder	
59	Chlorine Cylinder Change-Over	
60	Hazardous Substances	
61	Stores Operations	
62	Emergency Procedures	
63	Fire Protection	
64	Dust Control	
65	Excavation and Trenching	
66	Cutting Of Asbestos (AC) Cement Pipe	
67	Cutting, Handling and Disposal of Asbestos (AC) Cement Pipe	

WMS No./Procedure No.	Item	Date
68	Lake Rowlands	
69	Dangerous Goods	
70	Replacing a washer in a hydrant	
01	Trucks Safe Operating Procedure	15/06/2011
02	Brush Cutter/Line Trimmer Safe Operating Procedure	15/06/2011
03	Forklift Safe Operating Procedure	15/06/2011
04	Excavator Safe Operating Procedure	15/06/2011
05	Ride on Mower Safe Operating Procedure	15/06/2011
06	Chainsaw (Petrol)	15/06/2011
07	Fixed Air Compressor Safe Operating procedure	15/06/2011
08	Manual Metal Arc Welder Safe Operating procedure	15/06/2011
09	Oxy-Fuel Gas Welding Safe Operating procedure	15/06/2011
10	Bench Grinder Safe Operating procedure	15/06/2011
11	Spot Welder Safe Operating procedure	25/08/2010
12	Walk Behind Mower Safe Operating procedure	15/06/2011
13	Abrasive Cut Off Saw Safe Operating procedure	15/06/2011
14	Water Sampling Safe Operating Procedure	20/06/2014
15	Water Main Repairs Safe Operating Procedure	24/06/2014
16	Orion Dualstar Fluoride Meter Safe Operating Procedure	27/06/2014
17	Hach Spectrophotometer Dr2400	27/06/2014
18	Hach 2100n Turbidity Meter	27/06/2014
19	Hach Spectrophotometer Dr2400 – Total Iron	27/06/2014
20	Hach Spectrophotometer Dr2400 – Free Chlorine	27/06/2014

WMS No./Procedure No.	Item	Date
21	Hach Spectrophotometer Dr2400 – Total Chlorine	27/06/2014
22	Hach Spectrophotometer Dr2400 –Nitrate	27/06/2014
23	Hach Spectrophotometer Dr2400 –Aluminium	27/06/2014
24	Hach Spectrophotometer Dr2400 –Aluminium ECR	27/06/2014
25	Algae Count/Type Determination	27/06/2014
26	Orion 3 Star pH Meter - pH	27/06/2014
27	Hach Comparitor - Ammonia	27/06/2014
28	Hach Alkalinity Test Kit Model AL-AP MG/L	27/06/2014
29	Hach Chloride Test Kit Model 8-P	27/06/2014
30	Hach Spectrophotometer Dr2400 - Manganese	27/06/2014

Appendix C

CTW's Triggers and Stages Drought Supply Side Actions

Proposed Triggers for CTW	BOD Water Restriction Levels	Supply Actions
100% Bore Supply & 70% Lake Rowlands Storage Level	Level 1 Low	• Monitor all bore capacities • Monitor Lake Rowlands storage level.
100% Bore Supply & 60% Lake Rowlands Storage Level	Level 2 Moderate	• Review alternative groundwater supply options. • Review of water carting arrangement and infrastructure required to obtain water from other councils. • Monitor Lake Rowlands storage level and review infrastructure required to access 'dead' storage (900 ML).
100% Bore Supply & 50% Lake Rowlands Storage Level	Level 3 High	• Review of alternative groundwater supply options and their capacities. • Review and inspection of water carting infrastructure. • Review strategies to access 'dead' storage in Lake Rowlands.
100% Bore Supply & 40% Lake Rowlands Storage Level	Level 4 Very High	• Ensure of water carters are available and contracts are ready to operate. • Prepare water carting operation systems. • Contact NSW Office of Water to notify the water supply situation & ensure funding for water carting available. • Perform design and if possible trial implementation process to ensure operability of Lake Rowlands "dead" storage access system. • Inquire and verify the availability of water supply from alternative water sources.
100% Bore Supply & 35% Lake Rowlands Storage Level	Level 5 Extreme	• Request for the NSW Office of Water to commence support on water carting subsidy. • Inquire and verify the availability of water supply from water carting locations. • Complete construction of infrastructure for accessing 'dead' storage in Lake Rowlands.
100% Bore Supply & 30% Lake Rowlands Storage Level	Level 6 Critical	• Commence water carting. • Access Lake Rowlands "dead" storage for emergency only.

Note: *CTW has permanent Level 1 water restrictions as a demand management measure.

Appendix D

CTW's Drought Demand Side Actions

Note: where "Not permitted" is shown in the table below, this should read unless stated as "at Council's discretion".

REGIONAL SYSTEM OF WATER RESTRICTIONS for BATHURST, ORANGE, DUBBO - May 2009 Review						
	WATER RESTRICTIONS					
ACTIVITY	LEVEL 1 LOW	LEVEL 2 MODERATE	LEVEL 3 HIGH	LEVEL 4 VERY HIGH	LEVEL 5 EXTREME	LEVEL 6 CRITICAL
RESIDENTIAL WATER USE						
TARGET WATER CONSUMPTION	**260 litres/ person/day**	**240 litres/ person/day**	**220litres/ person/day**	**200 litres/ person/day**	**160 litres/ person/day**	**120 litres/person/ day**
Watering of Lawns **Note: Subject to varying Summer and Winter Times**	Watering systems, microsprays, drip systems, soaker hoses, non-fixed sprinklers, hand-held hoses only. Summer Time between 1800-0900 hrs only daily. Winter Time 0600- 1000 hrs and 1600- 2200 hrs daily.	Watering systems, non-fixed sprinklers, hand held hoses, microsprays, drip systems, soaker hoses, only. Summer Time between 0600-0900 hrs and between 1800-2100 hrs every second day as per odds and evens system. Winter Time between 0700- 1000 hrs and between 1600-1900 hrs every second day as per odds and evens system.	Watering systems, non fixed sprinklers, hand held hoses not permitted at any time. Microsprays, drip systems, soaker hoses, only. Summer Time between 0600-0900 hrs and between 1800-2100 hrs every second day as per odds and evens system. Winter Time between 0700-1000 hrs and between 1600-1900 hrs every second day as per odds and evens system.	Not permitted	Not permitted	Not permitted

REGIONAL SYSTEM OF WATER RESTRICTIONS for BATHURST, ORANGE, DUBBO - May 2009 Review						
	WATER RESTRICTIONS					
ACTIVITY	LEVEL 1 LOW	LEVEL 2 MODERATE	LEVEL 3 HIGH	LEVEL 4 VERY HIGH	LEVEL 5 EXTREME	LEVEL 6 CRITICAL
RESIDENTIAL WATER USE						
Watering of Residential Gardens: **Subject to varying Summer and Winter times**	Watering systems, microsprays, drip systems, soaker hoses, non fixed sprinklers, and hand held hoses only. Summer Time between 1800-0900 hrs only daily. Winter Time 0600- 1000 hrs and 1600- 2200 hrs daily.	Watering systems, non fixed sprinklers, hand held hoses, microsprays, drip systems, soaker hoses, only. Summer Time between 0600-0900 hrs and between 1800-2100 hrs every second day as per odds and evens system. Winter Time between 0700 - 1000 hrs and between 1600-1900 hrs every second day as per odds and evens system.	Watering systems, non fixed sprinklers, hand held hoses not permitted at any time. Microsprays, drip systems, soaker hoses, only. Summer Time between 0600-0900 hrs and between 1800-2100 hrs every second day as per odds and evens system. Winter Time between 0700 - 1000 hrs and between 1600-1900 hrs every second day as per odds and evens system.	Watering systems, non fixed sprinklers, hand held hoses not permitted at any time. Microsprays, drip systems, soaker hoses, only. Summer Time between 1800-2000 hrs only on each Wednesday and Sunday. Winter Time 1600-1800 hrs on each Wednesday and Sunday.	Watering systems, non fixed sprinklers, hand held hoses, microsprays, drip systems, soaker hoses, not permitted at any time. Bucket / watering can watering only. Summer Time between 1800-2000 hrs on Sunday only. Winter Time between 1300-1500 hrs on Sunday only.	Not permitted
Topping up, filling garden water features	Permitted	Permitted	Permitted	Permitted	Not to be topped up or filled.	Not to be topped up or filled.

REGIONAL SYSTEM OF WATER RESTRICTIONS for BATHURST, ORANGE, DUBBO - May 2009 Review						
	WATER RESTRICTIONS					
ACTIVITY	LEVEL 1 LOW	LEVEL 2 MODERATE	LEVEL 3 HIGH	LEVEL 4 VERY HIGH	LEVEL 5 EXTREME	LEVEL 6 CRITICAL
RESIDENTIAL WATER USE						
Irrigation of new turf	Permitted for one week after laying after which level 1 restriction on watering lawns applies	Permitted for one week after laying after which level 2 restriction on watering lawns applies	Permitted for one week after laying after which level 3 restriction on watering lawns applies	Not permitted.	Not permitted.	Not permitted
Washing down walls or paved surfaces	Not permitted	Not permitted	Not permitted	Not permitted	Not permitted	Not permitted
Topping up private swimming pools/spas	Permitted	Only between hours of 0700-0900 and between 1800-2000 hrs, every day.	Only between hours of 0700-0900 and between 1800- 2000 hrs, every day provided pool covers are used	Only between hours of 0700-0900 and between 1800-2000 hrs, every day. Pool covers must be used.	Not permitted	Not permitted
First fill of private swimming pools	Permitted	Only between hours of 0700-0900 and between 1800-2000 hrs, every day	Only with Council permission and provided pool covers are used.	Only with Council permission and after water savings elsewhere within property. Covers must be used.	Not permitted	Not permitted
Washing cars at home	Permitted with bucket and rinse with trigger hose on lawn at any time.	Permitted with bucket and rinse with trigger hose on lawn between 0900- 1200 hrs any day.	Permitted with bucket only on lawn between 0900- 1200 hrs any day.	Permitted with bucket only on lawn between 0900-1200 hrs any day.	Not permitted	Not permitted
Baths, showers	Permitted	Permitted	Permitted	Five (5) minute showers, one bath per person per day	Three (3) minute showers, one bath (100 mm depth) per person per day	Three (3) minute showers, one bath (100 mm depth) per person per day
Washing of clothes	Permitted	Permitted	Full loads only encouraged.	Full loads only permitted.	Full loads only permitted.	Two full loads of clothes per week
Use of evaporative air conditioners	Permitted	Permitted	Permitted	Permitted only 0700- 2400 hrs daily	Permitted only 0700- 2400 hrs daily, exemptions may be granted to aged accommo-dation or nursing homes.	Permitted only 1800- 2200 hrs daily, exemptions may be granted to aged accommodation or nursing homes.
Inflatable or temporary children pools	Permitted	Permitted	Permitted	Permitted	Not Permitted	Not Permitted

REGIONAL SYSTEM OF WATER RESTRICTIONS for BATHURST, ORANGE, DUBBO - May 2009 Review						
	WATER RESTRICTIONS					
	LEVEL 1 LOW	LEVEL 2 MODERATE	LEVEL 3 HIGH	LEVEL 4 VERY HIGH	LEVEL 5 EXTREME	LEVEL 6 CRITICAL
ACTIVITY	**NON RESIDENTIAL WATER USE**					
Watering of Lawns **Note: Subject to varying Summer and Winter Times**	Watering systems, microsprays, drip systems, soaker hoses, non fixed sprinklers, and hand held hoses only. Summer Time between 1800-0900 hrs only daily. Winter Time 0600- 1000 hrs and 1600- 2200 hrs daily.	Watering systems, non-fixed sprinklers, hand held hoses, microsprays, drip systems, soaker hoses, only. Summer Time between 0600-0900 hrs and between 1800-2100 hrs every second day as per odds and evens system. Winter Time between 0700- 1000 hrs and between 1600-1900 hrs every second day as per odds and evens system.	Watering systems, non fixed sprinklers, hand held hoses not permitted at any time. Microsprays, drip systems, soaker hoses, only. Summer Time between 0600-0900 hrs and between 1800-2100 hrs every second day as per odds and evens system. Winter Time between 0700- 1000 hrs and between 1600-1900 hrs every second day as per odds and evens system.	Not permitted	Not permitted.	Not permitted
Watering of Gardens **Note: Subject to varying Summer and Winter times**	Watering systems, microsprays, drip systems, soaker hoses, non fixed sprinklers, hand held hoses only. Summer Time between 1800-0900 hrs only daily. Winter Time 0600- 1000 hrs and 1600- 2200 hrs daily.	Watering systems, non fixed sprinklers, hand held hoses, microsprays, drip systems, soaker hoses, only. Summer Time between 0600-0900 hrs and between 1800-2100 hrs every second day as per odds and evens system. Winter Time between 0700- 1000 hrs and between 1600-1900 hrs every second day as per odds and evens system.	Watering systems, non fixed sprinklers, hand held hoses not permitted at any time. Microsprays, drip systems, soaker hoses, only. Summer Time between 0600-0900 hrs and between 1800-2100 hrs every second day as per odds and evens system. Winter Time between 0700- 1000 hrs and between 1600-1900 hrs every second day as per odds and evens system.	Watering systems, non fixed sprinklers, hand held hoses not permitted at any time. Microsprays, drip systems, soaker hoses, only. Summer Time between 1800-2000 hrs only on each Wednesday and Sunday. Winter Time 1600-1800 hrs on each Wednesday and Sunday.	Watering systems, non fixed sprinklers, hand held hoses, microsprays, drip systems, soaker hoses, not permitted at any time. Bucket / watering can watering only. Summer Time between 1800-2000 hrs on Sunday only. Winter Time between 1300-1500 hrs on Sunday only.	Not permitted

REGIONAL SYSTEM OF WATER RESTRICTIONS for BATHURST, ORANGE, DUBBO - May 2009 Review						
	WATER RESTRICTIONS					
	LEVEL 1 LOW	LEVEL 2 MODERATE	LEVEL 3 HIGH	LEVEL 4 VERY HIGH	LEVEL 5 EXTREME	LEVEL 6 CRITICAL
ACTIVITY	**NON RESIDENTIAL WATER USE**					
Topping up public swimming pools/spas, including those in motels etc	Permitted	Only between of 0700-0900 and between 1800-2000 hrs, every day.	Only between hours of 0700-0900 and between 1800- 2000 hrs, every day provided pool covers are used	Only between hours of 0700-0900 and between 1800-2000 hrs, every day. Pool covers must be used.	Not permitted.	Not permitted
First fill of public swimming pools/spas, including those in motels etc.	Permitted	Only between hours of 0700-0900 and between 1800-2000 hrs, every day	Only with Council permission	Only with Council permission and after water savings elsewhere within property. Covers must be used.	Not permitted.	Not permitted
Turf farm irrigation, market gardens	Permitted	Permitted	Irrigation only between 2000-0800 hrs. Business must prepare WSAP.	Business must implement and comply with WSAP	Not permitted.	Not permitted.
Irrigation of new turf on non-residential premises	Permitted for one week after laying after which level 1 restriction on watering lawns applies	Permitted for one week after laying after which level 2 restriction on watering lawns applies	Permitted for one week after laying after which level 3 restriction on watering lawns applies	Not permitted.	Not permitted.	Not permitted.
Public car and truck wash facilities	Permitted	Permitted	Permitted, but business must prepare WSAP.	Business must implement and comply with WSAP	Business must implement and comply with WSAP	Not permitted.
Construction industry e.g. mortar or concrete mix	Permitted	Permitted	Permitted	Permitted	Permitted	Not permitted.
Construction - wash down, paint prep, curing.	Permitted	Permitted	Permitted, but business must prepare WSAP.	Business must implement and comply with WSAP	Business must implement and comply with WSAP	Not permitted.
Cleaning - exterior	Permitted with trigger hoses, any time.	Permitted with pressure trigger hoses, any time.	Permitted with pressure trigger hoses. Business must prepare WSAP.	Business must implement and comply with WSAP	Business must implement and comply with WSAP	Not permitted.
Commercial or Government nurseries	Permitted.	Permitted.	Permitted, but business must prepare WSAP.	Business must implement and comply with WSAP	Business must implement and comply with WSAP	Not permitted.
Abattoirs	Permitted.	Permitted.	Permitted, but business must prepare WSAP	Business must implement and comply with WSAP.	Business must implement and comply with WSAP.	Not permitted.

REGIONAL SYSTEM OF WATER RESTRICTIONS for BATHURST, ORANGE, DUBBO - May 2009 Review						
	WATER RESTRICTIONS					
	LEVEL 1 LOW	LEVEL 2 MODERATE	LEVEL 3 HIGH	LEVEL 4 VERY HIGH	LEVEL 5 EXTREME	LEVEL 6 CRITICAL
ACTIVITY	**NON RESIDENTIAL WATER USE**					
Food or pet food production	Permitted	Permitted	Permitted, but business must prepare WSAP.	Business must implement and comply with WSAP.	Business must implement and comply with WSAP.	Not permitted
Canneries	Permitted	Permitted	Permitted, but business must prepare WSAP.	Business must implement and comply with WSAP.	Business must implement and comply with WSAP.	Not permitted
Pet care	Permitted	Permitted	Permitted, but business must prepare WSAP.	Business must implement and comply with WSAP	Business must implement and comply with WSAP	Business must implement and comply with WSAP
Public water features	Permitted	Permitted	Permitted, but WSAP must be prepared.	WSAP must be implemented.	WSAP must be implemented.	Not permitted.
Child care	Permitted	Permitted	Permitted, but business must prepare WSAP.	Business must implement and comply with WSAP	Business must implement and comply with WSAP	Business must implement and comply with WSAP.
Public parks, gardens, aviaries, plant houses, zoos	Permitted	Permitted	Permitted, but business must prepare WSAP.	Business must implement and comply with WSAP	Business must implement and comply with WSAP	Not permitted.
Schools, technical colleges, colleges, universities	Permitted	Permitted	Permitted, but business must prepare WSAP.	Business must implement and comply with WSAP	Business must implement and comply with WSAP	Not permitted.
Hospitals, hospices, nursing homes, rehab centres	Permitted	Permitted	Permitted, but business must prepare WSAP.	Business must implement and comply with WSAP	Business must implement and comply with WSAP	Business must implement and comply with WSAP
Aged accommodation	Permitted.	Permitted.	Permitted, but business must prepare WSAP.	Business must implement and comply with WSAP	Business must implement and comply with WSAP	Business must implement and comply with WSAP
Motels, caravan parks, cabins	Permitted.	Permitted.	Permitted, but business must prepare WSAP	Business must implement and comply with WSAP.	Business must implement and comply with WSAP.	Not permitted.
Hotels, registered clubs	Permitted.	Permitted.	Permitted, but business must prepare WSAP	Business must implement and comply with WSAP.	Business must implement and comply with WSAP.	Not permitted.
Businesses with cooling towers	Permitted.	Permitted.	Permitted, but business must prepare WSAP	Business must implement and comply with WSAP.	Business must implement and comply with WSAP.	Not permitted.

NOTES:

ODDS & EVENS SYSTEM EXPLAINED

- This means that if the street number of your property is odd you can water in accordance with the restrictions on odd days.
- If your property has an even number you can water in accordance with the restrictions on even days.
- If your property has a range of street numbers then it should be treated as odd or even as per the first number in the range. For example if your property is 12-15 Smith Street then you can water on even days in accordance with the restrictions.
- If your property has no street number then it should be treated as an even property. For example if your property is "Tara" then you can water on even days in accordance with the restrictions.

OTHER SOURCES OF WATER

These restrictions are restrictions that Council is placing on the use of its potable water supply. If the restrictions say "Not permitted" for a particular use, this means that Council's potable water supply cannot be used for this purpose. Water from another source, however, could be used for this purpose.

TIMES

The times quoted in the restrictions are based on a 24 hour clock. For example, if the restrictions state 2200 hrs it is equivalent to 10 pm.

- Summer Time - refers to Daylight Saving period 2.00am Eastern Standard Time first Sunday in October to Eastern Daylight Saving Time 3.00am first Sunday in April
- Winter Time - refers to the period outside of Daylight Saving Time

WSAP

This refers to a Water Savings Action Plan, an enterprise specific plan to adopt water efficiency prepared in accordance with "Guidelines for Water Savings Action Plans", NSW Office of Water, October 2005. A copy of this document is now available from NSW Office of Water.

Further water restrictions may permit the continued use of water for that activity

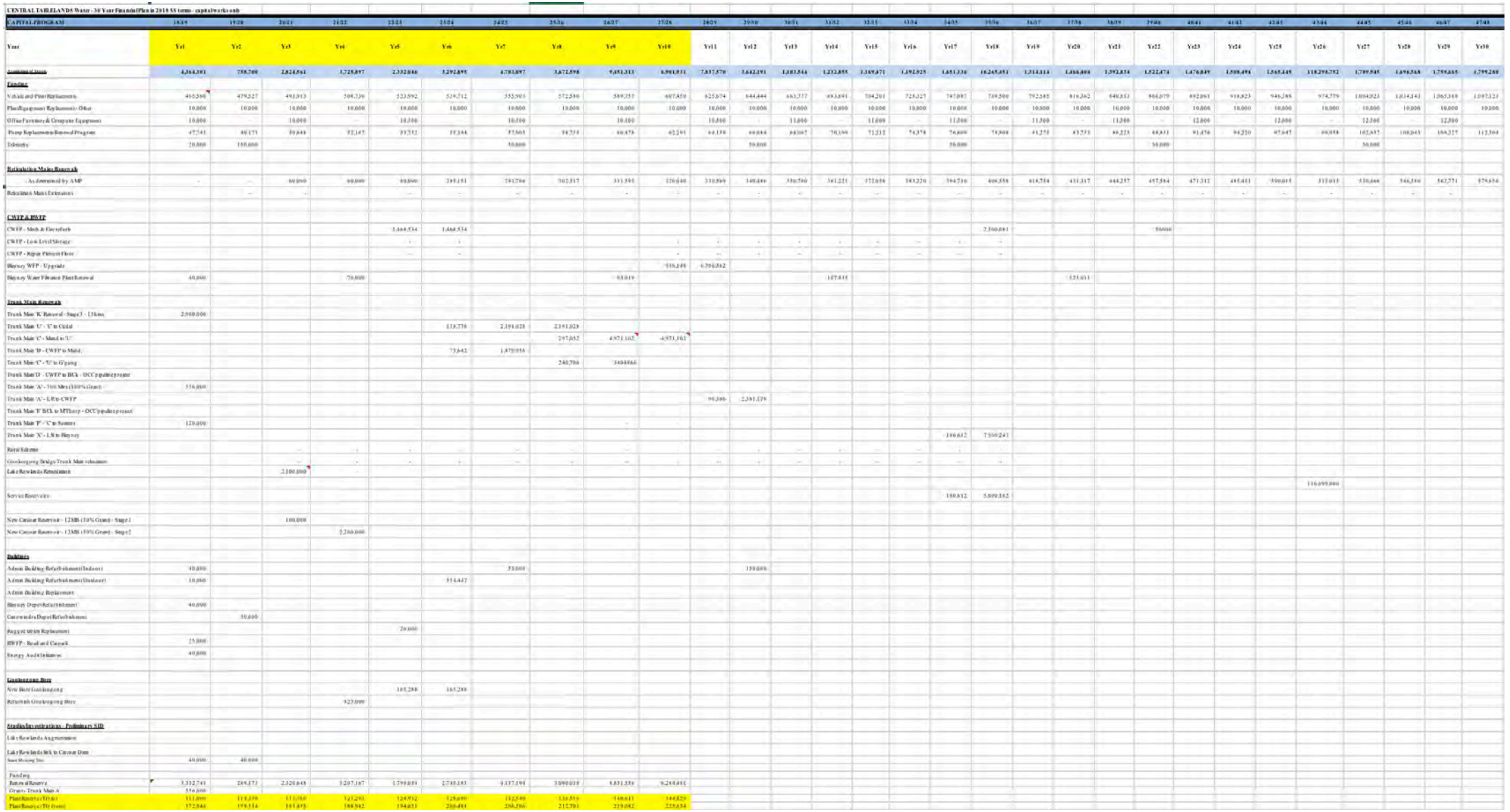
At certain levels of restrictions a business may be required to prepare a WSAP. The completed WSAP but only if the business strictly complies with its approved WSAP.

DEFINITIONS

- A watering system is any automated system for the watering of lawns by any means.
- A microspray irrigation system may be a manual or automatic lawn irrigation system that uses small sprays known as microsprays to irrigate lawn or gardens.
- A drip system is a surface or subsurface, manual or automatic system that uses a dripper or emitter to water lawn or gardens.
- A soaker hose is a fixed or moveable hose with a series of small openings to water lawn or gardens.
- A non fixed sprinkler is an above ground sprinkler that is attached to and supplied with water from a hose or similar used, automatically or manually, with or without a timer, to irrigate lawn or gardens.

Appendix E

30 years Capital Works Program (updated in April 2018)



CENTRAL TABLELANDS Water - 30 Year Financial Plan in 2018 $$ terms - capital works only

CAPITAL PROGRAM	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29	29/30	30/31	31/32	32/33	33/34	34/35	35/36	36/37	37/38	38/39	39/40	40/41	41/42	42/43	43/44	44/45	45/46	46/47	47/48
Year	Yr1	Yr2	Yr3	Yr4	Yr5	Yr6	Yr7	Yr8	Yr9	Yr10	Yr11	Yr12	Yr13	Yr14	Yr15	Yr16	Yr17	Yr18	Yr19	Yr20	Yr21	Yr22	Yr23	Yr24	Yr25	Yr26	Yr27	Yr28	Yr29	Yr30
Annual totals	4,364,281	758,709	2,824,561	3,725,897	2,332,046	3,292,895	4,783,897	3,672,598	9,451,313	6,991,931	7,837,570	3,642,191	3,183,544	3,232,855	3,369,871	3,192,925	3,651,330	16,265,851	3,314,314	3,066,898	3,292,834	3,522,474	3,470,849	3,598,494	3,565,349	118,298,752	3,789,945	3,698,568	3,759,865	3,799,289
Funding																														
Vehicle and Plant Replacements	465,590	479,527	493,913	508,730	523,992	539,712	555,903	572,580	589,757	607,450	625,674	644,444	663,777	683,691	704,201	725,327	747,087	769,500	792,585	816,362	840,853	866,079	892,063	918,823	946,388	974,779	1,004,023	1,034,143	1,065,168	1,097,123
Plant Equipment Replacements - Other	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
Office Furniture & Computer Equipment	10,000		10,000		10,000		10,000		10,000		10,000		11,000		11,000		11,000		11,000		11,000		12,000		12,000		12,000		12,000	
Pump Replacements Renewal Program	47,741	49,173	50,648	52,167	53,732	55,344	57,005	58,715	60,476	62,291	64,159	66,084	68,067	70,109	72,212	74,378	76,609	78,908	81,275	83,713	86,224	88,811	91,476	94,220	97,047	99,958	102,957	106,045	109,227	112,504
Telemetry	20,000	160,000				50,000						50,000					50,000					50,000					50,000			
Refurbishing Mains Renewals																														
- As determined by AMP	-	-	60,000	60,000	60,000	240,151	291,706	302,517	311,593	320,940	330,569	340,486	350,700	361,221	372,058	383,220	394,716	406,558	418,754	431,317	444,257	457,584	471,312	485,451	500,015	515,015	530,466	546,380	562,771	579,654
Relocations Mains Extensions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CWTP & BWTP																														
CWTP - Mech & Electrical					3,466,534	3,466,534												2,300,041				500,000								
CWTP - Low Level Storage					-	-				-	-	-	-	-	-	-	-	-												
CWTP - Repair Plenum Floor					-	-				-	-	-	-	-	-	-	-	-												
Bayway WFP - Upgrade										935,149	6,796,862																			
Bayway Water Filtration Plant Renewal	40,000			70,000					93,819					107,815						121,011										
Trunk Main Renewals																														
Trunk Main 'K' Renewal - Stage3 - 13kms	2,900,000																													
Trunk Main 'U' - 'C' to Cliffd						138,776	2,191,923	2,191,923																						
Trunk Main 'C' - Mand to 'U'								297,852	4,971,102	4,971,103																				
Trunk Main 'D' - CWTP to Mand.						73,842	1,479,056																							
Trunk Main 'C' - 'U' to G'gong								240,706	3,404,666																					
Trunk Main D - CWTP to BCL - OCC pipeline project																														
Trunk Main 'A' - 300 Mm (100% Grant)	556,000																													
Trunk Main 'A' - L/R to CWTP											90,306	2,391,179																		
Trunk Main 'F' BCL to MThorp - OCC pipeline project																														
Trunk Main 'F' - 'C' to Somers	120,000								-	-																				
Trunk Main 'X' - L/R to Bayway																	150,612	7,500,241												
Rural Schemes			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-												
Goulburgong Bridge Trunk Main relocation			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-												
Lake Rowlands Rehabilitation			2,100,000																											
Service Reservoirs																	150,612	5,899,162								116,099,000				
New Canvar Reservoir - 12MB (30% Grant) - Stage1			100,000																											
New Canvar Reservoir - 12MB (30% Grant) - Stage2				2,260,000																										
Buildings																														
Admin Building Refurbishment (Indoor)	40,000						53,000					159,000																		
Admin Building Refurbishment (Outdoor)	10,000					514,447																								
Admin Building Replacement																														
Bayway Depot Refurbishment	40,000																													
Canowindra Depot Refurbishment		50,000																												
Buggesi Shed Replacement					20,000																									
BWTP - Road and Carpark	25,000																													
Energy Audit Initiatives	40,000																													
Goulburgong Bore																														
New Bore Goulburgong					165,288	165,288																								
Refurbish Goulburgong Bore				923,000																										
Studies/Investigations - Preliminary SID																														
Lake Rowlands Augmentation																														
Lake Rowlands link to Canowar Dam																														
Asset Mgmt Sys	40,000	40,000																												
Funding																														
Renewal Reserve	3,332,741	289,173	2,320,648	3,207,187	1,799,889	2,740,183	4,137,494	3,090,018	8,831,550	6,248,891																				
Grant - Trunk Main A	556,000																													
Plant Reserve (TO &E)	111,000	114,330	117,760	121,293	124,932	128,680	132,540	136,516	140,611	144,829																				
Plant Reserve (Trucks)	172,540	198,114	161,693	188,582	194,633	260,481	266,396	212,701	239,082	228,654																				

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