

SAFE AND SECURE WATER PROGRAM

UPGRADE OF MENDOORAN WATER TREATMENT WORKS

BUSINESS CASE

WARRUMBUNGLA SHIRE COUNCIL
DRAFT
April 2021

KEY PROPOSAL DETAILS

PROPOSAL INFORMATION	
Proposal name	Mendooran Water Treatment Works
Lead proponent (e.g. Council)	Warrumbungle Shire Council
Lead proponent ABN	63 348 671 239
Proposal partners	-
LEAD CONTACT	
Name	Cornelia Wiebels
Position	Manager Warrumbungle Water
Phone	02 6378 5015
Email	Cornelia.Wiebels@warrumbungle.nsw.gov.au
Fax	
Address	59 Binnia Street, Coolah NSW 2843
PROPOSAL SCOPE	
Proposal summary for publication <i>Please provide 150 words or less</i>	Upgrades to the Mendooran Water Treatment Plant to address water quality issues and ensure water meets requirements of the ADWG. Upgrades include: <ul style="list-style-type: none"> • Improvements to disinfection processes (addition of UV unit, replacement of sodium hypochlorite system with chlorine gas system and redesign of the chlorine dosing system at the Coolabah reservoir site). • Operational improvements to the chemical dosing systems (reconfiguration of the potassium permanganate and polyaluminium chloride dosing). • Process control improvements (control and automation system improvements with the addition of remote alarming capabilities, installation of online instrumentation and feedback control to SCADA/PLC). • Installation of an inline booster pump to facilitate mains flushing. The upgrades seek to address design issues which impact on plant automation and efficacy of the treatment barrier.
PROPOSAL LOCATION	
Proposal address	Daglish St, Mendooran DP 1076077
Local government area	Warrumbungle Shire
NSW electorate	Barwon
Federal electorate	Parkes
SUPPORTING INFORMATION	
Attachments <i>Please list out all supporting information provided</i>	Attachment 1 – CWT, 2020a, <i>Mendooran WTP Site Constraint and Hazard Review Report</i> Attachment 2 – CWT, 2020b, <i>Mendooran WTP Project Risk Management Plan</i> Attachment 3 – CWT, 2020c <i>The Mendooran WTP Design Basis and Options Assessment Report</i> Attachment 4 – CWT, 2020d, <i>Mendooran WTP Upgrades Concept Design</i> Attachment 5 – CWT, 2020e, <i>Mendooran Technical Specification for Mendooran WTP</i> Attachment 6 – Hydrosphere Consulting, 2019a, <i>IWCM Issues Paper and Background information</i> Attachment 7 – HunterH2O, 2020, <i>Warrumbungle Shire Council WTP Automation and Process Instrumentation Audit</i> Attachment 8 – CWT, 2020f, <i>Mendooran WTP Upgrade Cost Estimates</i> Attachment 9 – Project timeline (Gantt Chart)

DOCUMENT INFORMATION

Document Summary Information	
Version	1.0
Version Release Date	7 April 2021
Document Security	

Document History			
Version	Amendment	Amendment Date	Amended by
1.0	Draft for Council review	6 April 2021	Kate Menzies, Robyn Campbell

CONTENTS

1	EXECUTIVE SUMMARY	5
2	CASE FOR CHANGE	6
2.1	BACKGROUND	6
2.2	RATIONALE FOR INVESTMENT	11
2.3	STRATEGIC ALIGNMENT	15
2.4	EXPECTED OUTCOMES	17
2.5	STAKEHOLDER & COMMUNITY SUPPORT	18
3	ANALYSIS OF THE PROPOSAL	20
3.1	OBJECTIVES & INDICATORS	20
3.2	THE BASE CASE	20
3.3	OTHER OPTIONS CONSIDERED	20
3.4	INFORMATION ABOUT THE PROPOSAL	21
3.5	PROJECTED COSTS	25
3.6	COST-BENEFIT ANALYSIS	26
3.7	FINANCIAL APPRAISAL	26
3.8	PROPOSED FUNDING ARRANGEMENTS	27
4	IMPLEMENTATION CASE	29
4.1	PROGRAM & MILESTONES	29
4.2	GOVERNANCE	30
4.3	KEY RISKS	30
4.4	LEGISLATIVE, REGULATORY ISSUES & APPROVALS	32
4.5	PROPOSED MANAGEMENT ACTIVITIES	33

1 EXECUTIVE SUMMARY

Mendooran is a small town in the Warrumbungle Shire located approximately 63 km south of Coonabarabran and 300 km northwest of Sydney. Warrumbungle Shire Council (WSC) owns and operates the Mendooran Water Treatment Plant (WTP), a conventional WTP which has a capacity of 1 ML/d and delivers treated water to approximately 227 connected properties in Mendooran and the neighbouring Coolabah Estate (Hydrosphere Consulting, 2019b). The Mendooran WTP can source raw water from a shallow river well, a backup bore, an emergency bore or a river pumping station (CWT, 2020d).

The WTP was constructed in 2009 but was never properly commissioned and has inherent operational performance issues. It is not uncommon that treated water produced by the plant exceeds the Australian Drinking Water Guidelines (ADWG) and between June and July 2017 a boiled water alert was issued for Mendooran due to the detection of *Escherichia coli* (*E. coli*) (Hydrosphere Consulting, 2019a).

In the eight-year period between 2002 and 2010, drought restrictions were in place for 7.5 years with 2 years being on level 2 or greater. Two additional bores and a second well were constructed and connected to the WTP to improve water security. In December 2018 algal blooms formed in the sedimentation lagoon which led to a filter break-through and elevated turbidity levels. This was found to be caused by elevated phosphorus levels in the water sourced from the backup bore and the bore water was unusable during this period. The town was subsequently placed on level 5 restrictions on the 10th of January 2019 and increased to level 6 restrictions on the 29th of January 2019 for 60 days (Hydrosphere Consulting, 2019a).

WSC is seeking funding assistance for the design and construction of upgrades to the Mendooran WTP to improve process efficacy and control, allow raw water from several sources to be blended before entering the treatment plant and ensure adequate disinfection is achieved.

2 CASE FOR CHANGE

2.1 BACKGROUND

2.1.1 Introduction

Mendooran is small town in the Warrumbungle Shire located approximately 63 km south of Coonabarabran and 300 km north-west of Sydney. Warrumbungle Shire Council (WSC) owns and operates the Mendooran Water Treatment Plant (WTP), a conventional WTP which has a capacity of 1 ML/d and delivers treated water to approximately 227 connected properties in Mendooran and the neighbouring Coolabah Estate (Hydrosphere Consulting, 2019b).

The Mendooran WTP can source raw water from the following sources (CWT, 2020d) (refer Figure 2-1):

- A shallow river well on the bed of the Castlereagh River (Castlereagh riverbed well and pumps) adjacent to the town which can draw water at 14.5 L/s subject to river flows.
- A backup bore located adjacent to the Castlereagh River 20 m downstream of the river well is used in dry times and provides approximately 4 L/s.
- An emergency onsite WTP bore is available for emergency use which can provide 0.8 L/s.
- The old river pump station, which was connected to the rising main leading to the WTP in October 2020 and can supply water at 12-14.5 L/s (pump with variable speed drive) subject to river flows.

The existing WTP consists of the following treatment processes (CWT, 2020c) as depicted in (Figure 2-2):

- Cascade aeration.
- Manganese and iron removal with potassium permanganate (KMnO₄).
- Coagulation with polyaluminium chloride (PACl).
- Flocculation with a baffled tank located at the base of the cascade aerator.
- Sedimentation via sedimentation lagoon (one duty/ one offline).
- Filtration using dual media (coal/sand) open gravity filters.
- Disinfection using sodium hypochlorite (NaOCl).
- Clear water tank, which then feeds the Mendooran standpipe and Coolabah reservoirs (x 3).

The plant also has a soda ash (NaCO₃) dosing system for pH control and a fluoride dosing system which are currently offline. The soda ash dosing system was never commissioned and has since been used for spare parts.

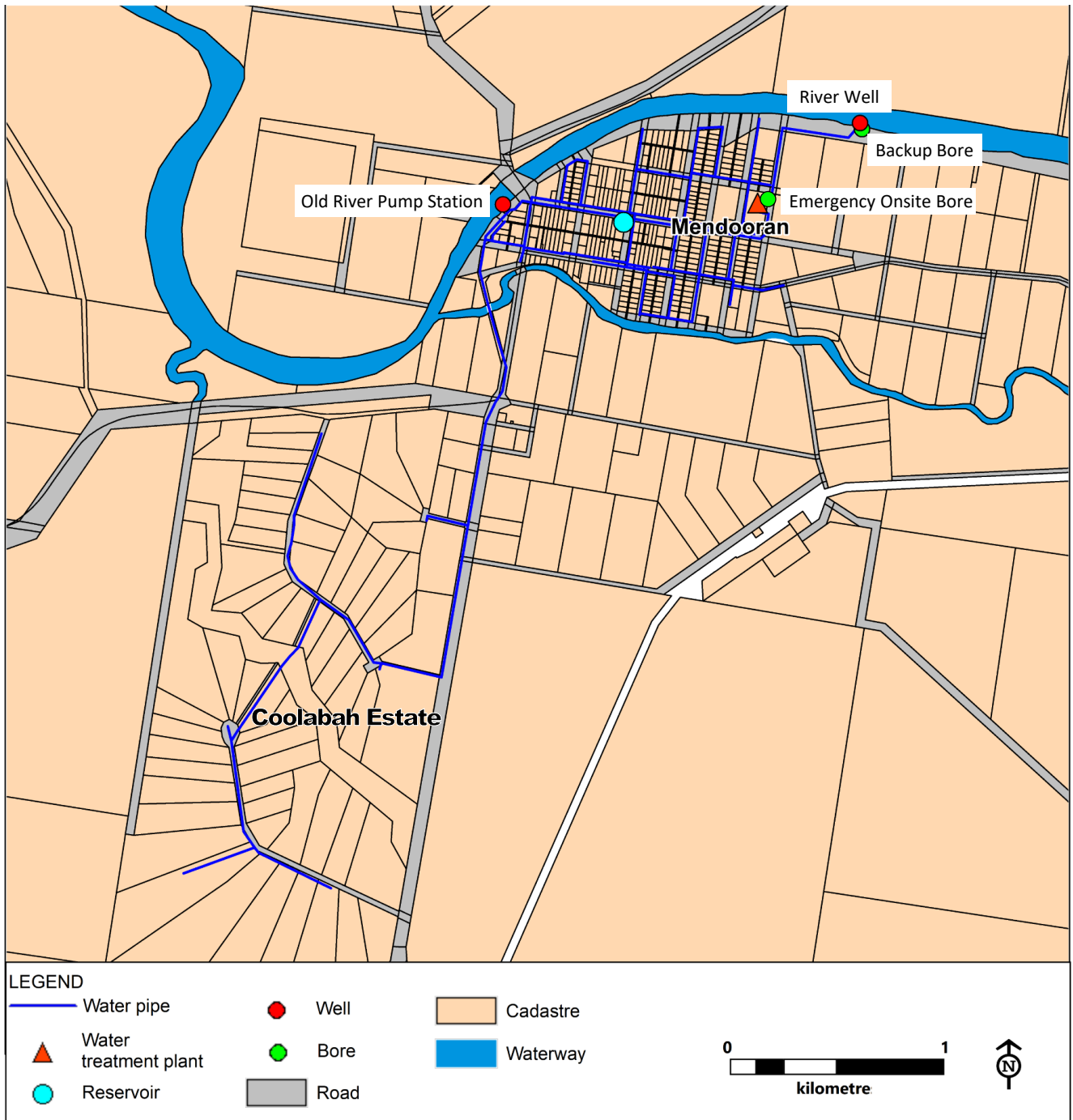


Figure 2-1 Mendooran water supply

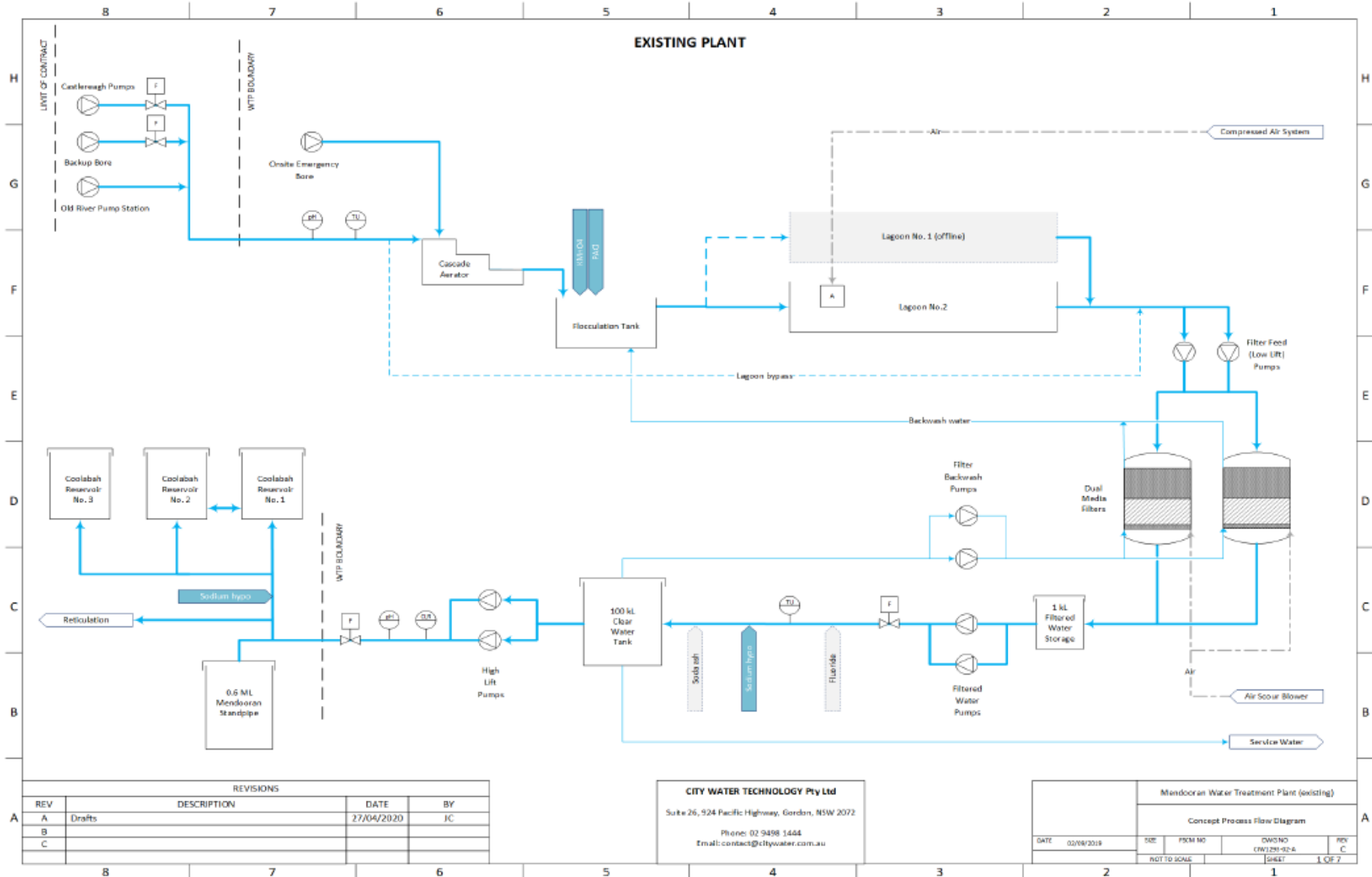


Figure 2-2 Existing Mendooran water treatment process

Source: CWT, 2020c

The Drinking Water Management System (AECOM, 2014) risk assessment identified several risks at the WTP presenting high and very high risks of pathogen contamination in the water. The assessment also identified very high risks of contamination at the reservoirs. Previous incident investigations, site inspections and audits have revealed several process deficiencies, water quality issues and work health and safety concerns (HunterH2O, 2017; Hydrosphere Consulting, 2019a; CWT, 2020a, b). The 2019 *Integrated Water Cycle Management (IWCM) Issues Paper* (Hydrosphere Consulting, 2019a) identifies the IWCM issues facing WSC and its customers. The Issues Paper reports that the WTP was never fully commissioned and has problems with process control and operation and compromised performance (IWCM Issue I-1). Risks to public health documented in the Issues Paper include insufficient disinfection and network chlorine residual and that the reservoirs and clear water tank are not secure from contamination echoing the findings of the DWMS (AECOM, 2014) risk assessment. Vermin proofing of the reservoirs and clear water tank has since been undertaken (WEARS, 2019) however mixing at the reservoirs is still required to prevent stratification and ensure adequate chlorine concentrations.

Between 2nd June 2017 and 12th July 2017, a boiled water alert was issued for Mendooran due to *Escherichia coli* (*E. coli*) detected in the treated water supply. On 10th December 2018, an algal bloom in the sedimentation lagoon occurred causing failure of the filters. This was suspected to be caused by elevated phosphorous levels in the emergency onsite and backup bore supply. Subsequent successful operation of the bores and water quality testing results suggest that the problem may be caused or exacerbated by issues at the sedimentation lagoons. Water quality testing of a sample taken from the sedimentation lagoon in May 2019 revealed a total microcystin-LR (a toxin produced by cyanobacteria (also known as blue green algae) which can cause damage to the liver and remain present in water even after boiling.) reading of 11µg/L (8 times greater than the ADWG health limit of 1.32µg/L). Microcystins can cause damage to the liver and are potentially carcinogenic (CWT, 2020a).

The *Mendooran WTP Site Constraint and Hazard Review Report* (CWT, 2020a) summarises process issues identified during a site visit by CWT on 14th November 2019. Key issues and hazards with the existing WTP outlined in the report include:

- Deficiencies in plant operation and chemical dosing.
- Insufficient disinfection and network chlorine residual.
- Lack of automation and monitoring.
- Work health and safety concerns for plant operators.

The findings from the *Site Constraint and Hazard Review Report* (CWT, 2020a) were used to develop upgrade options which were described in the *Mendooran WTP Design Basis and Options Assessment Report* (CWT, 2020c). This report identifies a range of available upgrade options for components of the WTP to address the issues identified in previous reports and investigations. The report made recommendations for upgrade works for various water treatment processes to be undertaken in three stages - immediately, Stage 1 small works packages and Stage 2 small works packages. Recommendations from the report were used to inform WSC of required upgrade works and formed the basis of Council's brief for a concept design.

A Preliminary Hazard Analysis (PHA) was undertaken during a workshop facilitated by CWT with WSC staff to ensure that the works packages identified in Council's concept design brief were adequate to mitigate risks presented by the existing treatment processes. The analysis evaluated the inherent risks associated with the existing water treatment processes and the residual risks following the implementation of the agreed scope of the WTP upgrade. Results of the PHA, documented in the *Mendooran WTP Project Risk Management Plan* (CWT, 2020b), were used to ensure that the work packages are appropriate for mitigating the inherent risks and identified additional works recommended to be included in the project to further improve risk management and ensure the WTP upgrade addresses all risks.

A concept design for the upgrade works was prepared (CWT, 2020d) consisting of seven works packages outlined in Section 2.1.3. A Technical Specifications report (CWT, 2020e) was also prepared. These reports have been reviewed by NSW Department of Planning, Industry and Environment (DPIE) as part of the

approval process required under Section 60 of the *Local Government Act 1993* (refer Section 4.4) and Council is addressing this feedback.

2.1.2 Objectives

The objectives of the proposed Mendooran WTP upgrade are:

- To protect public health through the provision of a safe drinking water supply to Mendooran.
- Adopt a multi-barrier treatment approach at the Mendooran WTP.
- Ensure treated water meets water quality objectives in accordance with the *Australian Drinking Water Guidelines (ADWG)* (NHMRC, 2011) and the *WSAA Manual for the Application of Health-Based Treatment Targets* (Water Services Association of Australia, 2015).
- Meet operational objectives in accordance with the *Good Practice Guide to the Operation of Drinking Water Supply Systems for the Management of Microbial Risk* (Water Research Australia, 2019).
- Improve operability of the plant to reduce the requirement for manual intervention by operators.

WSC intends to commission the preparation of construction specifications and drawings and construction of the work packages through a design and construct contract.

2.1.3 Proposal description

A concept design and technical specifications for seven small works packages have been developed to meet the project objectives and mitigate the identified risks. The proposed works packages are outlined in Table 2-1.

Table 2-1: Work Packages and Descriptions

Work package	Description	Activities
WP1	Raw water supply and blending	<ul style="list-style-type: none"> • Raw water mains upgrades, including connection of the emergency onsite bore to common inlet main. • Installation of a new blending tank.
WP2	Chemical dosing upgrades	<ul style="list-style-type: none"> • Upgrades to chemical dosing systems: <ul style="list-style-type: none"> ○ Soda ash. ○ Potassium permanganate. ○ Polyaluminium chloride. ○ Polymer LT22S. ○ Chlorine gas. • Installation of an inline mixer. • Upgrade of service water pumps. • Installation of a wastewater holding tank.
WP3	Online instrumentation and process control	<ul style="list-style-type: none"> • Installation of all required instrumentation including: <ul style="list-style-type: none"> ○ Analytical instrumentation (turbidimeters, pH, free chlorine) ○ Flow switches, flow meters and level sensors ○ Variable speed drives at: <ul style="list-style-type: none"> ▪ Riverbed pumps. ▪ Backup bore pumps. ▪ Low level/filter feed pumps. • WTP control modifications (including alarm setpoints and feedback control for: <ul style="list-style-type: none"> ○ Chemical dosing systems. ○ Analytical instrumentation. ○ Valve actuators, motors, drives and instrumentation.
WP4	Mendooran standpipe booster pumps	<ul style="list-style-type: none"> • Installation of high lift booster pumps to supply the Mendooran standpipe.
WP5	Management of water age at the Coolabah reservoirs	<ul style="list-style-type: none"> • Installation of: <ul style="list-style-type: none"> ○ Pipes and hydraulic connections between Coolabah Reservoirs No.1, No. 2 and No. 3. ○ Recirculation line and pump. ○ Chlorine gas dosing system adjacent to reservoirs. ○ Chlorine residual analyser.

Work package	Description	Activities
WP6	Replacement of sedimentation lagoons with clarifier	<ul style="list-style-type: none"> • Replace sedimentation lagoons with clarifier. • Reconfiguration of sedimentation lagoons to sludge lagoons. • Reconfiguration of filter backwash waste to lagoons. • Implementation of filter-to-waste line. • Installation of supernatant return facilities.
WP7	Installation of ultraviolet (UV) disinfection unit	<ul style="list-style-type: none"> • Installation of an inline UV disinfection unit.

Source: CWT 2020d, e

2.2 RATIONALE FOR INVESTMENT

The proposed upgrades to the WTP will:

- Protect public health by ensuring adequate removal of viruses, bacteria and protozoa.
- Improve work health and safety by improving chemical dosing procedures and reducing manual intervention.
- Improve drought resilience by allowing concurrent supply from multiple feed water sources.
- Improve WTP performance and statutory compliance as a result of the integration of online instrumentation and process control and improved consistency and reliability of treatment processes.

The expected outcomes and benefits of the project are:

- Health benefits - reduced risk of treated water contamination and resulting illness and associated health care and social costs.
- Social benefits - improved drought resilience, reduced drought related costs and social impacts, removing constraints on future development from inadequate water supply infrastructure.

Not completing the upgrades would pose significant health risks to the community and visitors to Mendooran.

2.2.1 Protection of public health and compliance with ADWG

The Mendooran WTP has inherent problems with process control and operation which compromise its performance. Of particular concern is the insufficient disinfection and network chlorine residual. A boiled water alert was issued for Mendooran and Coolabah between 2 June 2017 and 12 July 2017 due to elevated *E. coli* levels which increase the risk of waterborne diseases.

The Warrumbungle DWMS (AECOM, 2014) describes the current systems in place to manage drinking water and provides an implementation plan to update the system to ensure compliance with the ADWG requirements. The DWMS provides an analysis of water quality data between 10th March 2009 and 10 March 2014 citing occasional issues with *E. coli*, turbidity, manganese, iron, total hardness, total dissolved solids (TDS) and free chlorine and frequent issues with total coliforms.

NSW Health data on reticulated water quality between 2013 and 2019 are summarised in the following table and compared to ADWG guideline values. Water quality results for other parameters tested were within guideline values. *E. coli*, free chlorine, pH, total chlorine, total coliform, total dissolved solids and hardness results have exceeded the guideline values as shown by the orange cells in Table 2-2. High hardness in the water could cause scale build-up on household appliances and problems with the use of soaps and detergents.

Water quality concerns were also raised in the *Site Constraint and Hazard Review Report* (CWT, 2020a) which also revealed high levels of microcystin-LR in the sedimentation lagoons.

The proposal aligns with the fundamental principle of the ADWG - *the greatest risks to consumers of drinking water are pathogenic microorganisms. Protection of water sources and treatment are of paramount importance and must never be compromised.*

Table 2-2 Mendooran reticulated water quality

Parameter	Units	ADWG (2011) Guideline value	Minimum	Average	Maximum	No. of samples	% meeting guideline value
Aluminium	mg/L	0.2	0.01	0.038	0.18	10	100%
<i>E. Coli</i>	cfu/100 mL	0	<1	<1	1	151	97%
Fluoride	mg/L	1.5	0.2	0.29	0.39	10	100%
Free chlorine	mg/L	0.2 – 5.0	0	1.05	5.74	140	75%
Iron	mg/L	0.3	<0.01	0.03	0.08	10	100%
Manganese	mg/L	0.5	<0.005	0.008	0.045	10	100%
pH	-	6.5 – 8.5	6.54	7.73	8.7	154	99%
Total chlorine	mg/L	5	0.05	1.24	6.55	141	99%
Total coliforms	cfu/100 mL	0	<1	24	>200	151	89%
TDS	mg/L	600	187	526	629	10	70%
Hardness as CaCO ₃	mg/L	200	79.7	231	288	10	20%
True colour	HU	15	1	1	1	10	100%
Turbidity	NTU	5	<0.1	0.74	1.5	11	100%

Source: Hydrosphere Consulting, 2019b

Table 2-3 provides the rationale for the works packages demonstrating how they will mitigate the existing risks at the plant and achieve the project objectives.

Table 2-3 Rationale for works to protect public health

Work package	Current issue/risk	Mitigation via proposed works	Result
WP2 and WP7	Septic contamination	Upgrade existing NaOCl dosing system to a chlorine gas dosing system for improved disinfection control. UV disinfection installed	Log reduction value (LRV) of bacteria, virus and protozoa meet the health-based target for the catchment (category 4 catchment).
WP2	Reported chemical strength degradation issues with the existing NaOCl Dosing System.	Upgrade existing NaOCl dosing system to a chlorine gas dosing system for improved disinfection control.	Adequate chlorine disinfection achieved.
WP4	Operators manually dilute NaOCl from 12.5% solution to 5% presenting a risk of inconsistent and poor chemical quality.	Upgrade existing NaOCl dosing system to a chlorine gas dosing system for improved disinfection control.	Adequate chlorine disinfection achieved.
WP5	Long detention times in the reservoirs and reticulation line could potentially lead to low free chlorine residuals and subsequent risk of contamination.	Hydraulic connection of all three Coolabah reservoirs. Installation of a recirculation line and recirculation pump to recirculate water between reservoirs on a timer. Replacement of the booster chlorination system Installation of a chlorine residual analyser on the recirculation line.	Adequate chlorine concentrations in reticulated water.

Work package	Current issue/risk	Mitigation via proposed works	Result
WP6	Contamination of sedimentation lagoons by birds leading to pathogen introduction.	Replacement of the sedimentation lagoons with a clarifier with bird exclusion.	Prevent introduction of pathogens.
WP6	Sedimentation lagoons favouring algae growth which has led to algal blooms and filter damage.		Prevent algal blooms and subsequent disruptions of downstream processes.

Source: adapted from CWT 2020b

2.2.2 Improved work health and safety

The current WTP presents risks to WTP personnel safety including (CWT, 2020b):

- A PVC pipe is used to feed hot water to the chemical dosing area which could degrade and fail upon heating.
- Manual stirring is required for NaOCl dosing at the batching tank which can cause risks of human contact with the highly corrosive liquid.
- Operator intervention is sometimes required due to clogging of the NaOCl dosing system which increases the risk of contact.
- The NaOCl storage tank is 10 years old, exceeding its 5-7 year service life.
- Trapped air was detected in the NaOCl dosing pump calibration tube. This can lead to gas accumulation and release into the chemical dosing area when the pumps are not in operation.
- Risks to operator safety present at the Mendooran standpipe including open pits and overgrown grass, external stair issues, no internal ladder for safe access or rescue, non-certified davit on platform, Minimum handrailing on the roof area, existing stairs are very narrow, no base ladder present (WEARS, 2017).
- Risks to operator safety arising from the lack of safe access to the Coolabah reservoirs.

A risk management plan (CWT, 2020b) assesses the risks at the current treatment plant (inherent risks) as low medium or high and outlines the mitigation strategies for these risks and the residual risk level. Table outlines how the proposed work packages will mitigate work health and safety risks at the Mendooran WTP (CWT, 2020b).

Table 2-4 Inherent and residual work health and safety risks at the Mendooran WTP

Work package	Risk description	Inherent risk	Mitigation	Residual risk
WP02	PVC hot water pipe	High	The hot water pipework to the chemical dosing area to be replaced.	Low
	NaOCl tank has exceeded service life	High	NaOCl dosing system to be replaced with Chlorine Gas Dosing System in accordance with AS 2927:2001.	Low
	NaOCl injection point clogging	High		Low
	Unsafe NaOCl mixing practices	High		Low
	High operator intervention required for NaOCl dosing	High		Low
	Trapped air in NaOCl dosing system	High		Low
WP04	Mendooran standpipe WHS risks (open pits, overgrown grass, external stair issues, no internal ladder for safe access or rescue, non-certified davit on platform, Minimum handrailing on the roof area, existing stairs very narrow, no base ladder).	High	Issues to be rectified as part of WP03-Mendooran standpipe booster pumps installation.	Medium
WP05	Coolabah reservoir WHS risks (lack of access platform)	High	WHS issues to be addressed in WP05	Medium

Source: CWT, 2020b

2.2.3 Improved drought resilience

The IWCM Issues Paper (Hydrosphere Consulting, 2020a) reports that the old well supply at Mendooran becomes stressed during extended periods of drought. In the eight-year period between 2002 to 2010 drought restrictions were in place for 7.5 years with 2 years being on level 2 or greater. During dry periods

Council uses the backup bore and allows the well supply to recover. The old river pumping station was recently connected to the WTP in order to further secure its emergency water supply, however it does not have process control implementation. An emergency onsite bore is available for use however it is intended as an emergency source only. It is not connected to the common inlet main and delivers raw water directly to the cascade aerator.

On the 10th December 2018 an algal bloom in the sedimentation lagoon occurred which led to a filter breakthrough and elevated turbidity levels as the algal cells could not be removed by the filters. This only occurred with the use of the emergency onsite bore water and tests indicated it was due to the presence of elevated nutrients (phosphorus compounds) (Hydrosphere Consulting, 2019a). The use of bore water was discontinued on the 22nd of December. The plant was unable to adequately treat the bore water and low river flows resulted in the town being placed on level 5 restrictions on the 10th of January 2019, increased to level 6 restrictions on the 29th of January 2019 and remained until the 31st of March 2019 before being reduced to level 1. Drought restrictions remained in place until April 2020.

Algae outbreaks in the sedimentation lagoon have also reportedly occurred when the backup bore is in use and have been observed by Council during winter, signifying the algal issues are not seasonal (CWT, 2020a). Further observation and testing of source water and water from the sedimentation lagoon have suggested that the sedimentation lagoons are causing/contributing to algae outbreaks. The bores were constructed to provide drought resilience to the system however due to algal issues, replacement of the sedimentation lagoons with a clarifier is required to be able to utilise them. A blending tank to blend raw water sources will also reduce the risk of poor quality bore water affecting the system.

The proposed work package WP01 includes connecting the emergency onsite bore to the common inlet main, installing a new raw water blending tank to blend multiple sources prior to treatment and integrating Supervisory Control and Data Acquisition (SCADA) at each raw water source to allow the source feed to be operator selected. Variable speed drives will be installed at each raw water pump station (except for the onsite emergency bore pump) to provide further source selection flexibility. This will facilitate the simultaneous use of multiple raw water sources and mitigate water quality/algal issues with the backup bore water source, allowing Council to use this source more frequently, increasing the availability of water supply sources.

Work Package 6 includes the replacement of the sedimentation lagoons with a clarifier/s to mitigate the risk of algal blooms forming allowing the bore water sources to be used more reliably.

2.2.4 Improved WTP performance and statutory compliance

High levels of manual operation and minimal automation, monitoring and alarms at the Mendooran WTP make it susceptible to events where water enters the reticulation system without proper checks and validation that the water quality is within specification (HunterH2O, 2020).

HunterH2O audited the Mendooran WTP by reviewing the current automation monitoring and instrumentation as documented in *WTP Automation and Process Instrumentation Audit* (HunterH2O, 2020). The report documents existing analyser and process control functionality at the WTP, details inadequacies of the current configuration of the plant and provides recommendations for process instrumentation and upgrades to improve operability and compliance with critical and operational control points.

Key issues at the Mendooran WTP highlighted in the audit include:

- Not all water quality analysers are correctly interlocked to confirm compliance against Critical Control Points (CCPs).
- Insufficient water quality analysers to ensure multiple barrier approach to monitoring.
- The WTP was not properly commissioned and some aspects of the design do not match the operational manual.

CWT made similar observations during a site visit in 2020 as detailed in the *Site Constraint and Hazard Review Report* (CWT, 2020a) which gives recommendations for improving the process control strategy.

The work package WP3: Online instrumentation and process control comprises Programmable Logic Controller (PLC) and SCADA upgrades including the installation of:

- Alarms to alert operators of high parameters and automatic plant shut down on HH (High High) parameters.
- Turbidimeters at individual filter outlets.
- New chlorine/pH analyser.
- Flow meters to measure totalised flows at the inlet to the proposed blending tank.

This will mitigate water quality issues and will improve the performance of the WTP and ensure water quality meets the ADWG and CCPs.

Table 2-5 Rationale for works to improve plant performance

Work package	Current issue/risk	Mitigation via proposed works	Result
WP2	Filter backwash is only triggered by runtime leading to risk of supplying off-specification water.	Installation of turbidimeters at individual filter outlets. Upgrade PLC to ensure backwash is triggered in response to H/HH alarms or differential pressure across individual filters.	Filters backwashed as required. Reduce the risk of supplying off-specification water to customers.
WP2	Manual shut-down required when chlorine residual (CCP) is low or turbidity too high leading to delay periods in which off-specification water may be supplied to the customer.	Upgrade PLC to include automatic feedback control to shut-down the high lift pump when free chlorine (HH, LL) CCP is breached and filtered water turbidity CCP is breached.	Prevent supply of off-specification water to customers.
WP2	Dosing KMnO ₄ and PACl at the same location does not allow enough contact time for manganese to convert to its insoluble form before it can be bound up in floc.	Integration of a blending tank which allows sufficient contact time for KMnO ₄ dosing.	Adequate removal of manganese.
WP6	Sedimentation process performing poorly leading to risk of contaminant breakthrough.	Replacement of the sedimentation lagoons with a clarifier with bird exclusion.	Adequate sedimentation achieved.

2.3 STRATEGIC ALIGNMENT

2.3.1 State-wide strategies

State Infrastructure Strategy

The *NSW Infrastructure Strategy 2018-2038* (Infrastructure NSW, 2018) includes a strategic objective: “Support the growth, productivity and liveability of metropolitan and regional communities by ensuring that water security, quality and wastewater services protect public health and the environment”. Key directions for communities in the Strategy include “Ensure water supply and wastewater treatment to enable industry and population growth”.

The project aligns with the intent of the State Infrastructure Strategy to provide infrastructure that meets the needs of a growing population and a growing economy by improving water security, meeting the ADWG and subsequently removing constraints on growth in the region.

Safe and Secure Water Program (SSWP) version 2

The SSWP was launched to address key risks to regional water safety and security in NSW. Version 2 of the program includes new program criteria designed to prioritise projects that address the highest risks and issues for regional NSW. Risks to water security, water quality and the environment are assessed to direct funding to areas in most need.

Consistent with the SSWP objectives, the WTP upgrades will address water quality issues and resulting health risks present at the existing Mendooran WTP and improve water security by allowing a more flexible

approach to water source selection. This will ensure safe and reliable drinking water can be produced at an appropriate level of service to protect the community's health.

This proposal is categorised as Risk Score 5 (the highest risk level) and Risk Priority 14 on the Eligible Risks and Issues List (ERIL), a database maintained by DPIE. The department uses the ERIL to prioritise potential funding under the SSWP. Proposals with Risk Score 5 will be prioritised for funding over projects with lower risk levels.

Regional Development Framework

The Regional Development Framework provides a scaffold for better coordination, decision making and effort on the ground by supporting regional development to *provide quality services and infrastructure in regional NSW – ensuring a baseline set of services across regional NSW*. This project directly aligns with this objective as upgrades to WTP will provide Mendooran with a “baseline set of services” and removes barriers to regional growth.

2.3.2 Regional strategies

Central West and Orana Regional Plan 2036

The *Central West and Orana Regional Plan 2036* establishes goals and sets priorities and directions to help achieve these goals. Extensive consultation with the local councils, stakeholders and the wider community was undertaken during the plan's preparation and feedback from the release of a draft plan was integrated into the final plan. Within the plan, the local government snapshot for the Warrumbungle Shire lists “*Encouraging economic growth by supporting agriculture and emerging industries such as value-add manufacturing and freight-related opportunities*” as one of its priorities, which would be directly supported by the WTP upgrades.

The project aligns with goals and directions outlined by the regional plan as shown in Table 2-6.

Table 2-6: Project alignment with regional goals and directions

Goal	Direction	Project alignment
1. The most diverse regional economy in NSW	2. Grow the agribusiness sector and supply chains	Removes constraints to growth imposed by the current WTP to improve the town's capacity to support increased tourism, development.
	3. Develop advanced manufacturing and food processing sectors	
	4. Promote and diversify regional tourism markets	
2. A stronger, healthier environment and diverse heritage	15. Increase resilience to natural hazards and climate change	Provide increased drought resilience.
4. Dynamic vibrant and healthy communities	23. Build resilience of towns and villages	Improve resilience of the town so it remains a robust and dynamic settlement.
	27. Deliver a range of accommodation options for seasonal, itinerant and mining workforces.	Provide essential infrastructure to accommodate seasonal workers.

2.3.3 Local government strategies

Warrumbungle Community Strategic Plan (CSP) 2017-2032

The CSP is a document which identifies the community's main priorities and aspirations and provides a strategic plan for achieving these goals. The CSP is developed using input from the community using initiatives such as a community forum and surveys, presentations and workshops and community consultation meetings. The goals outlined in the CSP is therefore considered to be represent the community's desires and address their concerns.

The CSP includes goals for public infrastructure and services including goal PI7 “Communities across the shire are supported by the secure, long term supply of energy and clean water.” Upgrades to the water treatment process directly align with strategy PI7.1 of the CSP which aims to achieve the goal through adequate planning and provision of water services for future requirements.

The Delivery Program documents the actions and activities to be undertaken to achieve the community’s strategic goals. It is a statement of commitment from Council which outlines what the elected council intends to achieve during its term of office. The Operational Plan details which projects and deliverables will be undertaken in order to achieve the commitments made in the Delivery Program. This proposal is supported by the Council’s Operational Plan and Delivery Program 2020/21 – 2023/24 which lists *Mendooran Water Supply Modification Upgrade* as a key project for achieving CSP goal PI7.

Safe drinking water services are an essential element that enables communities to grow and provide the labour to support the region’s economy which is consistent with the community’s aspirations as detailed in the Operational Plan and Delivery Program, the CSP and the *Community Strategic Plan Forum Results*.

Integrated Water Cycle Management (IWCM) Strategy

The 2019 draft IWCM Strategy (Hydrosphere Consulting, 2019b) (in preparation) is a long-term overarching plan for the management of water services within the Warrumbungle Shire, including water supply, wastewater and stormwater. The IWCM Issues Paper (Hydrosphere Consulting, 2019a) identifies the need to ensure appropriate levels of service provided by the Mendooran WTP as a high priority project due to the risks to public health. The IWCM Strategy and Issues Paper discuss the water quality and treatment issues at the Mendooran WTP and highlight the need for upgrades to the WTP. Council’s draft IWCM Strategy identifies the need to:

- Determine the extent of any contamination of the back-up bore and the adequacy of the treatment process to manage those risks.
- Install a raw water blending tank at the WTP to collect and mix all incoming flows and to allow potassium permanganate contact time before flocculation.
- Modify the controls at the river pump station to allow concurrent operation of the river and back-up bore pumps
- Consider upgrading the aerator to cope with algal blooms.

These would be addressed through the proposal to upgrade the WTP.

Asset Management Policy

WSC’s *Asset Management Policy* (WSC, 2017) objectives include:

- Council services and infrastructure are provided in a sustainable manner, with the appropriate levels of service to residents, visitors and the environment.
- All legislative requirements in relation to asset management are identified and met.

Upgrades to the WTP are consistent with this policy and are essential for Council to provide water customers in Mendooran with an appropriate level of service.

2.4 EXPECTED OUTCOMES

The key outcomes of this project are:

- The provision of safe drinking water to Mendooran and Coolabah.
- Producing potable water that meets the requirements of the ADWG.
- Avoid costs to Council and the NSW Government associated with emergency water carting if the existing supply fails.
- To facilitate the simultaneous use of multiple raw water sources.
- To improve work health and safety conditions for Mendooran WTP operators.

Achieving these outcomes is necessary to enable the community to grow and provide the labour to support the region's economy which is consistent with community aspirations. It is also expected to result in the following benefits:

- Reduced community health risks and costs associated with water borne disease outbreaks.
- Reduced costs to Council associated with ad-hoc repairs and maintenance to the existing WTP.
- Increased trust in and support for WSC by residents.
- Sustained revenue for Council from sales of potable water.

Without the WTP upgrade, the water supply demand cannot be guaranteed, and water cannot be provided that meets the drinking water guidelines. Drinking water quality complaints and Council's inability to meet the required levels of service is likely to result in reduced investment and growth in the town and region. Mendooran offers a peaceful and affordable lifestyle and can provide an ideal location for entrepreneurs with small businesses such as the Black Gate Distillery (established in 2009) whose owners moved to Mendooran from larger regional towns.

The economic benefits of the project relate to the sustained Council revenue from water sales, reduced impacts on residents and businesses (through maintenance of lifestyle and welfare). In addition, Council's current operating and maintenance costs are currently high due to ageing assets and difficulties with operation of the plant. The WTP upgrade will reduce operating and renewal expenditure due to the new assets and improved operational regime.

A secure potable water supply is required to:

- Ensure a constant level of income for Council - financial stress including reduction in revenue due to the decline in water usage and the increased costs of enforcement of restrictions and advertising are experienced during restriction periods.
- Allow ongoing maintenance of public areas to ensure an attractive environment for visitors, tourists and residents.
- Demonstrate commitment to essential services and infrastructure to attract new business and industry to the region.
- Support existing water-reliant businesses such as:
 - Blue Sky Cheese (cheese making business).
 - Black Gate Distillery (whisky and rum distillery).
 - Bakery.
 - the Mendooran Bowling Club.
 - the Mendooran Royal Hotel.
 - municipal swimming pool.
- Provide a high level of amenity for residents.
- Attract new labour and industries to the region.

Key objectives and indicators are further discussed in Section 3.1.

2.5 STAKEHOLDER & COMMUNITY SUPPORT

The key stakeholders for this project are:

- Mendooran and Coolabah residents – water users and rate payers.
- Mendooran businesses.
- Warrumbungle councillors – as elected representatives of the community.
- Warrumbungle Shire Council – co-funding for capital and operational costs.
- NSW government – co-funding.
- DPIE – Water - Section 60 (Local Government Act) approval.

Table 2-7: Stakeholder interests

Stakeholder(s)	Key interests
Mendooran and Coolabah residents	<ul style="list-style-type: none"> To be provided with water for drinking and household uses that is safe and meets the appropriate standards. To be provided with an appropriate level of water supply service to fulfil the community's desires to enhance economic development, growth and tourism in the region as expressed in the CSP. To reduced health risks to the community arising from the existing Mendooran WTP.
Mendooran businesses	<ul style="list-style-type: none"> To be provided with water for commercial uses that is safe and meets the appropriate standards. To be provided with an appropriate level of water supply service to enhance economic development, growth and tourism in the region as expressed in the CSP. To reduced health risks arising from the existing Mendooran WTP.
Warrumbungle councillors	<ul style="list-style-type: none"> To uphold the commitment made to undertake the upgrades to the Mendooran WTP in the WSC Operational Plan and Delivery Program 2020/21 – 2023/24. To address the community's concerns and act in the community's best interest. To prioritise resident's health and safety.
Warrumbungle Shire Council	<ul style="list-style-type: none"> To provide town water that complies with ADWG. To uphold commitment made to undertake the upgrades to the Mendooran WTP in the WSC Operational Plan and Delivery Program 2020/21 – 2023/24. To avoid public health threats to the community and avoid health related costs arising from outbreaks of water borne diseases. To avoid damage to Council's image in the event of serious public health threats arising from known issues with the Mendooran WTP. To continue to collect revenue from access charges and sales of water to support funding for water supply infrastructure asset management.
NSW government	<ul style="list-style-type: none"> To fund regional water infrastructure projects which present high risks to water quality and security, particularly where the local council is unable to provide the funding. To support local water utilities to deliver their services safely and reliably. To support regional economic development.
DPIE - Water	<ul style="list-style-type: none"> To manage the Safe and Secure Water Program and prioritise funding for projects presenting high risks to water security and quality. To assist local councils to reduce health risks arising from inadequate water service/quality. To support local councils in gaining approval and funding for water infrastructure projects.

3 ANALYSIS OF THE PROPOSAL

3.1 OBJECTIVES & INDICATORS

Table 3-1 outlines the key issues that this project seeks to address, objectives for the project and indicators of its success.

Table 3-1: Proposal objectives

Key problem/issue	Key proposal objective	Key success indicator
Treated water does not always meet ADWG due to deficiencies in plant processes.	Quality potable water is supplied to connected properties and new customers.	Water quality meets criteria established by Australian Drinking Water Guidelines.
Treated water does not meet pathogen removal requirements as per the ADWG.	Potable water is safe for drinking.	No boil water alerts.
Issues identified in previous investigations and reports (discussed in Section 2.1) have not been addressed.	Best practice water recommendations are completed.	Recommendations actioned/completed.
Water insecurity exacerbated by lack of control over raw water source selection and inability to blend raw water source.	Ensure continued supply of water during drought conditions.	Water restrictions do not exceed level 3.
Work health and safety risks to WTP operators.	Improved onsite health and safety at the WTP.	All plant components comply with applicable Australian Standards. Nil safety incidents.

3.2 THE BASE CASE

The 'Base Case' scenario is that the WTP continues to operate in its existing condition without any of the proposed upgrades. Under the Base Case, Mendooran WTP:

- Presents a high risk to public health, through an elevated likelihood of containing disease causing pathogens.
- Presents health and safety risks to WTP operators.
- Operates with a sub-optimal level of process control and automation.

3.3 OTHER OPTIONS CONSIDERED

The outcomes of the Base Case scenario outlined in the previous section highlight the necessity and urgency of achieving the project objectives promptly. The options assessment investigated the following options:

- Do nothing – base case (Section **Error! Reference source not found.**).
- Upgrade current WTP with various process technologies.

Through previous investigations (CWT, 2020a; HunterH2O, 2020) Council has determined that the plant upgrades are required to adequately achieve the project objectives. A full plant replacement is not necessary and therefore would not be a cost-effective option for this project.

WSC commissioned CWT to prepare the *Mendooran WTP Design Basis and Options Assessment Report* (CWT, 2020c). This report defines the plant upgrade requirements necessary to address the issues at the plant as identified in the *Site Constraint and Hazard Review Report* (CWT, 2020a). The report provides detailed discussions for each WTP process requiring an upgrade including chemical, process and equipment options to meet the upgrade requirements. CWT (2020c) provides key considerations,

comments and justification for the recommendations made in the report and details how the recommendation satisfy the upgrade requirements.

The alternative to this project is the progressive refurbishment of the existing WTP when funding and resources permit. This is considered to be an inferior approach due to the non-compliance with drinking water guidelines and workplace health and safety requirements.

3.4 INFORMATION ABOUT THE PROPOSAL

3.4.1 Scope of works

Location

This project proposes upgrades to the existing Mendooran WTP located on Darglish Street, Mendooran (refer Figure 3-1) opposite the Mendooran showground approximately 500m from the Castlereagh River.



Figure 3-1 Mendooran WTP site

Scope of works

The scope of the upgrades is provided in the *Technical Specification for Mendooran WTP* (CWT, 2020e) and *Mendooran WTP Upgrades Concept Design* (CWT, 2020d) and is supported by information provided in the *WTP Design Basis and Options Assessment Report* (CWT, 2020c), *WTP Site Constraint and Hazard Report* (CWT 2020a) and *WTP Project Risk Management Plan* (CWT, 2020b). WSC proposes to tender the upgrade work packages on a design and construct basis.

The scope of works includes the following (refer Figure 3-2):

- Detailed design of all works to be completed (based on concept design (CWT, 2020d) and technical specifications (CWT, 2020e).
- Components of the following four work packages as detailed in the technical specifications (CWT, 2020e) (technical specifications to be developed for WP4, WP6 and WP7):
 - WP1: Raw water supply and blending.

- WP2: WTP chemical dosing upgrades, including:
 - WP2.1 Potassium permanganate (KMnO₄) dosing system.
 - WP2.2 Polyaluminium chloride (PACl) dosing system.
 - WP2.3 Chlorine gas (Cl₂) dosing system.
 - WP2.4 Soda ash dosing system.
 - WP2.5 Polymer dosing system.
 - WP3: WTP online instrumentation and process control.
 - WP4: Mendooran standpipe booster pumps and standpipe modifications.
 - WP5: Coolabah reservoirs management of water age, including:
 - WP5.1 Reticulation line.
 - WP5.2 Chlorine gas booster system with dosing and residual monitoring.
 - WP6: Replacement of sludge lagoons with clarification, including:
 - WP6.1 Replacement of sedimentation lagoons with clarifier.
 - WP6.2 Reconfiguration of sedimentation lagoons to sludge lagoons.
 - WP6.3 Install filter to waste.
 - WP6.4 Installation of supernatant return facilities.
 - WP7: Installation of UV disinfection unit.
- Electrical and controls systems modifications including those to switchboards, PLCs, SCADA system, operator HMI, and all necessary valve actuators, motors, drives and instrumentation for automated control of the upgraded WTP.
 - Instrumentation to measure flow, water quality parameters, water levels, differential pressure as outlined in WP3 and water quality sampling points.
 - Earthworks for site preparation and remediation.
 - Plant buildings as required, for i.e. chlorine gas storage.
 - Building approvals, engineering certificates and regulatory requirements.
 - Removal of old redundant equipment, structures, and tanks upon successful completion of commissioning and proof of performance of the upgraded WTP.
 - Professional services including project management, management plans, surveying and drafting.
 - Testing and commissioning of the works.
 - A one-year defects and liability period.

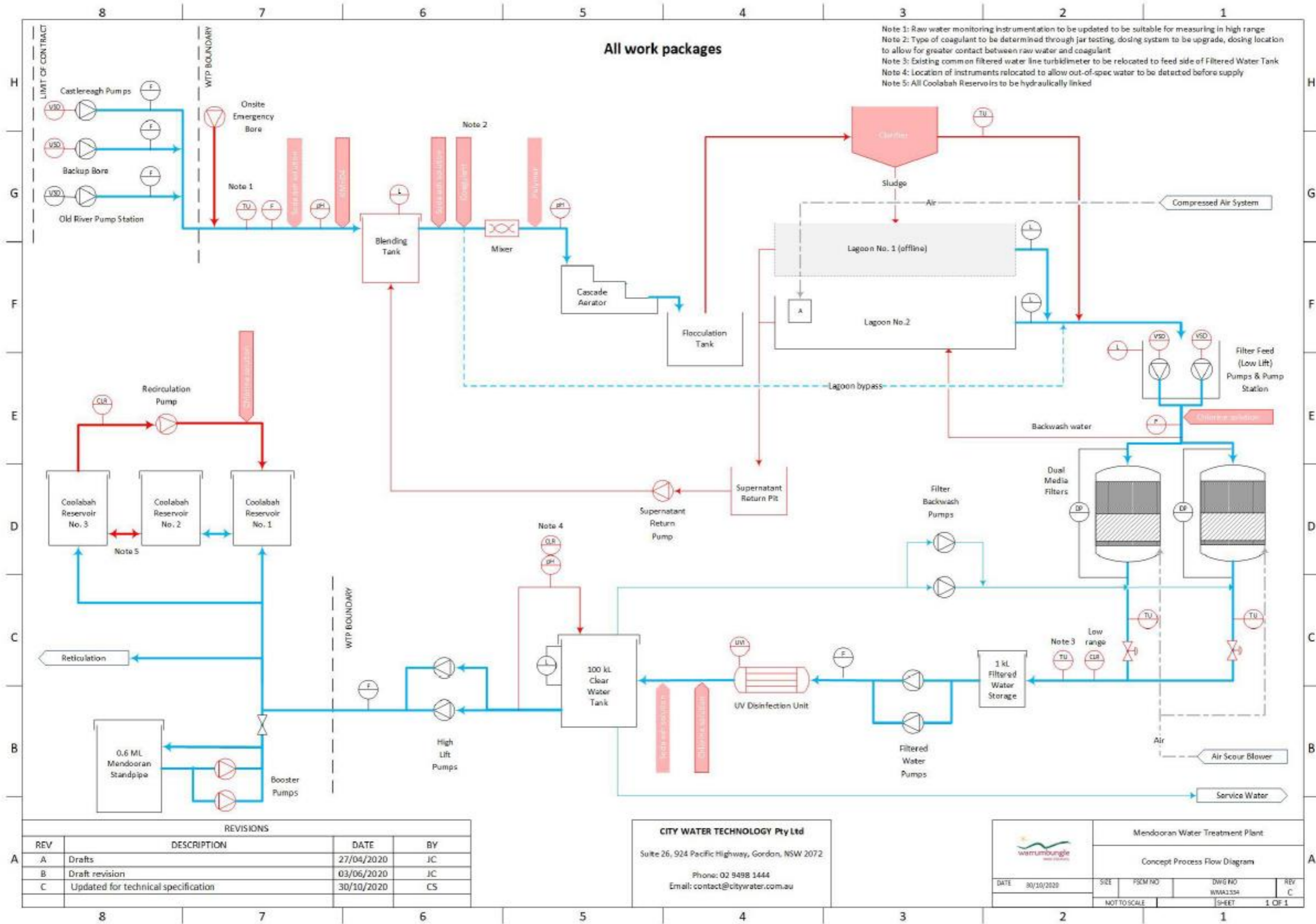


Figure 3-2: Process flow diagram showing scope of works in red

Source: CWT, 2020d

Applicable Australian Standards:

- AS 1100.101 - 1992 Technical Drawing General principles
- AS 1100.401 - 1984 Engineering survey and engineering survey design drawings
- AS 1100.201 - 1992 Mechanical engineering drawings
- AS 1100.301 - 2008 Architectural drawings
- AS 1100.501 - Structural engineering drawings
- AS 1102 -101 to 113 - Electrical engineering drawings

Design and Construct Procurement

Council prefers to deliver the WTP upgrade via a single design and construct contract to maximise the efficiency in which it is delivered. Council will be fully involved in the design process and be able to ensure design outcomes are suitable and cost efficient. This will also simplify the funding process as a fixed fee will be provided before project commencement.

The detailed design and construction would be completed under a specialist engineering and construction consultancy and meet Council's procurement policies and standards.

It is anticipated that this delivery method will achieve the lowest total design and construction cost through competitive bidding and still provide the opportunity for Council oversight of the detailed design. In this procurement model, Council will engage a consultant project manager to manage the design and construction of the project.

Detailed Design

Detailed design of all works to be completed based on the concept design (CWT, 2020d) and technical specifications (CWT, 2020e).

Construction

Construction of the Mendooran WTP upgrades consists of seven work packages as described above.

During the construction of the upgrades, the existing Mendooran WTP will be required to supply potable water to the town of Mendooran. This will be achieved by keeping upgrade works offline until the completion of each work package.

3.4.2 Proposal exclusions

The following elements of this project are outside the scope of this proposal:

- Upgrades to the safety showers recommended in the *WTP Site Constraint and Hazard Review Report* (CWT, 2020a) – complete.
- Land acquisition (if required).

3.4.3 Related projects

No other related projects have been identified.

3.5 PROJECTED COSTS

3.5.1 Projected capital costs

Preliminary capital cost estimates were prepared by CWT and are outlined in *Mendooran WTP Upgrades Cost Estimates* (CWT, 2020f). The costs are based on the concept design and technical specifications provided by CWT (2020d; 2020e) and include the capital costs for WP1, WP2, WP3 and WP5 which comprised the original scope of this project. WP4, WP6 and WP7 were identified as necessary during the concept design of the upgrades and as a result cost estimates for these work packages have not yet been completed. These work packages are essential to achieve the project outcomes and are included in this funding request although the costs have not yet been determined.

Costs are provided in Table 3-2 excluding costs for WP4, WP6 and WP7. Revised costs will be provided when cost estimates are available for these work packages and the SSWP funding request will be updated.

The cost estimates are based on the following:

- Equipment costs were obtained using:
 - Recent quotations for other CWT projects.
 - Quotations provided by suppliers.
 - Brochure price lists.
 - Estimates based on experience and successful design and construct tenders for similar projects.
- Contingency estimated at 25% of the total direct costs.
- Engineering costs (project management, detailed design, surveying, drafting, documentation, commissioning, operator training) calculated as 20% of total direct cost.
- Other direct costs (mechanical, electrical and civil works, site preparation and engineering costs) were calculated based on the works included in each package and the associated equipment or instrumentation.

For further details on costs and the basis of each estimation, refer to the *Mendooran WTP Upgrades Cost Estimates* report (CWT, 2020).

Table 3-2: Projected capital costs inclusive of contingency

Stage	2021-22	2022-23	Total
Total direct costs	\$879,923	\$359,202	\$1,239,125
Engineering costs (project management/ engineering / design) (20% of direct costs)	\$175,985	\$71,840	\$247,825
Contingency (25% of direct costs)	\$219,981	\$89,801	\$309,782
Subtotal	\$1,275,889	\$520,843	\$1,796,732
Contractor margins (20% of subtotal)	\$255,178	\$104,169	\$359,346
Project management margins (10% of subtotal)	\$127,589	\$52,084	\$179,673
Escalation (based on 2 % p.a price inflation)	\$33,173	\$27,355	\$60,528
Nominal cost	\$1,691,829	\$704,450	\$2,396,279

Source: CWT (2020f)

3.5.2 Projected ongoing costs

The construction of the upgrades is expected to be completed in September 2022. Testing and commissioning is also scheduled to begin in September 2022 and marks the commencement of the upgraded WTP operations. Following a testing and commissioning period and a one-year defects liability period the project is expected to reach a steady state. Ongoing costs attributed to the WTP upgrades during this period include:

- Chemical consumption (soda ash, potassium permanganate, chlorine gas, PACl, polymer).
- Additional power usage (associated with upgrades only).
- Maintenance (assumed as 2.5% of direct equipment costs).

Existing WTP personnel will manage the operation of the upgraded WTP. No additional labour costs will be required to maintain the plant following the upgrades.

Table 3-3: Projected ongoing costs

Year	2022-23	2023-24	Total
Chemical consumption	\$19,800	\$23,931	\$43,731
Power	\$19,124	\$23,114	\$42,238
Maintenance	\$15,762	\$19,050	\$34,812
Escalation (assuming 2% p.a. inflation)	\$2,209	\$4,046	\$6,255
Total	\$56,896	\$70,141	\$127,037

Source: CWT (2020f)

3.6 COST-BENEFIT ANALYSIS

The key costs are identified in Section 3.5 and include:

- Capital costs and contingency associated with the proposed works packages.
- Ongoing operation and maintenance costs.

The following benefits are expected to arise from the completion of the upgrade works:

- Reduced health risks for residents and reduced costs associated with water borne disease outbreaks.
- Potential for enhanced economic development and growth.
- Encouraging a sense of pride in the community and fostering community spirit.
- Potential for increase in tourism to the area.
- Continued income of approximately \$253,758 p.a. from water sales in Mendooran including:
 - Access charges totalling approximately \$171,158 p.a.
 - Usage charges totalling approximately \$82,600 p.a.

3.7 FINANCIAL APPRAISAL

Revenue is also generated by WSC for the provision of water services to the community through access charges and water usage charges. By providing the upgrades, Council will be able to continue to generate revenue of approximately \$253,758 p.a. from Mendooran water supply customers.

There are also benefits not quantified in the analysis which cannot be easily separated from other contributing factors. These are:

- The contribution to increased tourism revenue.
- Additional employment opportunities provided by new businesses to the region.

Council has reviewed the capital expenditure, asset management, whole of life costs, benefits, costs, and deem the project to be affordable with SSWP funding.

3.8 PROPOSED FUNDING ARRANGEMENTS

Mendooran has a small number of water supply customers (227) which provides a low revenue base to fund water supply capital works. There is little scope for a significant increase in water access charges for Mendooran as it is a low socio-economic area and customers already pay a higher rate than the rest of the shire to pay for the WTP construction loan.

WSC is requesting 75% of costs from the NSW Government SSWP (version 2) and proposes to fund the remaining 25% of the project costs.

Council's borrowing capacity is limited as reported in TCorp's 2013 Financial Assessment, Sustainability and Benchmarking Report and Council is very reliant on grants as a core source of revenue and for future capital expenditure. Council is therefore seeking 75% of funding of the project through the SSWP.

Due to recent periods of extended drought, the Mendooran community does not have the capacity to absorb future increases in water pricing or to fund major capital works like the WTP upgrade. WSC is ranked the 13th most disadvantaged locality of 130 LGAs based on the Socio-Economic Indexes for Areas (SEIFA) index in the State of NSW (ABS, 2016). This is a significant level of social and economic disadvantage. Recently this hardship has been exacerbated under the recent prolonged drought experienced in rural NSW, where the Warrumbungle Shire has been recognised by the Federal Government as eligible for funding relief under the Drought Communities Program. This eligibility is based on rainfall deficiency and population and industry data.

WSC is co-funding several essential infrastructure projects which have resulted from the need to upgrade facilities to meet an acceptable service level. The projects impose significant financial challenges for this small LGA which cannot absorb the total costs of the upgrades.

Due to the significant financial impacts of the drought on the Warrumbungle Shire community and the need to ensure the financial sustainability of Council's forward expenditure program it is requested that 75% funding be provided by the SSWP for project implementation.

Proposed funding capital contributions are provided in Table 3-4. As outlined in Section 3.5, these funding contributions will be revised at a later date to include cost estimates for all works.

Table 3-4: Proposed capital funding contributions

Stage	2021-22	2022-23	Total
Proposal capital costs	\$ 1,749,709	\$ 645,412	\$ 2,395,120
Funding Sources			
NSW Government (subject of this request)	\$ 1,312,282	\$ 484,059	\$ 1,796,340
Warrumbungle Shire Council	\$ 437,427	\$ 161,353	\$ 598,780
Sub-total	\$ 0	\$ 0	\$ 0
Request for funding	\$ 1,312,282	\$ 484,059	\$ 1,796,340

4 IMPLEMENTATION CASE

4.1 PROGRAM & MILESTONES

Council will use external project management services to deliver the project and external contractors and suppliers to design and construct the project. Council staff will provide operational, supervisory, design review and managerial support as required.

Subject to Section 60 approval and securing funding from the NSW government, the WTP upgrades are expected to commence in August 2021 and works are due to be completed by October 2022. A one-year 'defects and liability' period is included after which the plant is expected to be completely operational and have reached a "steady-state".

The timing of key milestones is given in Attachment 9 - Project timeline (Gantt Chart).

Council is ready to proceed with the design and approvals for the project. Once funding is approved, Council will appoint project management resources and commence development of the tender package for the works. The project is required as soon as possible on the basis of the risks posed by the current situation.

There is also a risk of cost escalation, particularly if the project is delayed. Cost estimates include 25% contingency and have been prepared by expert consultants with detailed industry knowledge. The new WTP will be delivered through a design and construct procurement method which will maximise the value for money achieved from the marketplace and provides the best opportunity to manage delivery risks through design.

4.2 GOVERNANCE

The project will be overseen by WSC with support from specialist engineering and construction contractors.

The Project Team will report to the General Manager of WSC and Council monthly. Decisions will be escalated in line with the established delegation of authority.

Project Sponsor: Director Environment and Development, WSC

Project Manager: External consultant

- Managing the Request for Tender process to determine the preferred contractor.
- Managing the preferred supplier's activities.
- Managing the Project Team.
- Reporting to the Project Director and Manager Warrumbungle Water.
- General project administration.

Project Director: Director Environment and Development, WSC

Key Stakeholders: Mendooran community, WSC Councillors, NSW Treasury, DI-Water

Design and Construction contractor: subject to tender.

The project is currently being managed by Cornelia Wiebels (Manager Warrumbungle Water) and overseen by Warrumbungle Shire Council.

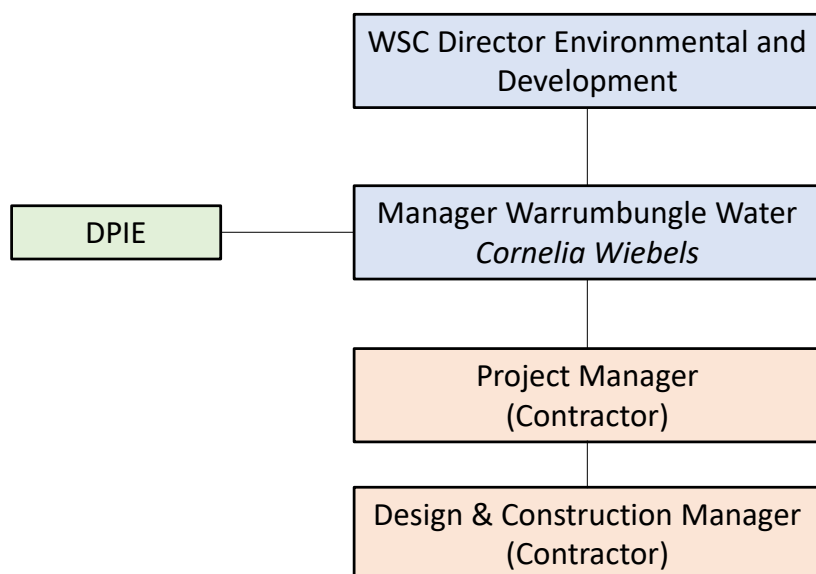


Figure 4-1 Governance Structure

4.3 KEY RISKS

Key risks include implementation delays due to poor weather or supply of goods and services. These are expected to be minor and will not significantly alter the success of the project.

The alternative to this project is the progressive refurbishment of the existing WTP when funding and resources permit. This is considered to be an inferior approach due to the non-compliance with drinking water guidelines and workplace health and safety requirements.

A risk assessment has been undertaken, considering areas of scope, construction, financing, planning and approvals, legal, property acquisitions, procurement, change and sustainability. Key risks to project delivery are provided in Table 4-1.

Table 4-1: Key proposal risks

Risk	Proposed mitigation	Risk rating after mitigation		
		Consequence	Likelihood	Rating
Funding from partners, including the NSW Government is not secured in part or whole	Identify alternative funding sources. Delay project	Severe	Possible	High
Unfavourable ground conditions increase geotechnical costs	Undertake early works to investigate geotechnical conditions.	Major	Possible	Moderate
Excessive workloads on Warrumbungle Water Manager	External Project Manager to be contracted Train other existing council staff to assist	Moderate	Likely	Moderate
Location of utilities e.g. bulk power supply not certain	Dial before you dig.	Moderate	Unlikely	Low – Moderate
Results from water quality monitoring necessitate change in scope.	Water monitoring currently being undertaken. Any recent monitoring results that would alter project scope to be immediately identified and added to scope as soon as possible.	Moderate	Unlikely	Low – Moderate
Covid-19 outbreaks delaying project delivery	Adaptive project management to prepare for and manage delays as they arise. Existing WTP to operate until project delivery.	Moderate	Possible	Moderate
Tenders above the budget	Develop pre-tender estimate based on industry benchmarking and first principal estimation. Review and revise project budget if required and seek and confirm funding prior to award of tender or scope change if required. Adopt an alternate specification for the WTP to reduce costs where practical.	Moderate	Unlikely	Low – Moderate
Inclement weather delaying project delivery	Ensure sufficient time contingency is included with the adopted construction program. Monitor the delays and determine impact on completion date. Council to construct all weather access prior to construction.	Minor	Possible	Low – Moderate
Quality: Defective work identified during or after contract period.	Ensure implementation of quality requirements during contract period (tests and certifications, ITPs of completed works submitted monthly with progress claims). Manage the defects promptly via defects register. Issue defects notice to Contractor to fix the defects within a stipulated time frame.	Minor	Unlikely	Low
Safety: Work involves high risk activities (work near water, deep excavation, earthworks) and contractor injured.	Review, approve and strictly implement project management plans. Ensure high risk activities are considered.	Moderate	Unlikely	Low -Moderate

Risk	Proposed mitigation	Risk rating after mitigation		
		Consequence	Likelihood	Rating
Environment: Damage to heritage or flora and fauna.	<p>Undertake a Review of Environmental Factors, including a detailed assessment of Aboriginal cultural heritage impacts from the works.</p> <p>Ensure contractor has a management plan and that this adequately addresses how to respond if heritage flora items are found in accordance with the REF.</p>	Minor	Unlikely	Low

4.4 LEGISLATIVE, REGULATORY ISSUES & APPROVALS

Section 125 of the *State Environmental Planning Policy (Infrastructure) 2007* (development without consent) is expected to apply to the proposal and assessment under Part 5 of the *Environmental Planning and Assessment Act, 1979* is expected to be required. The project is expected to result in minimal environmental impact as the location of the upgrade works is at the existing WTP site. Council will be the proponent and determining authority responsible for deciding whether to approve or proceed with the WTP upgrade.

Under Section 60 of the *Local Government Act 1993*, Council is required to obtain ministerial approval for the construction of the WTP upgrades. The Section 60 approval process and status of each step is discussed in Table 4-2.

Council has a preference to deliver the new WTP project via a single design and construct contract.

Table 4-2 Section 60 approval process

Step	Progress to date (April 2020)	Tasks to be completed as part of Detailed Design phase
1 – Initial consultation	SSWP V2 Council Snapshot for Initial Funding Meeting (8/12/2020) between WSC and DPIE.	-
2 – Options Study	<p>Site Constraint and Hazard Review Report (CWT, 2020a)</p> <p>Design Basis and Options Assessment Report (CWT, 2020c)</p> <p>A Preliminary Hazard Assessment Workshop was held in May 2020 comprising a desktop risk assessment to verify that the works proposed by the options study would be suitable to mitigate risks.</p>	-

Step	Progress to date (April 2020)	Tasks to be completed as part of Detailed Design phase
3 – Concept design	City Water Technology – Concept Design (2020). Documentation provided to DPIE-Water (18/11/2020). Feedback received from Michael Holmes (DPIE-Water) on 22 January 2021 with comments on: <ul style="list-style-type: none"> • Site Constraint and Hazard Review Report • Design Basis and Options Assessment Report • Upgrades Concept Design (Rep B) • Concept Design (Rep C) • Technical Specification • Upgrades Cost Estimates 	Ongoing liaison with DPIE. Revision of the Concept Design, Technical Specifications and Upgrades Cost Estimates incorporating comments from DPIE. Costs estimates for remaining work packages. Update of funding submission.
4 – Detailed design	Application for funding through SSWP. Delivery method, scope, cost estimate and program requirements (included in business case, Sections Error! Reference source not found. and Error! Reference source not found.).	Ongoing liaison with DPIE. Tendering and procurement of design and construct contractor. Detailed design. Draft detailed design report to be provided to DPIE. Revision of the Detailed Design incorporating any comments from DPIE.
5 – Approval	Program requirements included in Gantt chart (Attachment 10).	Ongoing liaison with DPIE. Provision of final detailed design report to DPIE. DPIE endorsement of detailed design.

4.5 PROPOSED MANAGEMENT ACTIVITIES

4.5.1 RISK MANAGEMENT

Risk monitoring of the project during the delivery phase will be the responsibility of the external Project Manager who will oversee the project. Key risks and risk activities identified by the Project Manager will be reported to the Manager Warrumbungle Water.

Should critical risks be identified by the Project Manager, Construction Manager or Designer, these shall be escalated immediately as per the governance structure (refer Figure 4-1).

A Risk Management Plan will be developed by the Project Team and will guide risk reporting, monitoring and mitigation activities during the delivery phase of the Project.

Day-to-day risk monitoring will be overseen by the Project Team, led by the Project Manager. Generally, key risks and risk activities will be reported through the governance structure monthly i.e. to the Director Environment and Development, Manger Warrumbungle Water and Councillors. Should critical risks be identified by the Project Team, these risks will be escalated immediately through the governance structure.

Key mitigation activities for reach project phase are provided below:

Pre-Construction:

- Service locations identified to inform design.
- Geotechnical survey and testing along the pipeline alignment.
- Construction rates include provisional allowances for latent conditions (i.e. rock and over excavation).

Construction:

- Appropriate time contingency included in the construction program.
- Management plans are implemented.

Post Construction:

- Regular inspection and testing in accordance with Council's asset management plan.

4.5.2 ASSET MANAGEMENT & OPERATIONS

WSC will be responsible for all maintenance, operation and ownership of the new assets associated with the proposed work packages. Council owns, operates and maintains the existing WTP as detailed in its Asset Management Plan. The WTP maintenance schedule will be modified as appropriate to include upgrade components and outcomes.

Council is committed to the ongoing operation and maintenance of the WTP as documented in Council's Operational Plan and Delivery Program 2020/21 – 2023/24.

References

- ABS, 2016, *Local Government Area, Indexes, SEIFA 2016* accessed: 30th March 2021 available at: <https://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/2033.0.55.0012016?OpenDocument#Publications>
- AECOM, 2014, *Drinking Water Management System – Warrumbungle Shire Council*
- CWT, 2020a, *Mendooran WTP Site Constraint and Hazard Review Report*
- CWT, 2020b, *Mendooran WTP Project Risk Management Plan*
- CWT, 2020c *The Mendooran WTP Design Basis and Options Assessment Report*
- CWT, 2020d, *Mendooran WTP Upgrades Concept Design*
- CWT, 2020e, *Mendooran Technical Specification for Mendooran WTP*
- CWT, 2020f, *Mendooran WTP Upgrade Cost Estimates*
- Hydrosphere Consulting, 2019a, *IWCM Issues Paper and Background information*
- Hydrosphere Consulting, 2019b, *IWCM Strategy – Draft Report*
- HunterH2O, 2020, *Warrumbungle Shire Council WTP Automation and Process Instrumentation Audit*
- Infrastructure NSW, 2018, *State Infrastructure Strategy 2018 – 2038*
- Warrumbungle Shire Council, 2017, *Asset Management Policy*
- Water Research Australia, 2019, *Good Practice Guide to the Operation of Drinking Water Supply Systems for the Management of Microbial Risk (Second Edition)*
- Water Services Association of Australia, 2015, *Drinking Water Source Assessment and Treatment Requirements - Manual for the Application of Health Based Targets*
- WEARS, 2017, *Reservoir Inspection Report MDN 2017-08 and WIS - Warrumbungle - Mendooran - Cobra Street - Visual Inspection*
- WEARS, 2019, *Mendooran Reservoir Upgrade Report 2019*