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Service Provider ID: 9

# **Drinking Water Quality Management Plan (DWQMP)**

## **ANNUAL REPORT 2022/2023**

## Glossary of terms

ADWG 2004	Australian Drinking Water Guidelines (2004). Published by the National Health and Medical Research Council of Australia
ADWG 2011	Australian Drinking Water Guidelines (2011). Published by the National Health and Medical Research Council of Australia
<i>E. coli</i>	<i>Escherichia coli</i> , a bacterium which is considered to indicate the presence of faecal contamination and therefore potential health risk
HACCP	Hazard Analysis and Critical Control Points certification for protecting drinking water quality
mg/L	Milligrams per litre
NTU	Nephelometric Turbidity Units
MPN/100mL	Most probable number per 100 millilitres
CFU/100mL	Colony forming units per 100 millilitres
<	Less than
>	Greater than

# 1. Introduction

This report documents the performance of Barcoo Shire Council's drinking water service with respect to water quality and performance in implementing the actions detailed in the drinking water quality management plan (DWQMP) as required under the *Water Supply (Safety and Reliability) Act 2008* (the Act).

The report assists the Regulator to determine whether the approved DWQMP and any approval conditions have been complied with and provides a mechanism for providers to report publicly on their performance in managing drinking water quality.

This template has been prepared in accordance with the *DWQMP report guidance note* published by the Department of Natural Resources, Mines and Energy, Queensland, accessible at [www.business.qld.gov.au/industries/mining-energy-water/water/industry-infrastructure/industry-regulation/drinking-water/annual-report](http://www.business.qld.gov.au/industries/mining-energy-water/water/industry-infrastructure/industry-regulation/drinking-water/annual-report).

# 2. Overview of Operations

Barcoo Shire incorporates the towns of Jundah, Stonehenge and Windorah, and covers an expanse of 61,974 sq km. The population of the shire is approximately 312 (ABS 2021). The administration centre of Barcoo Shire is 220 km south of Longreach in the township of Jundah.

Barcoo Shire Council is a small drinking water service provider as defined under the Act and provides drinking water to a population of approximately 190 people. Each town is serviced by dual water reticulation, a treated, potable water supply as well as an untreated non-potable supply.

Barcoo Shire Council is responsible for the following water supply schemes:

- **Jundah**

Raw water is sourced from a nearby waterhole on the Thomson River. This river water is coagulated and treated by conventional sedimentation and rapid sand filtration in a package module. After chlorination, it transfers to a ground level reservoir and from there it is pumped into a high-level reservoir which supplies the town.

Bore water is stored in a small ground level reservoir prior to treatment in the reverse osmosis plant and transfers to the same ground level reservoir as the treated river water. The reverse osmosis plant hasn't been in operation since November 2014.

- **Windorah**

Raw water is sourced from two nearby waterholes on the Cooper Creek. This river water is treated through processes including optional pre dosing of chlorine for oxidation of metals, optional PAC dosing predominantly for taste and odour removal, pH adjustment if required, coagulation with ACH, sedimentation, mixed media filtration, UV disinfection and gas chlorination (multiple cylinders in duty/ standby configuration). The plant is fully controlled by SCADA.. After chlorination, it transfers to a ground level reservoir and from there it is pumped into a high-level reservoir which supplies the town.

- **Stonehenge**

Raw water is sourced from a nearby waterhole on the Thomson River and is pumped to an off-stream storage during river flows. Water from the off-stream storage is pumped, with addition of coagulant, to a small floc-sed unit and then into a flow balance tank. The water then passes through a pressure filter and is chlorinated before being transferred to a ground level reservoir from which it is pumped into a high-level reservoir which supplies the town.

### 3. Actions taken to implement the DWQMP

#### **Progress in implementing the risk management improvement program**

Refer to the Appendices for a summary of progress in implementing each of the Improvement Program actions.

#### **Revisions made to the operational monitoring program to assist in maintaining the compliance with water quality criteria<sup>1</sup> in verification monitoring.**

No revisions were made to the operational monitoring program in 2022/23.

#### **Amendments made to the DWQMP**

A full review was undertaken of the DWQMP in June 2023, with an application to amend the DWQMP being submitted on 8 November 2023. The amendments were made to:

- Include updates to reflect the commissioning of the new WTP at Windorah as follows:
  - Infrastructure details
  - Risk assessment and management measures
- Minor updates to:
  - Reflect current dilution practice for sodium hypochlorite use
  - Include latest operational monitoring results
  - Include latest details of drinking water incidents
  - Reflect current staff position titles

### 4. Compliance with water quality criteria for drinking water

The water quality criteria mean health guideline values in the most current Australian Drinking Water Guidelines, as well as the standards in the Public Health Regulation 2005. Refer to Appendix A for the monitoring results.

### 5. Notifications to the Regulator under sections 102 and 102A of the Act

This financial year there were five (5) instances where the Regulator was notified under sections 102 or 102A of the Act.

#### **Non-compliances with the water quality criteria and corrective and preventive actions undertaken**

On 13/4/2023 the notification of elevated readings for chlorate (1.4 NTU) and THMs (280 µg/L) was made for Jundah. The elevated readings were identified during routine monitoring for these two parameters. Upon detection, the relevant water mains were flushed and a fresh batch of chlorine made, with follow up testing undertaken until readings returned to the required levels.

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<sup>1</sup> Refer to *Water Quality and Reporting Guideline for a Drinking Water Service* for the water quality criteria for drinking water.

## Prescribed incidents or Events reported to the Regulator and corrective and preventive actions undertaken.

On 3/1/2023 the notification of a drinking water event was made for Stonehenge. The incident occurred due to an issue with fluctuating electrical supply and the raw water inlet valve to the WTP being stuck in the open position. This resulted in high turbidity readings in the treated water storage tanks. Upon detection, the WTP was shut down, the affected storages drained and cleaned as well as the clarifier. The filter was then backwashed before the WTP was started up again. A boiled water alert was issued and testing for *E. Coli* was undertaken until turbidity readings were brought back to the required levels. The faulty valve was replaced and the incident was concluded on 18/1/2023.

On 19/1/2023 the notification of a detection of *E. Coli* was made for Windorah. The incident was identified during routine testing on treated water from the elevated storage tank. Upon detection, the chlorine dosage was increased to the affected tank and additional testing undertaken. The incident was concluded on 27/1/2023.

On 2/5/2023 the notification of a drinking water event was made for Jundah. This incident was identified during routine operational monitoring which identified high turbidity in the treated water storage tanks. Upon detection, the affected storage tank was drained and cleaned. A fault in the coagulant dosing system was found to be the cause of the problem and was rectified immediately. A boiled water alert was issued and testing for *E. Coli* was undertaken until turbidity readings were brought back to the required levels. Flushing of water mains and additional filter backwashing was also undertaken. The incident was concluded on 8/5/2023.

On 23/5/2023 the notification of a drinking water event was made for Jundah. This incident was identified during routine operational monitoring which identified high turbidity in the treated water storage tanks. Upon detection, extra backwashing of the filters was undertaken until turbidity readings were brought back to the required levels. The incident was concluded on 6/10/2023.

## 6. Customer complaints related to water quality

Barcoo Shire Council is required to report on the number of complaints, general details of complaints, and the responses undertaken.

Throughout the year, the following complaints about water quality were received:

**Table 1 - complaints about water quality, (including per 1000 customers)**

	Suspected Illness	Discoloured water	Taste and odour	Total
Jundah	0	0	0	0
Windorah	0	0	0	0
Stonehenge	0	0	0	0
Total	0	0	0	0

### Suspected Illness

Nil

### Discoloured water

Nil

### Taste and odour

Nil

## 7. Findings and recommendations of the DWQMP auditor

No audit of the DWQMP was undertaken in 2022/23.

## 8. Outcome of the review of the DWQMP and how issues raised have been addressed

A full review was undertaken of the DWQMP in June 2023, with an application to amend the DWQMP being submitted on 8 November 2023. The amendments were made to:

- Include updates to reflect the commissioning of the new WTP at Windorah as follows:
  - Infrastructure details
  - Risk assessment and management measures
- Minor updates to:
  - Reflect current dilution practice for sodium hypochlorite use
  - Include latest operational monitoring results
  - Include latest details of drinking water incidents
  - Reflect current staff position titles

## Appendix A – Summary of compliance with water quality criteria

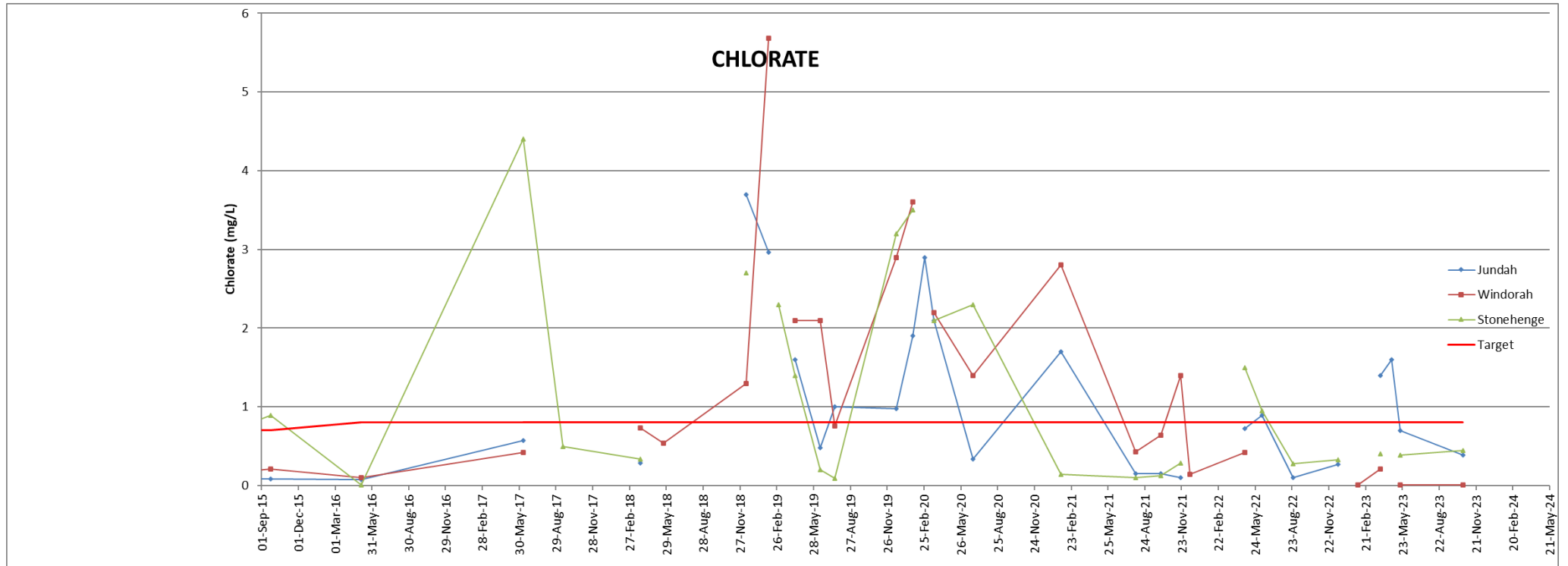
The results from the verification monitoring program have been compared against the levels of the water quality criteria specified by the Regulator in the *Water Quality and Reporting Guideline for a Drinking Water Service*.

The reported statistics do not include results derived from repeat samples, or from emergency or investigative samples undertaken in response to an elevated result.

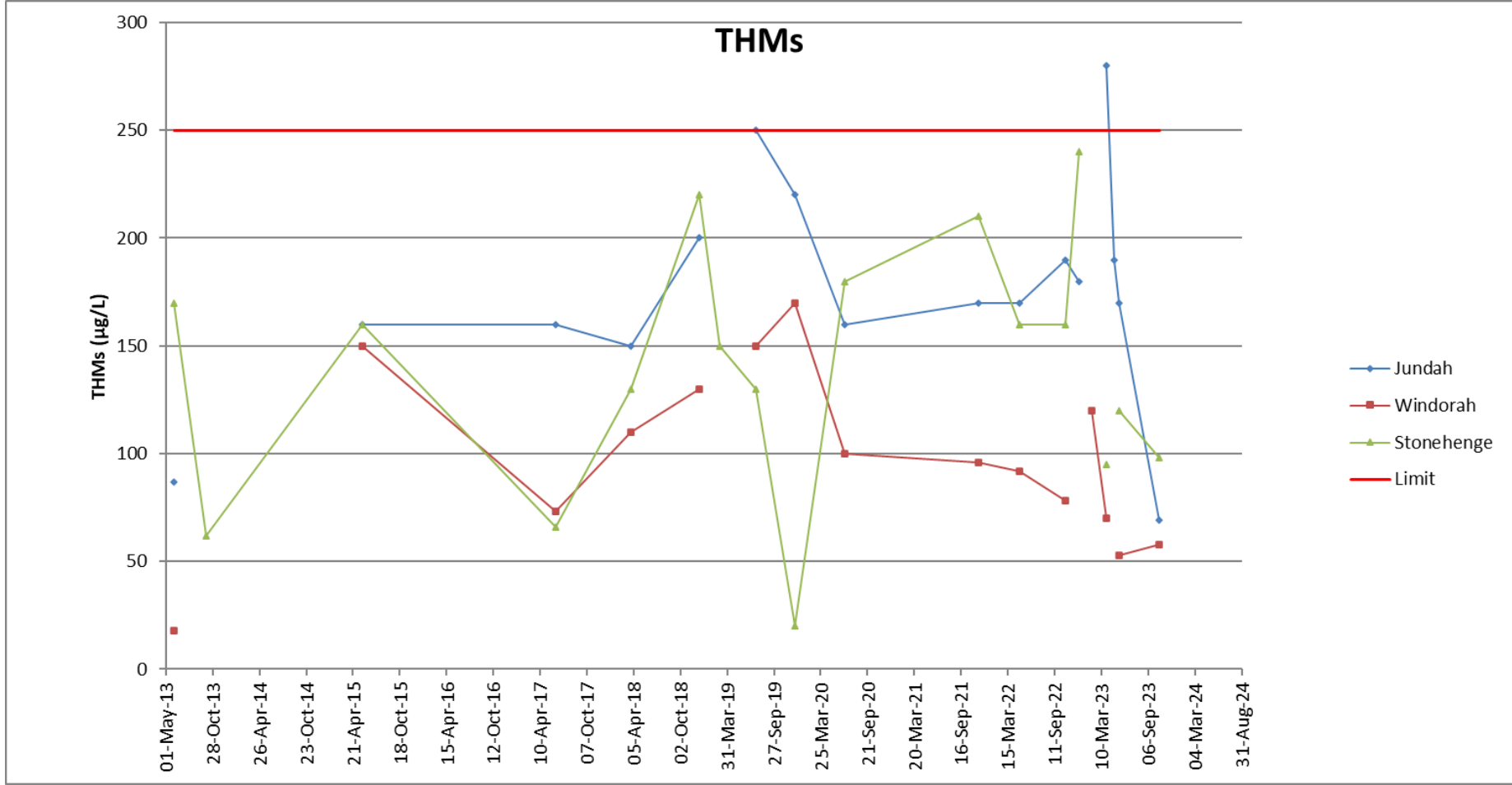
The verification monitoring did not meet the requirements as stated in the DWQMP on the following occasions:

- The fortnightly testing for *E. Coli* in Jundah wasn't undertaken in July 2022 & September 2022 and only once in December 2022 & April 2023
- The fortnightly testing for *E. Coli* in Windorah was only undertaken once in June 2023

Table 2 - Verification monitoring results

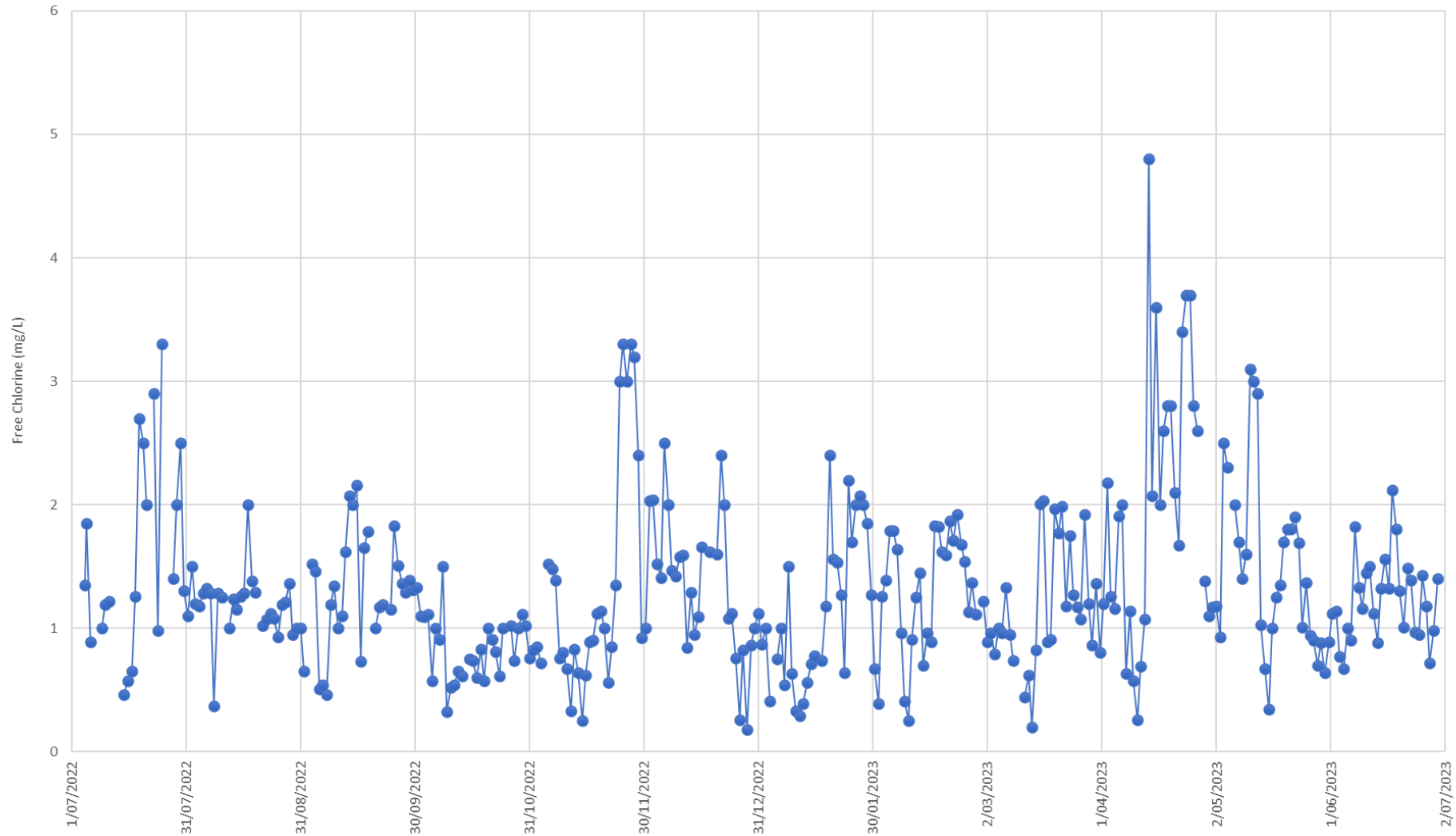






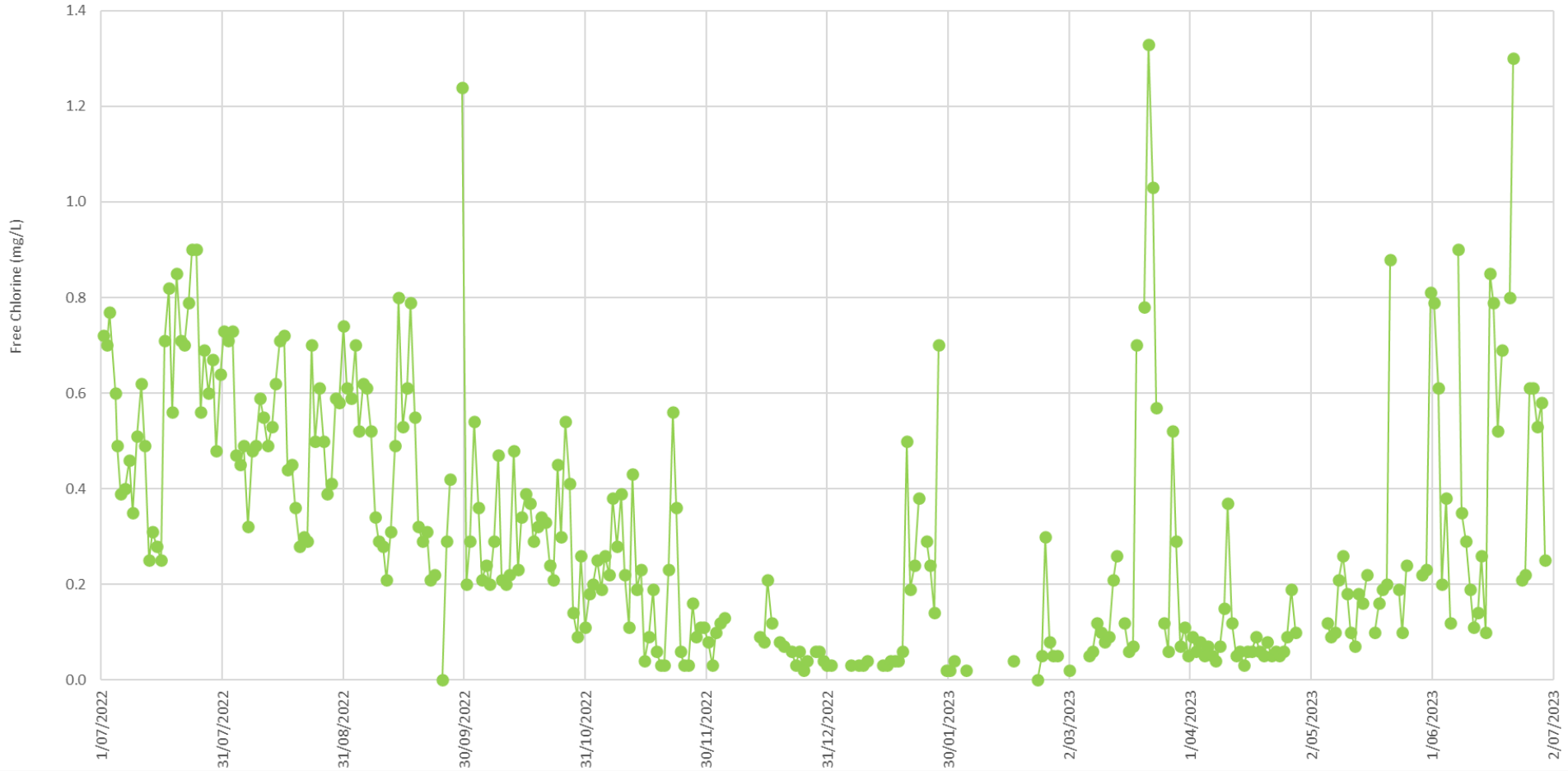
# FREE CHLORINE IN RETICULATION NETWORK

Free chlorine - Jundah



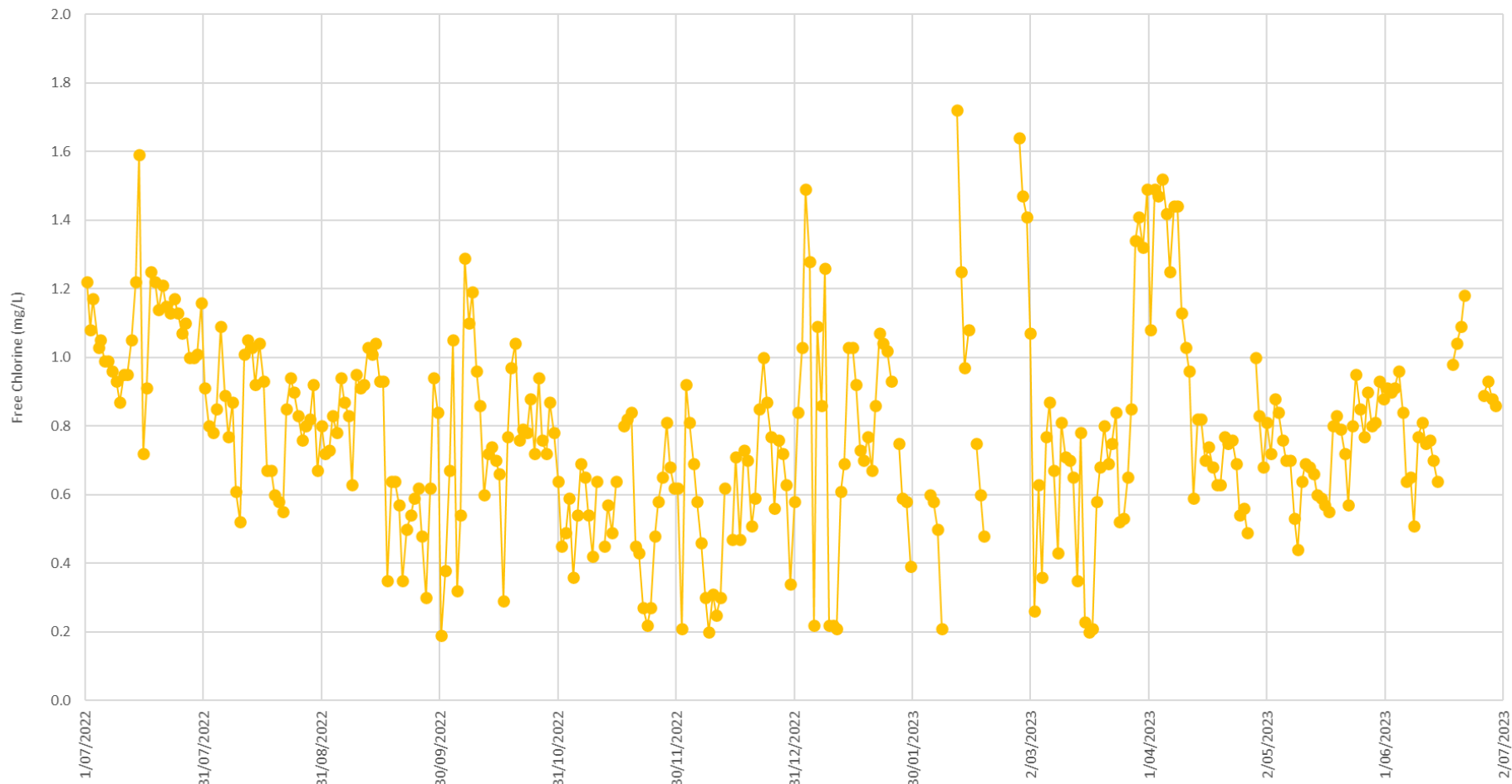
# FREE CHLORINE IN RETICULATION NETWORK

Free chlorine - Windorah



# FREE CHLORINE IN RETICULATION NETWORK

Free chlorine - Stonehenge



**Table 3 - Reticulation *E. coli* verification monitoring**

**CALCULATE PERCENTAGE USING A TWELVE (12) MONTH 'ROLLING' ANNUAL VALUE**

The *Public Health Regulation 2005* (the regulation) requires that 98 per cent of samples taken in a 12 month period should contain no *E. Coli*. This requirement is referred to as the 'annual value' in Schedule 3A of the regulation.

This requirement comes into effect once you have 12 months data and should be assessed every month based on the previous 12 months data (so that it is a 'rolling' assessment).

Drinking water scheme: Jundah

Year	2022 to 2023											
Month	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
No. of samples collected	0	12	0	13	8	4	8	8	8	4	8	10
No. of samples collected in which <i>E. coli</i> is detected (i.e. a failure)	0	0	0	0	0	0	0	0	0	0	0	0
No. of samples collected in previous 12 month period	86	90	83	95	92	88	88	88	85	85	85	83
No. of failures for previous 12 month period	4	4	4	4	4	4	0	0	0	0	0	0
% of samples that comply	95.3%	95.6%	95.2%	95.8%	95.7%	95.5%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Compliance with 98% annual value	NO	NO	NO	NO	NO	NO	YES	YES	YES	YES	YES	YES

**CALCULATE PERCENTAGE USING A TWELVE (12) MONTH 'ROLLING' ANNUAL VALUE**

The *Public Health Regulation 2005* (the regulation) requires that 98 per cent of samples taken in a 12 month period should contain no *E. Coli*. This requirement is referred to as the 'annual value' in Schedule 3A of the regulation.

This requirement comes into effect once you have 12 months data and should be assessed every month based on the previous 12 months data (so that it is a 'rolling' assessment).

Drinking water scheme: Windorah

Year	2022 to 2023											
Month	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
No. of samples collected	4	8	8	8	12	4	12	4	8	12	8	4
No. of samples collected in which <i>E. coli</i> is detected (i.e. a failure)	0	0	0	0	0	0	1	0	0	0	0	0
No. of samples collected in previous 12 month period	84	88	88	92	92	92	96	92	88	96	100	92
No. of failures for previous 12 month period	0	0	0	0	0	0	1	1	1	1	1	1
% of samples that comply	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.0%	98.9%	98.9%	99.0%	99.0%	98.9%
Compliance with 98% annual value	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

**CALCULATE PERCENTAGE USING A TWELVE (12) MONTH 'ROLLING' ANNUAL VALUE**

The *Public Health Regulation 2005* (the regulation) requires that 98 per cent of samples taken in a 12 month period should contain no *E. Coli*. This requirement is referred to as the 'annual value' in Schedule 3A of the regulation.

This requirement comes into effect once you have 12 months data and should be assessed every month based on the previous 12 months data (so that it is a 'rolling' assessment).

Drinking water scheme: Stonehenge

Year	2022 to 2023											
Month	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
No. of samples collected	4	12	4	12	8	4	12	8	8	8	8	8
No. of samples collected in which <i>E. coli</i> is detected (i.e. a failure)	0	0	0	0	0	0	0	0	0	0	0	0
No. of samples collected in previous 12 month period	97	101	97	105	101	97	101	96	92	96	96	96
No. of failures for previous 12 month period	0	0	0	0	0	0	0	0	0	0	0	0
% of samples that comply	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Compliance with 98% annual value	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

**CALCULATE PERCENTAGE USING A TWELVE (12) MONTH 'ROLLING' ANNUAL VALUE**

The *Public Health Regulation 2005* (the regulation) requires that 98 per cent of samples taken in a 12 month period should contain no *E. Coli*. This requirement is referred to as the 'annual value' in Schedule 3A of the regulation.

This requirement comes into effect once you have 12 months data and should be assessed every month based on the previous 12 months data (so that it is a 'rolling' assessment).

## Appendix B – Implementation of the DWQMP Risk Management Improvement Program



**Table 4 – Progress against the risk management improvement program in the approved DWQMP**

# JUNDAH

Process Step	Primary hazard	Source of Hazard/Event	Primary Preventive Measure	Residual Risk		RMIP			Comments	Status
				Risk Level	Immediate	Short Term	Long Term			
Water source - Thomson River	Protozoa (Crypto/Giardia) (Source Water)	On-site sewage management system discharges and failures	Media Filter	Extreme 20	Purchase turbidity meter - install as soon as possible. Undertaking potholing as first stage of developing shovel ready treatment plant upgrade proposal	Install turbidity meter and re-establish SMS alarms immediately on installation. Replace filter media with sand and GAC. Prepare concept plan for new water treatment plant for funding applications. Investigate UV disinfection	If turbidity remains high with new filter media, consider need for UV disinfection prior to new treatment plant. New treatment plant with monitoring and control if funding requests are successful		New meter purchased and installed. SMS alarms still to be completed. Filter media replaced in September 2023. Potholing completed. Council has secured funding to develop the design of a replacement WTP. Expected to be completed in March 2024.	
Water source - Thomson River	Protozoa (Crypto/Giardia) (Source Water)	Unrestricted access to livestock or wild/feral animals/birds	Media Filter	Extreme 20	Purchase turbidity meter - install as soon as possible. Undertaking potholing as first stage of developing shovel ready treatment plant upgrade proposal	Install turbidity meter and re-establish SMS alarms immediately on installation. Replace filter media with sand and GAC. Prepare concept plan for new water treatment plant for funding applications. Investigate UV disinfection	If turbidity remains high with new filter media, consider need for UV disinfection prior to new treatment plant. New treatment plant with monitoring and control if funding requests are successful		New meter purchased and installed. SMS alarms still to be completed. Filter media replaced in September 2023. Potholing completed. Council has secured funding to develop the design of a replacement WTP. Expected to be completed in March 2024.	
Water source - Thomson River	Bacteria/ Virus (Source Water)	Flood event, storm flow	Chlorine	Medium 6	Install chlorine meter	Prepare concept plan for new water treatment plant for funding applications. Consider gas chlorination/ Investigate UV disinfection			New meter purchased and installed. Council has secured funding to develop the design of a replacement WTP. Expected to be completed in March 2024.	
Water source - Thomson River	Turbidity	Drought, bushfire, runoff	Coag and settling tank	High 12	Undertaking potholing as first stage of developing shovel ready treatment plant upgrade proposal	Prepare concept plan for new water treatment plant for funding applications	New treatment plant with monitoring and control if funding requests are successful	Filter performance not able to be accurately determined due to lack of online monitoring.	Potholing completed. Council has secured funding to develop the design of a replacement WTP. Expected to be completed in March 2024.	
Water source - Thomson River	Colour	Naturally occurring in raw water		High 12	Undertaking potholing as first stage of developing shovel ready treatment plant upgrade proposal	Prepare concept plan for new water treatment plant for funding applications	New treatment plant with monitoring and control if funding requests are successful	Historical WQ data indicates high raw water true colour	Potholing completed. Council has secured funding to develop the design of a replacement WTP. Expected to be completed in March 2024.	
Poly dosing	Turbidity	Pump failure/underdosing	Daily checks	Medium 9		new treatment plant to have specifications for duty standby pumps		Nalco 8103 plus used as the coagulant. Robust performance over range of turbidity expected. Currently, coagulant is dosed with daily turbidity check only analysis of performance	Development of specifications yet to commence.	
Poly dosing	Turbidity	Overdosing	Daily checks	Medium 6		new treatment plant to have specifications for duty standby pumps			Development of specifications yet to commence.	
Media Filter	Protozoa (Crypto/Giardia) (Source Water)	Inadequate filter operation or backwashing, mudball formation	Filter backwash	Extreme 20	Purchase turbidity meter - install as soon as possible. Undertaking potholing as first stage of developing shovel ready treatment plant upgrade proposal	Install turbidity meter and re-establish SMS alarms immediately on installation. Replace filter media with sand and GAC. Prepare concept plan for new water treatment plant for funding applications. Investigate UV disinfection	If turbidity remains high with new filter media, consider need for UV disinfection prior to new treatment plant. New treatment plant with monitoring and control if funding requests are successful	Potential evidence of filter operational issues. Filter media needs replacing. Chlorination effectiveness unlikely to be impacted, but cryptosporidium removal could not be guaranteed.	New meter purchased and installed. SMS alarms still to be completed. Filter media replaced in September 2023. Potholing completed. Council has secured funding to develop the design of a replacement WTP. Expected to be completed in March 2024.	
Media Filter	Turbidity	Media loss	Media level testing	Medium 9		Replace media			Filter media replaced in September 2023.	
Chlorine dosing	Bacteria/ Virus (Reticulation)	Pump failure/underdosing	Chlorine dosing, daily checks	Extreme 20	Purchase chlorine meter - install as soon as possible. Undertaking potholing as first stage of developing shovel ready treatment plant upgrade proposal	Install chlorine meter and re-establish SMS alarms to operators. Prepare concept plan for new water treatment plant for funding applications	New treatment plant with monitoring and control if funding requests are successful	Single dosing pump and reliant on operator to identify issues. Historically a high chlorine dose would have mitigated a short term failure, but with need to reduce dose to mitigate chlorate, the risk of underdosing is higher.	New meter purchased and installed. SMS alarms still to be completed. Council has secured funding to develop the design of a replacement WTP. Expected to be completed in March 2024.	
Chlorine dosing	Chlorine	Overdosing	Chlorine concentration manual daily checks	Medium 9	Purchase chlorine meter - install as soon as possible.	Install chlorine meter and re-establish SMS alarms to operators. Prepare concept plan for new water treatment plant for funding applications	New treatment plant with monitoring and control if funding requests are successful	Elevated free chlorine in network unlikely due to excessive detention time in clear water tank and reservoir before distribution to network, resulting in excessive chlorine deterioration, especially in higher temperatures. Chlorine differential between two tanks can be as high as 6 mg/L between the clear water tank and the reservoir. Based on dosing rates, total chlorine levels in network need to be explored	New meter purchased and installed. SMS alarms still to be completed. Council has secured funding to develop the design of a replacement WTP. Expected to be completed in March 2024.	
Chlorine dosing	Chlorate	Breakdown of chlorine solution	Active management of chlorine stocks	High 12	Dilution of stock solution, and change in monitoring to target fresh batches to allow for disposal of out of specification chemical if necessary.	Prepare concept plan for new water treatment plant for funding applications	New treatment plant with monitoring and control if funding requests are successful	Chlorate management has to be balanced against effective disinfection.	Change to batching of chlorine solution has been implemented and refined. Council has secured funding to develop the design of a replacement WTP. Expected to be completed in March 2024.	
Reservoir	Bacteria/ Virus (Reticulation)	Excessive water detention leading to chlorine deterioration	System integrity	Medium 6	Main break repair to include requirement for disinfection by either addition of granular chlorine to repaired section, or by increasing chlorine from treatment plant and flushing chlorine through the reticulation network	Replace blue treated water reservoir.			Mains disinfection covered in 'Disinfection of Water Mains (potable supply)' procedure. Council has secured funding to replace the blue treated water reservoir with work planned for completion by June 2024.	
Reticulation	Taste and odour	Stagnation	Removal of dead ends, ring main circuit	Low 1		Complete installation of scour valves		Currently undertaking program of fitting of scour valves to enable scouring	Ongoing with funding in the 2023/24 budget	
Whole of system	All hazards	Inadequate online monitoring or control	Inline turbidity and chlorine meter	High 15		Investigate replacing turbidity and chlorine meters on old plant or progress new treatment plant funding applications.		Turbidity analyser not operational during site visit due to calibration issues. Difficulty in accessing calibration standards due to isolated locality. Chlorine and turbidity inline analysers recently checked against handheld meters, inline meter accuracy issues detected	New meter purchased and installed. Council has secured funding to develop the design of a replacement WTP. Expected to be completed in March 2024.	
Whole of system	All hazards	Inadequate operators/staff training	WTP operators completed Cert III in water industry treatment	Medium 8		Currently manage. Ensure contingency planning if operators move on.		Risk is when main operators are on leave - however have increased level of training so that there are 2 main operators a third trained person.	Additional staff trained in WTP operation and Cert III	
Whole of system	All hazards	Not having operational procedures developed/available	DWQMP procedures developed	High 15	Ensure all CCP traffic light procedures are laminated and present in the treatment plant.				Completed	

# WINDORAH

Process Step	Primary hazard	Source of Hazard/Event	Primary Preventive Measure	Residual Risk	RMIP			Comments	Status
				Risk Level	Immediate	Short Term	Long Term		
Water source - Cooper Creek Waterholes	Protozoa (Crypto/Giardia) (Source Water)	Septic system overflows, discharges and failures	Media Filter	Extreme 20		New Treatment plant in construction, will be commissioned in early 2022. Multiple barriers, full SCADA control.		Backwash manually instigated. Backwash based on turbidity, or minimum frequency of every second day. Filter performance currently not meeting ADWG threshold for effective filter performance for protozoa removal (<0.2 NTU)	New WTP commissioned in October 2022.
Water source - Cooper Creek Waterholes	Protozoa (Crypto/Giardia) (Source Water)	Unrestricted access to livestock or wild/feral animals/birds	Media Filter	Extreme 20		New Treatment plant in construction, will be commissioned in early 2022. Multiple barriers, full SCADA control.		Cattle able to access raw water source. Campers often located adjacent to raw water off-takes	Please see above
Water source - Cooper Creek Waterholes	Colour	Naturally occurring in raw water	Mixed media filter (activated carbon)	High 12		New Treatment plant in construction, will be commissioned in early 2022. Multiple barriers, full SCADA control.		Historical WQ data indicates high raw water true colour	Please see above
Coagulation /flocculation	Turbidity	Inadequate mixing or inadequate clarifier detention time	Static inline mixer; flow limited at approx. 2.3 L/s	High 12		New Treatment plant in construction, will be commissioned in early 2022. Multiple barriers, full SCADA control.		Carry-over of floc currently occurring from settling tank	Please see above
Media Filter	Protozoa (Crypto/Giardia) (Source Water)	Inadequate filter operation or backwashing, mudball formation	Daily turbidity monitoring	Extreme 20		New Treatment plant in construction, will be commissioned in early 2022. Multiple barriers, full SCADA control.		Following on from backwash, filter media does not settle well. Currently having issues with in-line turbidity meter. Average filter output turbidity 0.39 NTU, with 95th percentile 0.72 NTU	Please see above
Media Filter	Protozoa (Crypto/Giardia) (Source Water)	Excessive filter flow rates, filter preferential flow	Filter flow rate limited by plant design	High 10		New Treatment plant in construction, will be commissioned in early 2022. Multiple barriers, full SCADA control.		Backwash currently manually operated. Backwash tank fed from high level res. Backwash tank has large amount of algal growth	Please see above
Media Filter	Turbidity	Media loss	Media inspection and replacement	High 10		New Treatment plant in construction, will be commissioned in early 2022. Multiple barriers, full SCADA control.		Filter media periodically replaced	Please see above
Chlorine dosing	Bacteria/ Virus (Reticulation)	Pump failure/underdosing	Spare chlorine dosing pump maintained on-site	Extreme 20		New Treatment plant in construction, will be commissioned in early 2022. Multiple barriers, full SCADA control.		Need to record chlorine dosing rate. Chlorine sampling and testing issues (refer to discussion below)	Please see above
Chlorine dosing	Bacteria/ Virus (Reticulation)	Inadequate chlorine c.t.	Clear water tank and reservoir	High 10		New Treatment plant in construction, will be commissioned in early 2022. Multiple barriers, full SCADA control.		Maintaining chlorine dosing above 0.7 mg/L ensures adequate chlorine c.t. Current WTP target chlorine dosing threshold = 1.5 mg/L.	Please see above
Chlorine dosing	Chlorate	Excessive storage tank detention	Water storage turnover	High 12	Dilution of sodium hypochlorite stocks 200L to 600 L. Ensure Ct in clear water tank, not aim for residual in town in Summer 2021	Gas chlorination as part of new WTP to be commissioned in 2022.		Current dosing post-filter causes large amounts of chlorine degradation, especially in summer, resulting in excessive chlorine dosing, but inadequate chlorine in network. This is also contributing to elevated chlorate concentrations.	Gas chlorination implemented with new WTP commissioning in October 2022.
Clear water tank/reservoir	Protozoa (Crypto/Giardia) (Retic)	Animal access including birds, amphibians, reptiles or rodents	Tank hatches	High 15		New Treatment plant in construction, will be commissioned in early 2022. Multiple barriers, full SCADA control.		Unprotected access to clear water tank identified during site visit. Swallows currently nesting under clear water tank platform	Please see above
Reticulation	Bacteria/ Virus (Reticulation)	New mains	New mains hygiene practices	High 15		New Treatment plant in construction, will be commissioned in early 2022. Multiple barriers, full SCADA control.		Fittings were seen during site visit stowed under bird nests beneath high level tank, with bird faecal matter observed on the fittings	Please see above
Whole of system	All hazards	Inadequate online monitoring or control	Inline turbidity and chlorine meter	High 15		New Treatment plant in construction, will be commissioned in early 2022. Multiple barriers, full SCADA control.			Please see above
Whole of system	All hazards	Not having operational procedures developed/available	DWQMP procedures developed	High 15		New Treatment plant in construction, will be commissioned in early 2022. Multiple barriers, full SCADA control. Operators to be trained on new plant as part of commissioning.			Please see above

# STONEHENGE

Process Step	Primary hazard	Source of Hazard/Event	Primary Preventive Measure	Residual Risk	RMIP			Comments	Status
				Risk Level	Immediate	Short Term	Long Term		
Water source - Thomson River Weir	Protozoa (Crypto/Giardia) (Source Water)	On-site sewage management system discharges and failures; Unrestricted access to livestock or wild/feral animals/birds	GAC filter	Extreme 20	Obtain costings for UV unit and present to Council	Replacement of GAC filter with media filtration		New treatment plant with monitoring and control considered in long term planning. Not yet sufficiently progressed to identify in improvement plan.	Design/specifications for upgrading of filtration planned to be completed by March 2024. UV disinfection to be included subject to available funding and available power supply.
Pressure filter	Protozoa (Crypto/Giardia) (Source Water)	Inadequate filter operation or backwashing	Turbidity monitoring	Extreme 20	Purchase turbidity meter. Obtain costings for UV unit and present to Council	Install meter as soon as received and reinstate SMS alarms. Replacement of GAC filter with media filtration.			New meter purchased and installed. SMS alarms still to be completed.  Design/specifications for upgrading of filtration planned to be completed by March 2024. UV disinfection to be included subject to available funding and available power supply.
Pressure filter	Protozoa (Crypto/Giardia) (Source Water)	Excessive filter flow rates, filter preferential flow	Turbidity monitoring	High 10	Purchase turbidity meter. Obtain costings for UV unit and present to Council	Install meter as soon as received and reinstate SMS alarms. Replacement of GAC filter with media filtration.			New meter purchased and installed. SMS alarms still to be completed.  Design/specifications for upgrading of filtration planned to be completed by March 2024. UV disinfection to be included subject to available funding and available power supply.
Chlorine dosing	Bacteria/ Virus (Reticulation)	Pump failure/underdosing	Critical control points with daily grab samples	Extreme 20	Purchase chlorine meter	Installing a chlorine meter and reinstate SMS alarms			New meter purchased and installed. SMS alarms still to be completed.
Chlorine dosing	Chlorine	Overdosing	CCP with daily grab samples	Medium 9	Purchase chlorine meter	Installing a chlorine meter and reinstate SMS alarms			New meter purchased and installed. SMS alarms still to be completed.
Chlorine dosing	Bacteria/ Virus (Reticulation)	Inadequate chlorine c.t.	Clear water tank plus high level tank ensures adequate c.t.	Medium 6	Purchase chlorine meter	Installing a chlorine meter and reinstate SMS alarms		Chlorine CT validated in this recent update to the DWQMP	New meter purchased and installed. SMS alarms still to be completed.
Chlorine dosing	Chlorate	Excessive storage tank detention		High 12	Re-batch chlorine every week. Make new batch in a new storage container, and dispose of old solution and clean old container. Monitor 3 monthly, and source new chlorine if chlorate levels increase above 0.8 mg/L.	Consider UV and or chlorine gas as disinfection method			Change to batching of chlorine solution has been implemented and refined.  Design/specifications for upgrading of filtration planned to be completed by March 2024. UV disinfection to be included subject to available funding and available power supply.
Whole of system	All hazards	Inadequate online monitoring or control	Daily operator monitoring	High 15	Within 6 weeks order turbidity and chlorine meters	Install turbidity meters as soon as received and reinstate SMS alarms.	Determine long term strategy for Stonehenge as new treatment plant may be better than retrofitting full SCADA control on current WTP.		New meter purchased and installed. SMS alarms still to be completed.  Long term replacement options to be considered once upgrading of filtration is completed.
Whole of system	All hazards	Not having operational procedures developed/available	DWQMP procedures developed	High 15	Ensure all CCP traffic light procedures are laminated and present in the treatment plant.				Completed