



BOULIA SHIRE COUNCIL
DWQMP ANNUAL REPORT
2021- 2022 FINANCIAL YEAR

Drinking Water Service Provider ID - 18

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1.0 INTRODUCTION

This is the Drinking Water Quality Management Plan (DWQMP) Annual Report for Boulia Shire Council (BSC) for the financial year 2021- 2022. This annual report will assist the Regulator to determine whether the approved DWQMP and any approval conditions have been complied with. It further provides a mechanism for service providers to report publicly on their performance in managing drinking water quality.

BSC is a registered Service Provider with Identification (SPID) number 18. BSC operates under an approved DWQMP to ensure consistent supply of safe quality drinking water in order to protect public health. This is done through proactive identification and minimisation of public health related risks associated with drinking water.

This DWQMP report includes:

- Activities undertaken over the financial year in operating Council's drinking water service
- Drinking water quality summary
- A summary of Council's performance in implementing the approved DWQMP
- Incidents reported to the Regulator
- Customer complaints
- Review outcomes and audit findings.

This report will be made available publicly to Council customers through the website or upon request at the Council offices.

2.0 SUMMARY OF SCHEME/S OPERATED

Boulia Shire covers an area of 61,635 km² with a permanent population of approximately 470 people. There are two operational water schemes in the shire in the towns of Boulia and Urandangi. The administration centre of the shire is in Boulia. The two water schemes source water from shallow sub-artesian bores less than 100m deep. These bores yield relatively low volumes of water with 5 bores required to supply Boulia's water needs.

Table 1: Summary of Schemes.

Scheme	Water Source	Treatment	Pop. Served	No. Conns	Demand
Boulia	Sub-Artesian Bore Water	Chlorination	300	119	770 KL/d
Urandangi	Sub-Artesian Bore Water	Chlorination	25	19	61 KL/d

3.0 DWQMP IMPLEMENTATION

The implementation of BSC's DWQMP has provided Council with an operational framework to manage the water supply systems of Boulia and Urandangi. The operational systems implemented have allowed personnel to optimise water quality within the distribution systems of Boulia and Urandangi. The risk management components of the DWQMP have been a priority for BSC for providing a safe and reliable water source for the local population.

Table 2 below provides a status summary of the Risk Management Improvement Programme, this program is an integral part of the DWQMP as it identifies the main risk factors and mitigation measures associated with Council's drinking water schemes.

Finally, it should be noted that Council's DWQMP was submitted for Amendment in February 2022, however, the Amendment was not approved until after the end of the 2021-22 financial year and therefore some items contained within this report may be out of date and have since been updated in the approved 2022 Amendment.

Table 2: Boulia Shire Council Risk Management Improvement Program Implementation Status.

Scheme	Component	Improvement Actions	Target Date	Actions Taken To Date	Status/Revised Target Date	Responsible Officer
Boulia	Disinfection System	Provide additional training for staff to manage Disinfection System.	Dec 21	This was briefly put on hold while alternate chlorination options were investigated by Council. In July 2022. This item has been carried over into the 2022 DWQMP Amendment and will be re-visited upon completion of the WTP upgrades.	June 2023	Director of Works
Boulia	Distribution System	Install non-return valves at high-risk locations.	Dec 21	High-risk locations have been identified. This item has been carried over into the 2022 DWQMP Amendment.	June 2023	Director of Works
Boulia	Whole of System	Update live drawings to reflect rising main manifold	Jun 21	Completed 2021.	Completed	Director of Works
Boulia/ Urandangi	Bore/Sourcing Infrastructure	Reduce turbidity levels	Dec 22	It was discovered during the 2022 audit in May that Council have been measuring turbidity in FAUs (a less accurate measurement). A new turbidity metre that measures in NTUs was purchased by Council in June 2022. Council are currently assessing if this more accurate measure of turbidity will show reduced levels and then will re-assess their management measures from there. This item has been carried over into the 2022 DWQMP Amendment.	June 2023	Director of Works
Boulia/ Urandangi	Whole of System	Cyber security risk is not fully understood, specific assessment is to be undertaken through regional water alliance.	Dec 21	Completed 2021, Council's water assets are not connected to the internet and so the cyber security risk was deemed to be extremely low.	Completed	Director of Works
Urandangi	Source Water	Seal bores	Jun 22	Urandangi bore still requires capping. This item has been carried over into the 2022 DWQMP Amendment.	June 2023	Director of Works

Scheme	Component	Improvement Actions	Target Date	Actions Taken To Date	Status/Revised Target Date	Responsible Officer
Urandangi	Whole of System	Continue to inform the public of the potential impacts of elevated Fluoride levels	Jun 21	On-going as notification is given to residents on a biannual basis. This item has been carried over into the 2022 DWQMP Amendment.	Completed	Director of Works
Urandangi	Elevated Reservoir	Address leaking of the elevated reservoir or install new reservoir	Jun 22	Completed 2021. Leaking issue was addressed.	Completed	Director of Works
Urandangi	Whole of System	Update live drawings to reflect current infrastructure status	Jun 22	Completed 2021.	Completed	Director of Works
Urandangi	Source Water	Undertake a desktop analysis of alternate source water locations with improved water quality	Jun 22	Completed 2021, no suitable alternative was discovered.	Completed	Director of Works

3.1 Boulia Water Treatment Plant Upgrades

Over the last few years, BSC have faced numerous maintenance issues with the current chlorine gas disinfection system which is not robust enough for Boulia's harsh environment. The system has elements that require expertise troubleshoot and repair with the system clearly not operating as designed. Recent issues such as perished hoses and parts have required replacement, however, the nearest specialist is located in the south-east corner of Queensland and must travel to Boulia to troubleshoot the issue, order the parts and fix them. A process that can take several weeks and multiple trips to resolve. Additionally, chlorine gas bottles are sourced from Adelaide which poses logistical challenges for the timely arrival of gas. Subsequently, Council have been investigating other disinfection and Water Treatment Plant upgrade options to increase the reliability of their water supply.

In 2022, Council obtained \$212,000 worth of funding for the installation of a saltwater chlorinator. Furthermore, in July 2022, a Chlorine Dosing Options Assessment was undertaken by MJM Environmental to investigate the potential chlorine dosing options for the Boulia scheme. This initial report recommended that Council upgrade the existing chlorine gas dosing system. A follow-up Treatment Options Investigation was undertaken which identified the following design limitations in Boulia's existing Water Treatment Plant:

- There is no dedicated turbidity removal process with some partial settling in the reservoirs
- There is no dedicated colour removal process which results in aesthetic colour exceedances in the distribution system
- Soluble iron is oxidised by chlorination but the insoluble iron is not removed from the treated water
- Soluble manganese is partially oxidised by chlorination but the insoluble manganese is not removed from the treated water
- The existing treatment process does not provide any sodium removal
- A free chlorine residual cannot be easily maintained in the reticulation due to design limitations of the existing chlorine dosing system. This has a potential to result in *E.coli* incidents.

The Investigation Report recommended Continuous Backwashing Filtration (DynaSand Filtration) as the preferred upgrade option for the Water Treatment Plant. Key advantages of this option includes:

- The manganese oxide coated media process is the most proven and robust process for soluble iron and soluble manganese removal
- It is a proven treatment technology with relatively low complexity
- The process is relatively simple to operate and maintain
- Small but constant backwash wastewater flow, which won't cause surges/overflows in the in the sewer network
- Small design footprint
- Lowest capital, operating and life cycle cost.

Council are still seeking funding for the Continuous Backwashing Filtration installation which has been estimated to cost between \$500,00- \$800,00, however, a concept design for the proposed Water Treatment Plant has been designed (Figure 1 below).

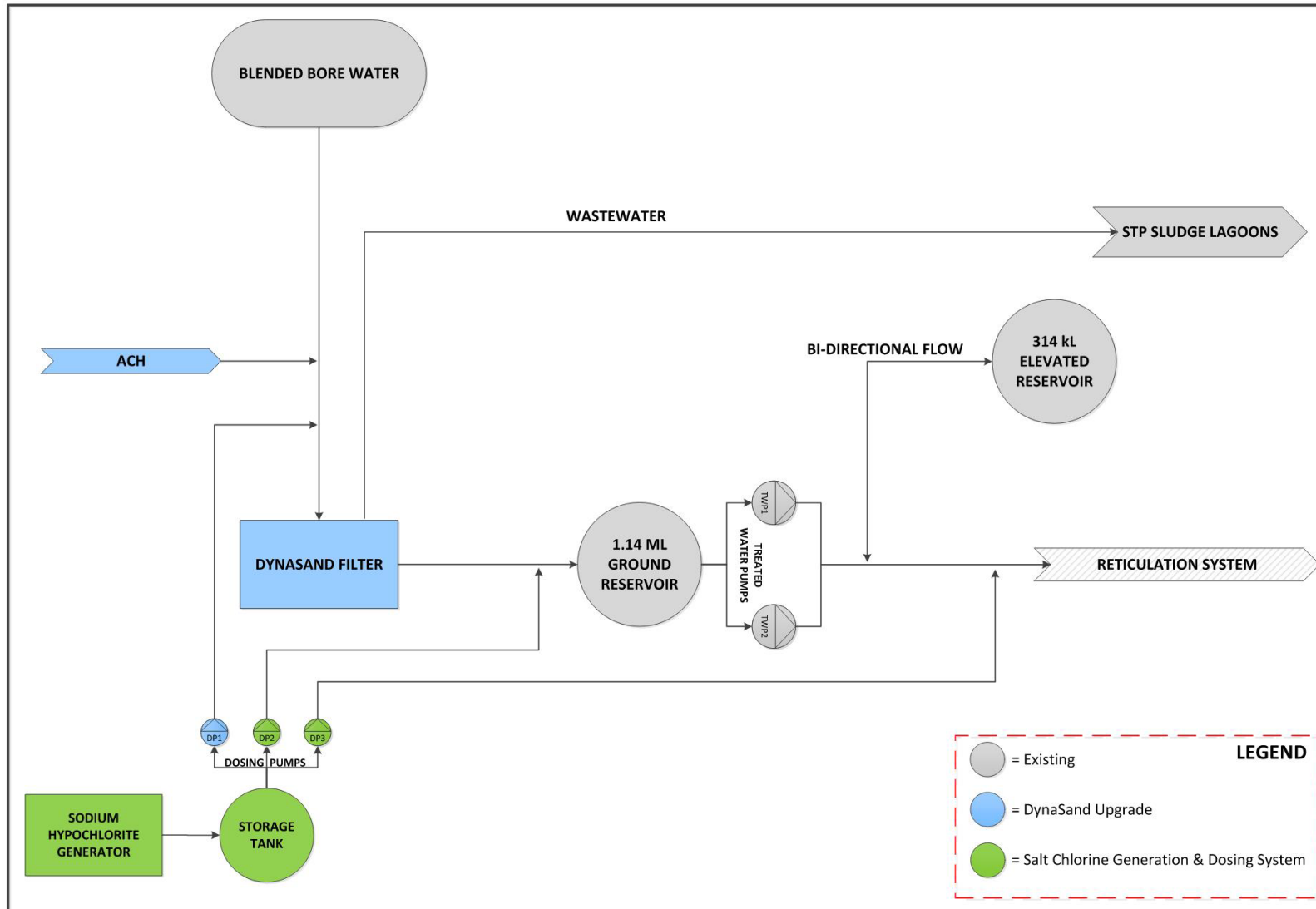


Figure 1: Concept design for the proposed upgrades to the Boulia Water Treatment Plant.

4.0 VERIFICATION MONITORING - WATER QUALITY INFORMATION AND SUMMARY

Council conduct weekly operational testing within Boulia's distribution system and quarterly monitoring of Boulia's bores. Monthly testing is conducted for Urandangi's distribution system. Weekly visual inspections are also undertaken of all drinking water infrastructure (bores, reservoirs, water treatment equipment etc.) within both schemes. Finally, verification monitoring is conducted annually (bores) and biannually (distribution system) across both schemes, with samples being sent to external laboratories. One issue for Council that has arisen in the verification monitoring programme is getting the *E.coli* samples to the laboratory within the 24-hour holding period. This is further complicated for Urandangi as samples must be taken the day before they are sent on the plane which leaves from Boulia. Council are unable to collect Urandangi samples on the same day that the plane is scheduled to leave as the distance between the two towns (approximately 300kms) does not allow for samples to be collected and driven to Boulia to meet the morning departure time. Another issue that arises for Council is that during the wet season, the road to Urandangi can become impassable for prolonged periods of time which can result in missed operational testing.

Sections 4.1 and 4.2 below summarises all operational and verification monitoring for Boulia and Urandangi undertaken during the reporting period, while Section 4.3. discusses any potential water quality issues encountered by Council.

Table 3: Boulia Source Water Verification Monitoring.

Boulia Source Water Supply	Start Date: 01/07/2021			End Date: 30/06/2022					Guideline Value			
Parameters	Units	Testing Frequency	No. of Samples Tested	Summary of Results					Health	Exceedances	Aesthetic	Exceedances
				Max Value	Average Value	Min Value	Std Dev	95 th Percentile				
<i>E.coli</i>	CFU/100mL	Annual	5	0	0	0	0	0	1	0		
Total Coliforms	CFU/100mL	Annual	5	0	0	0	0	0				
Conductivity	µS/cm	Annual	5	1470	1422	1390	29.26	1464				
Dissolved Organic Carbon	mg/L	Annual	5	1	1	1	0	1				
Dissolved Oxygen	mg/L	Annual	5	10.4	9.58	8.1	0.82	10.34				
pH	mg/L	Annual	5	7.4	7.36	7.3	0.049	7.4			≥6.5 & ≤ 8.5	0
Total Dissolved Solids	mg/L	Annual	5	790	754	720	25.8	786			660	5
Turbidity	NTU	Annual	5	2.1	1.64	0.9	0.45	2.1			5	0
Chlorate	mg/L	Annual	5	0.01	0.01	0.01	0	0.01	0.8	0		
Chloride	mg/L	Annual	5	190	176	160	10.2	188			250	0
Fluoride	mg/L	Annual	5	1	0.98	0.9	0.04	1	1.5	0		
Lead	mg/L	Annual	5	0.0002	0.0002	0.0002	0	0.0002	0.01	0		
Nitrate	mg/L	Annual	5	0.1	0.1	0.1	0	0.1	50	0		
Nitrite	mg/L	Annual	5	0.1	0.1	0.1	0	0.1	3	0		
Selenium	mg/L	Annual	5	0.001	0.001	0.001	0	0.001	0.01	0		

Boulia Source Water Supply	Start Date: 01/07/2021			End Date: 30/06/2022					Guideline Value			
Parameters	Units	Testing Frequency	No. of Samples Tested	Summary of Results					Health	Exceedances	Aesthetic	Exceedances
				Max Value	Average Value	Min Value	Std Dev	95 th Percentile				
Silica (SiO ₂)	mg/L	Annual	5	17	16.4	16	0.49	17			80	0
Silver	mg/L	Annual	5	0.001	0.001	0.001	0	0.001	0.1	0		
Sodium	mg/L	Annual	5	210	192	180	9.8	206			180	4
Total Iron	mg/L	Annual	5	0.21	0.192	0.17	0.013	0.208			0.3	0
Soluble Iron	mg/L	Annual	5	0.018	0.0106	0.005	0.004	0.017				
Total Manganese	mg/L	Annual	5	0.06	0.049	0.023	0.014	0.06	0.5	0		
Soluble Manganese	mg/L	Annual	5	0.057	0.047	0.023	0.013	0.057				
Uranium	mg/L	Annual	5	0.001	0.001	0.001	0	0.001	0.017	0		
Aesthetic Guideline Exceedance												
Health Guideline Exceedance												

Table 4: Boulia Distribution Water Verification Monitoring.

Boulia Distribution Water Supply		Start Date: 1/07/2021			End Date: 30/06/2022				Guideline Value			
Parameters	Units	No. of Samples to be Tested as per DWQMP	No. of Samples Tested	Summary of Results					Health	Exceedances	Aesthetic	Exceedances
				Maximum Value	Average Value	Minimum Value	Std Dev	95 th Percentile				
<i>E.coli</i>	CFU/100mL	2	6	0	0	0	0	0	1	0		
Total Coliforms	CFU/100mL	2	3	0	0	0	0	0				
Conductivity	µS/cm	2	6	1500	1423.3	1340	73.64	1500				
True Colour	HU	2	3	1	1	1	0	1			15	0
Dissolved Organic Carbon	mg/L	2	6	1	1	1	0	1				
Dissolved Oxygen	mg/L	2	6	8.3	7.3	5.6	1.04	8.25				
pH	pH Units	2	6	8.1	7.92	7.8	0.107	8.075			≥6.5 & ≤ 8.5	0
Total Dissolved Solids	mg/L	2	6	770	743.3	690	26.25	767.5			660	6
Turbidity	NTU	2	3	1.5	0.83	0.5	0.47	1.4			5	0
Chlorate	mg/L	2	3	0.01	0.01	0.01	0	0.01	0.8	0		
Chloride	mg/L	2	6	220	215	200	7.64	220			250	0

Boulia Distribution Water Supply	Start Date: 1/07/2021			End Date: 30/06/2022					Guideline Value			
Parameters	Units	No. of Samples to be Tested as per DWQMP	No. of Samples Tested	Summary of Results					Health	Exceedances	Aesthetic	Exceedances
				Maximum Value	Average Value	Minimum Value	Std Dev	95 th Percentile				
Fluoride	mg/L	2	6	1.1	1.02	1	0.037	1.075	1.5	0		
Lead	mg/L	2	6	0.0006	0.00027	0.0002	0.0001	0.0005	0.01	0		
Nitrate	mg/L	2	3	0.01	0.01	0.01	0	0.01	50	0		
Nitrite	mg/L	2	3	0.01	0.01	0.01	0	0.01	3	0		
Sodium	mg/L	2	3	190	186.67	190	4.71	190			180	2
Uranium	mg/L	2	6	0.001	0.001	0.001	0	0.001	0.017	0		
Total Iron	mg/L	2	6	0.35	0.21	0.091	0.1	0.34			0.3	1
Soluble Iron	mg/L	2	6	0.031	0.017	0.008	0.007	0.028				
Total Manganese	mg/L	2	6	0.11	0.053	0.027	0.028	0.097	0.5	0		
Soluble Manganese	mg/L	2	6	0.0055	0.0033	0.0016	0.0012	0.005				
Trihalomethanes	mg/L	2	6	0.009	0.0047	0.002	0.003	0.009	0.25	0		
Aesthetic Guideline Exceedance												
Health Guideline Exceedance												

Table 5: Boulia Operational Monitoring Source Water and Distribution.

Boulia Distribution Water Supply		Start Date: 1/07/2021			End Date: 30/06/2022				Guideline Value			
Parameters	Units	No. of Samples to be Tested as per DWQMP	No. of Samples Tested	Summary of Results					Health	Exceedances	Aesthetic	Exceedances
				Maximum Value	Average Value	Minimum Value	Std Dev	95 th Percentile				
Source Water												
<i>E.coli</i>	CFU/100mL	Quarterly	17	0	0	0	0	0	1	0		
Total Coliforms	CFU/100mL	Quarterly	18	2.17	14	0	3.95	8.9				
Turbidity	FAU	Quarterly	18	7	4.11	2	1.29	6.15			5	2
Total Iron	mg/L	Quarterly	18	0.28	0.24	0.19	0.03	0.28			0.3	0
Distribution System												
<i>E. coli</i>	mg/L	Monthly	36	0	0	0	0	0	1	0		
Total Coliforms	pH Units	Monthly	36	0	0	0	0	0				
Free Chlorine	mg/L	Weekly	138	1.14	0.55	0	0.31	0.95			>0.2	25
Turbidity	FAU	Monthly	33	9	5.56	3	1.28	7.4			5	18
Turbidity	NTU	Monthly	3	0.33	0.28	0.22	0.045	0.326			5	0

Boulia Distribution Water Supply		Start Date: 1/07/2021			End Date: 30/06/2022			Guideline Value				
Parameters	Units	No. of Samples to be Tested as per DWQMP	No. of Samples Tested	Summary of Results					Health	Exceedances	Aesthetic	Exceedances
				Maximum Value	Average Value	Minimum Value	Std Dev	95 th Percentile				
Source Water												
pH	mg/L	Monthly	36	8.91	8.41	7.81	0.301	8.87			≥6.5 & ≤ 8.5	14
Conductivity	µS/cm	Monthly	36	1378	1349.58	1310	14.68	1375				
Aesthetic Guideline Exceedance												
Health Guideline Exceedance												

Table 6: Boullia *E.coli* Annual Value Compliance Table.

Year	1/07/2021- 30/06/2022											
Month	July	August	September	October	November	December	January	February	March	April	May	June
No. of samples collected	3	10	3	3	8	3	3	10	3	3	12	3
No. of samples collected in which <i>E.coli</i> is detected	0	0	0	0	0	0	0	0	0	0	0	0
No. of samples collected in previous 12 month period	53	60	53	53	53	53	53	60	52	55	64	64
No. failures for previous 12 month period	0	0	0	0	0	0	0	0	0	0	0	0
% of samples that comply	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Compliance with 98% annual value	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Table 7: Urandangi Source Water Verification Monitoring.

Boulia Source Water Supply	Start Date: 01/07/2021 End Date: 30/06/2022				Guideline Value				
	Parameters	Units	Testing Frequency	No. of Samples Tested	Result	Health	Exceedances	Aesthetic	Exceedances
<i>E.coli</i>	CFU/100mL	Annual	1	0		1	0		
Total Coliforms	CFU/100mL	Annual	1	0					
Conductivity	µS/cm	Annual	1	2060					
Dissolved Organic Carbon	mg/L	Annual	1	1					
Dissolved Oxygen	mg/L	Annual	1	10.3					
pH	mg/L	Annual	1	7.3				≥6.5 & ≤ 8.5	0
Total Dissolved Solids	mg/L	Annual	1	1300				660	1
Turbidity	NTU	Annual	1	0.5				5	0
Chlorate	mg/L	Annual	1	0.01		0.8	0		
Chloride	mg/L	Annual	1	310				250	0
Fluoride	mg/L	Annual	1	1.8		1.5	1		
Lead	mg/L	Annual	1	0.0002		0.01	0		
Nitrate	mg/L	Annual	1	0.34		50	0		
Nitrite	mg/L	Annual	1	0.05		3	0		
Selenium	mg/L	Annual	1	0.002		0.01	0		
Silica (SiO ₂)	mg/L	Annual	1	36				80	0
Silver	mg/L	Annual	1	0.001		0.1	0		
Sodium	mg/L	Annual	1	200				180	1

Boulia Source Water Supply	Start Date: 01/07/2021 End Date: 30/06/2022				Guideline Value			
Parameters	Units	Testing Frequency	No. of Samples Tested	Result	Health	Exceedances	Aesthetic	Exceedances
Total Iron	mg/L	Annual	1	0.001			0.3	0
Soluble Iron	mg/L	Annual	1	0.001				
Total Manganese	mg/L	Annual	1	0.023	0.5	0		
Soluble Manganese	mg/L	Annual	1	0.018				
Uranium	mg/L	Annual	1	0.012	0.017	0		
Aesthetic Guideline Exceedance								
Health Guideline Exceedance								

Table 8: Urandangi Distribution Water Verification Monitoring.

Boulia Distribution Water Supply	Start Date: 1/07/2021			End Date: 30/06/2022					Guideline Value			
Parameters	Units	No. of Samples to be Tested as per DWQMP	No. of Samples Tested	Summary of Results					Health	Exceedances	Aesthetic	Exceedances
				Maximum Value	Average Value	Minimum Value	Std Dev	95 th Percentile				
<i>E.coli</i>	CFU/100mL	Biannual	4	0	0	0	0	0	1	0		
Total Coliforms	CFU/100mL	Biannual	2	0	0	0	0	0				
Conductivity	µS/cm	Biannual	4	2190	2087.5	2180	97.56	2188.5				
True Colour	HU	Biannual	2	1	1	1	0	1			15	0
Dissolved Organic Carbon	mg/L	Biannual	4	1	1	1	0	1				
Dissolved Oxygen	mg/L	Biannual	4	9.2	7.625	6.3	1.21	9.08				
pH	pH Units	Biannual	4	7.8	7.65	7.5	0.112	7.79			≥6.5 & ≤ 8.5	0
Total Dissolved Solids	mg/L	Biannual	4	1300	1250	1200	50	1300			660	4
Turbidity	NTU	Biannual	2	0.5	0.5	0.5	0	0.5			5	0
Chlorate	mg/L	Biannual	2	0.38	0.355	0.33	0.025	0.378	0.8	0		
Chloride	mg/L	Biannual	4	390	382.5	380	4.33	388.5			250	4
Fluoride	mg/L	Biannual	4	1.9	1.825	1.8	0.043	1.885	1.5	4		
Lead	mg/L	Biannual	4	0.0002	0.0002	0.0002	0	0.0002	0.01	0		

Boulia Distribution Water Supply	Start Date: 1/07/2021			End Date: 30/06/2022					Guideline Value			
Parameters	Units	No. of Samples to be Tested as per DWQMP	No. of Samples Tested	Summary of Results					Health	Exceedances	Aesthetic	Exceedances
				Maximum Value	Average Value	Minimum Value	Std Dev	95 th Percentile				
Nitrate	mg/L	Biannual	2	0.41	0.41	0.41	0	0.41	50	0		
Nitrite	mg/L	Biannual	2	0.01	0.01	0.01	0	0.01	3	0		
Sodium	mg/L	Biannual	2	200	195	190	5	199.5			180	2
Uranium	mg/L	Biannual	4	0.013	0.0128	0.012	0.0004	0.013	0.017	0		
Total Iron	mg/L	Biannual	4	0.007	0.003	0.001	0.0024	0.006			0.3	0
Soluble Iron	mg/L	Biannual	4	0.003	0.00175	0.001	0.0008	0.003				
Total Manganese	mg/L	Biannual	4	0.022	0.014	0.0029	0.007	0.022	0.5	0		
Soluble Manganese	mg/L	Biannual	4	0.0005	0.0005	0.0005	0	0.0005				
Trihalomethanes	mg/L	Biannual	4	0.015	0.012	0.01	0.0021	0.015	0.25	0		
Aesthetic Guideline Exceedance												
Health Guideline Exceedance												

Table 9: Urandangi Operational Monitoring.

Boulia Distribution Water Supply	Start Date: 1/07/2021			End Date: 30/06/2022					Guideline Value			
Parameters	Units	No. of Samples to be Tested as per DWQMP	No. of Samples Tested	Summary of Results					Health	Exceedances	Aesthetic	Exceedances
				Maximum Value	Average Value	Minimum Value	Std Dev	95 th Percentile				
Distribution System												
<i>E.coli</i>	CFU/10 0mL	Quarterly	20	0	0	0	0	0	1	0		
Total Coliforms	CFU/10 0mL	Quarterly	20	0	0	0	0	0				
Free Chlorine	mg/L	Weekly	20	1.85	0.67	0.16	0.49	1.76			>0.2	3
Turbidity	FAU	Monthly	20	5	3.67	2	0.88	5			5	0
Turbidity	NTU	Monthly	20	0.24	0.195	0.15	0.045	0.24			5	0
pH	mg/L	Monthly	20	8.81	8.32	7.95	0.23	8.79			≥6.5 & ≤ 8.5	3
Conductivity	µS/cm	Monthly	20	1950	1907.6	1849	28.59	1947.15				
Aesthetic Guideline Exceedance												
Health Guideline Exceedance												

Table 10: Urandangi *E.coli* Annual Value Compliance Table.

Year	1/07/2021- 30/06/2022											
Month	July	August	September	October	November	December	January	February	March	April	May	June
No. of samples collected	2	4	2		2	2		4	2	2	4	2
No. of samples collected in which <i>E.coli</i> is detected	0	0	0		0	0		0	0	0	0	0
No. of samples collected in previous 12 month period	32	32	32	30	30	30	28	30	26	28	28	26
No. failures for previous 12 month period	1	1	1	1	1	1	1	1	0	0	0	0
% of samples that comply	96.9%	96.9%	96.9%	96.7%	96.7%	96.4%	96.7%	100%	100%	100%	100%	100%
Compliance with 98% annual value	NO	NO	NO	NO	NO	NO	NO	NO	YES	YES	YES	YES

4.1 Summary of Results

Boulia Verification Monitoring:

Within Boulia's source water, the following ADWG aesthetic exceedances were reported:

- Total Dissolved Solids (5 exceedances from 5 samples)
- Sodium (4 exceedances from 5 samples)

Within Boulia's distribution system, the following ADWG aesthetic exceedances were reported:

- Total Dissolved Solids (6 exceedances from 6 samples)
- Sodium (2 exceedances from 6 samples)
- Total Iron (1 exceedance from 6 samples)

Boulia Operational Monitoring:

Within Boulia's source water, the following ADWG aesthetic exceedances were reported:

- Turbidity* (2 exceedances from 18 samples)

Within Boulia's distribution system, the following ADWG aesthetic exceedances were reported:

- Turbidity* (18 exceedances from 33 samples)
- Free Chlorine (25 exceedances from 138 samples)
- pH (14 exceedances from 36 samples)

*** Note, turbidity exceedances were only reported while Council were measuring turbidity in FAUs. Since the purchase of a turbidity metre which measures in NTUs no turbidity exceedances have been reported. It should also be noted that the turbidity limit for both Boulia and Urandangi during the 2021-22 financial year was set at 5NTU as per the 2020 DWQMP Amendment. This turbidity target level was revised during the 2022 Amendment, however, was not implemented until the following financial year and therefore not applicable to this report.**

Urandangi Verification Monitoring:

Within Urandangi's source water, the following ADWG aesthetic exceedances were reported:

- Total Dissolved Solids (1 exceedance from 1 sample)
- Sodium (1 exceedance from 1 sample)

Within Urandangi's distribution system, the following ADWG aesthetic exceedances were reported:

- Total Dissolved Solids (4 exceedances from 4 samples)
- Chloride (4 exceedances from 4 samples)
- Sodium (2 exceedances from 2 samples)

Urandangi Operational Monitoring:

Within Urandangi's distribution system, the following ADWG aesthetic exceedances were reported:

- Free Chlorine (3 exceedances from 20 samples)
- pH (3 exceedances from 20 samples)

Urandangi ADWG Health Exceedances:

- Fluoride** (5 exceedances from 5 samples)

****Note: Elevated Fluoride levels detected in Urandangi's drinking water have been identified as a hazard in Council's DWQMP, this is further discussed in Section 5 below.**

Summary of Water Quality Within the Schemes:

Since the implementation of chlorination within the schemes, the Boulia and Urandangi drinking water generally meets the aesthetic and health ADWG values. For the aesthetic exceedances of Chloride, Total Dissolved Solids, Total Iron and Sodium, no ADWG health-based target is considered necessary as elevated levels are generally only associated with taste issues and therefore do not pose any adverse threats to public health. Similarly, drinking water that does not sit within the ADWG pH aesthetic range of 6.5 and 8.5 may result in a bitter taste but is not necessarily unsafe as elevated pH is not uncommon in groundwater.

Council have previously had issues with the operation of Boulia's gas chlorine disinfection system which is not robust enough for the harsh climate and requires frequent servicing. This has resulted in periods where the free chlorine residual has fallen below the 0.2 mg/L target that has been set for the scheme. This was more of an issue during the beginning of the financial year as 2022 has seen better management from Council in the operation of the system with the free chlorine residual target being achieved. In June 2022, a Review of the Boulia QTP Chlorine Gas System was undertaken by MJM Environmental. This Review included a chlorine dosing options assessment of the following short-listed options:

- Option 1: Existing chlorine gas system upgrades
- Option 2: On-site chlorination generations, storage and dosing
- Option 3: Sodium hypochlorite storage and dosing system

In short, it was recommended to Council that upgrading the existing chlorine gas system (Option 1) would be the most viable option based on the already invested significant capital to construct the existing chlorine dosing facility. Other key advantages of this option included:

- Chlorine gas is a stable chemical that does not decompose in concentration with time
- Chlorine gas depresses the pH of treated water which can be beneficial in reducing incidents of elevated pH above the ADWG aesthetic
- Reduced footprint as a result of gas cylinder storage as opposed to bulk liquid storage
- Chlorine gas dosing is a high established and proven chlorine dosing process
- BSC personnel are experienced in operating chlorine gas as it is currently in use within the scheme
- It is the option with the lowest capital cost.

In conclusion, Council have agreed to pursue option 1, upgrading the Boulia disinfection system so that it can handle the robust climate. This item has been added to the RMIP in the 2022 Amendment.

In Urandangi, chlorination can sometimes be difficult for staff due to fluctuations in the town's water usage requiring changes to the chlorine dosing rate. However, Council are aware of this issue and are working to produce a chlorine dosing procedure which will assist the town foreman to maintain the target free chlorine residual.

As mentioned above, turbidity exceedances reported in Boulia were a result of Council measuring Turbidity in FAUs and not NTUs, an issue that was rectified in June 2022. Since changing the turbidity measurement to NTUs Council have found that Turbidity levels within Boulia and Urandangi are consistently below the critical limit of 1NTU (the limit which was implemented in the 2022 Amendment).

Urandangi's elevated Fluoride levels are discussed further in Section 5.

E.coli Verification and Operational Monitoring:

Bacteriological sampling within the Boulia and Urandangi drinking water schemes recorded no positive *E.coli* results for the reporting period. Therefore, both Boulia and Urandangi have been compliant with the 98% *E.coli* value for the 2021-22 financial year.

Missed Operational and Verification Monitoring:

There was no missed verification or operational monitoring for the Boulia drinking water scheme during the 2021-22 financial year. There were no ADWG health exceedances recorded within Boulia's drinking water during the 2021-22 financial year.

Urandangi missed two rounds of operational monitoring during the 2021-22 financial year (October 2021 and January 2022). These missed tests were a result of flooding. Due to Urandangi's isolation, access to the town is via unsealed roads which quickly become impassable when it rains. While Council attempts to re-schedule missed operation monitoring, this is not always possible as flooding can cut access to the town for the entire month. A lack of staff at Urandangi also contributes to this issue.

Finally, the following parameters were not tested for at the frequency stipulated in Council's DWQMP:

- Total Coliforms
- True Colour
- Turbidity
- Chlorate
- Nitrate
- Nitrite
- Sodium

It was identified in the previous Annual Report (2020-21 financial year) that the above parameters were not being included in the verification monitoring programme for both Boulia and Urandangi. This was attributed to a miscommunication between Council and the testing lab. Council have addressed this issue and the above parameters are now being tested for regularly as part of the verification monitoring programme for both schemes. Nonetheless, it still resulted in one round of missed verification monitoring.

5.0 INCIDENTS REPORTED TO THE REGULATOR

Table 11: Incidents Reported to The Regulator.

Incident Date	Scheme	Issue	Preventive Actions	Investigation Report
7/09/2020 1/06/2021 8/03/2021	Urandangi	Fluoride in exceedance of ADWG health guideline value	Public notification and ongoing monitoring to ensure values are stable and remain only slightly above the ADWG health limit.	N/A, ongoing incident
18/03/2021	Boulia	<ul style="list-style-type: none">- The remote monitoring and control platform which automatically regulates water pumps from the bores and WTP malfunctioned due to a failure of the Telstra 3G network- The network failure meant that the monitoring system did not activate any alarms to staff to notify when	<ul style="list-style-type: none">- Once Council were aware of the issue, the pumps were manually operated until the 3G network was back up and running- Mains were air bled and water supply was brought back to the town with follow-up testing to show there was no <i>E.coli</i> present and the chlorine residual was being maintained- Working day visual inspection of the ground level reservoir has been added to the operational	Submitted 16/03/2022

Incident Date	Scheme	Issue	Preventive Actions	Investigation Report
		the ground level and elevated reservoirs were empty and subsequently water supply to the town was lost	<ul style="list-style-type: none"> monitoring programme until the system can be updated to the more reliable 4G network (this item has been added to the 2022 RMIP) - An update of operation and maintenance procedures to ensure there is a formal procedure to follow should water supply to the town be lost again 	

BSC has one ongoing incident for the naturally elevated levels of fluoride within Urandangi’s drinking water. The elevated fluoride levels are associated with the natural geology of the area and averages around 1.8mg/L. Treatment to reduce fluoride levels in the drinking water is not financially feasible, considering that the concentration is only slightly above the ADWG health value of 1.5mg/L. The main issues associated with elevated fluoride levels in Urandangi is dental fluorosis primarily affecting children under the age of 6. Despite the frequent exceedance of fluoride levels, verification monitoring three times a year has been deemed to be suitable for the Urandangi scheme as historical data has identified fluoride concentrations to be within a consistent range. At this stage, Council’s primary management strategy is to provide public notification to Urandangi residents every six months in the form of a fluoride fact-sheet to help the community understand the potential impacts of elevated fluoride in the drinking water.

6.0 CUSTOMER COMPLAINTS

There were no customer complaints made to Council during the 2021-22 Financial Year.

7.0 DWQMP REVIEW OUTCOMES

The last DWQMP Review was conducted in December 2021. The Review found the current DWQMP to be out of date. Council applied for an Amendment to the DWQMP in February 2022 to incorporate these findings. The Amendment was approved in October 2022. The next review is scheduled for December 2023.

8.0 DWQMP AUDIT FINDINGS

An audit was completed in March 2022. The major audit findings are summarised in Table 10 below. Audit findings and recommendations were incorporated into the 2022 DWQMP Amendment. Therefore, no further Amendment to the DWQMP is required by Council.

Table 12: DWQMP Audit summary.

Item	Non-conformance	Action	Status of actions	Responsible Officer / Position
Periodically review the water supply system analysis.	The disinfection system is poorly described in the plan and is inconsistent.	This has been updated in the 2022 DWQMP Amendment.	Completed.	Director of Works
Assess preventative measures from catchment to consumer to identify critical control points.	The chlorine disinfection process is normally expected to be a Critical Control Point. Chlorine dosing in 2019 and 2020 was highly variable, with examples of periods when low chlorine left the tank outlet. The performance in 2021 was dramatically improved.	As noted by the auditor, Council's operation of the disinfection system has dramatically improved since 2019. Disinfection system upgrades and additional staff training has been added to the RMIP in the 2022 Amendment.	Ongoing.	Director of Works
Document the critical control points, critical limits and target criteria.	The Boulia disinfection process has different chlorine targets stated throughout the plan.	This has been updated in the 2022 DWQMP Amendment.	Completed.	Director of Works
Identify procedures required for processes and activities from catchment to consumer.	The specific procedures stated in the DWQMP are not available.	All procedures have been updated in the 2022 Amendment, including an RMIP item for the review of all drinking water operation and maintenance procedures.	Ongoing.	Director of Works
Document monitoring protocols into an operational monitoring plan.	The operating plans and SWIMS for maintenance and repair of water infrastructure were not able to be located by Council. Works on water infrastructure are undertaken by a contract plumber who should have his own procedure but this should be confirmed. It was also noted that there were no specific reservoir inspection procedures in regards to the elevated reservoirs.	The 2022 Amendment includes an RMIP item for the review of all drinking water operation and maintenance procedures.	Ongoing.	Director of Works

Item	Non-conformance	Action	Status of actions	Responsible Officer / Position
Was the event reported to the Regulator?	In the past, there have been times when the free chlorine residual for Boulia has dropped the below 0.2mg/L target. These events were not reported to the Regulator.	Council staff have a better understanding of the operation and maintenance of the Boulia disinfection system, resulting in the ability to maintain the target free chlorine residual. Staff are now also aware of drinking water events that require reporting to the Regulator.	Not applicable.	Director of Works
Ensure that equipment performs adequately and provides sufficient flexibility and process control.	This is related to the chlorine dosing system that has a regular history of failures. However, this is a historical non-conformance and Council is doing quarterly external servicing of the system.	Council now undertake quarterly external servicing of the Boulia disinfection system.	Completed.	Director of Works
Is there appropriate duty/standby equipment for key processes?	There are recorded examples where the stated monitoring has not occurred as the handheld equipment was sent away for external calibration.	A calibration procedure has been implemented by Council and where required, additional monitoring equipment has been purchased.	Completed.	Director of Works
Was the verification monitoring programme implemented as stated?	There is a history of some missed verification and operational monitoring.	Some missed tests were unavoidable and a result of road closures due to flooding or a lack of available staff. Other missed testing came from a mis-communication between Council and the external lab, an issue that has now been fixed.	Completed.	Director of Works
Were any exceedances identified and reported immediately?	There was an elevated fluoride result that was not reported as its own incident to the Regulator. It was determined to be a laboratory error but should still have been reported as an incident.	The elevated fluoride level was reported via the 24-hour hotline at the time of the incident. Since the audit, an incident and investigation report has been supplied to the Regulator.	Completed.	Director of Works
Develop an active two-way communication programme to inform consumers and promote	Council indicated that there was a one-off fluoride notification to Urandangi residents but this has not been repeated annually as implied in the DWQMP.	Council have provided annual notification to Urandangi residents in regards to the elevated fluoride levels in the drinking water.	Completed.	Director of Works

Item	Non-conformance	Action	Status of actions	Responsible Officer / Position
awareness of drinking water quality issues.				
Were all high priority actions undertaken in the timeframes committed?	Not all RMIP items have been completed within the indicated timelines.	All RMIP items were reviewed in the 2022 Amendment and given updated target dates.	Completed.	Director of Works

Item	Improvement Action	Action	Status of actions	Responsible Officer / Position
Assemble pertinent information and document key characteristics of the water supply system to be considered.	The system analysis generally describes how the schemes operate; however, this should be reviewed to ensure all statements are completely accurate.	Updated in the 2022 Amendment.	Completed.	Director of Works
Does the schematic accurately reflect the scheme?	The Boulia schematic in the DWQMP requires updating.	Updated in the 2022 Amendment.	Completed.	Director of Works
Assemble historical data from source waters, treatment plants and finished water supplied to consumers (over time and following specific events).	The water quality data provided in the DWQMP is limited. Additional more recent data should be provided.	Updated in the 2022 Amendment.	Completed.	Director of Works
Identify and document hazards, sources and hazardous events for each component of the water supply system.	The risk assessment in general identifies categories of hazards as opposed to the actual hazard, there are no specific line items.	Updated in the 2022 Amendment.	Completed.	Director of Works

Item	Improvement Action	Action	Status of actions	Responsible Officer / Position
Were all likely hazards identified effectively?	In the auditor's opinion, the risk assessment does not adequately identify the risks associated with the ability to attract and retain sufficiently skilled staff.	Updated in the 2022 Amendment.	Completed.	Director of Works
Estimate the level of risk for each identified hazard or hazardous event.	All hazards and hazardous events have been assessed as having major consequences. This assessment does not match the risk matrix that is used.	Updated in the 2022 Amendment.	Completed.	Director of Works
Document the preventative measures and strategies into a plan addressing each significant risk.	Not all operation and maintenance procedures documented in the plan are available.	The 2022 Amendment includes an RMIP item for the review of all drinking water operation and maintenance procedures.	Ongoing.	Director of Works
Establish mechanisms for operational control.	There have been regular chlorination system failures with the system not operating as designed.	Disinfection system upgrades in Boulia and additional staff training has been added to the RMIP in the 2022 Amendment.	Ongoing.	Director of Works
Establish a programme for regular inspection and maintenance of all equipment, including monitoring equipment.	The 6-monthly maintenance of the chlorine system by an external provider has not been sufficient to prevent failures. The equipment does not appear to be fit for purpose given the history of failures.	Council is in the process of upgrading Boulia's disinfection system and currently undertake Quarterly servicing of the disinfection system.	Ongoing.	Director of Works