



BOULIA SHIRE COUNCIL DRINKING WATER QUALITY MANAGEMENT PLAN

Service Provider ID 18

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1.0 REGISTERED SERVICE DETAILS

Boulia Shire Council (BSC) is located in Western Queensland and comprises of the towns of Boulia and Urandangi covering an area of 61,176 km².

Figure 1.1 shows the location of the Boulia Shire relative to major Queensland centres.

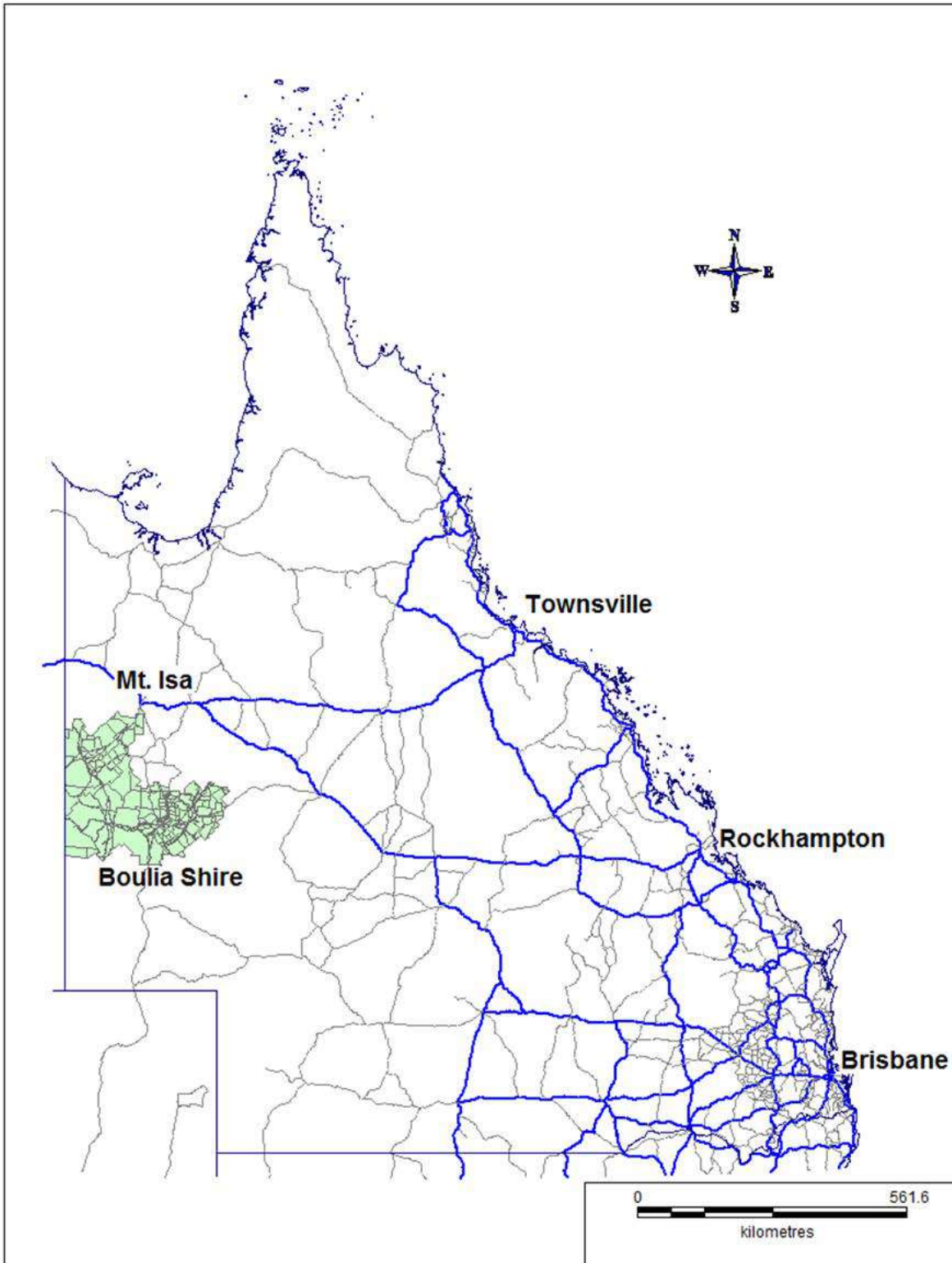


Figure 1.1: Boulia Shire Location Map.

BSC is the drinking water service provider (SPID 18) for the following two drinking water supply schemes in the region (Figure 1.2 below).

- **Boulia Water Supply Scheme**

Boulia is located approximately 360km west of Winton, 382km north of Birdsville and 295km south of Mt Isa.

- **Urandangi Water Supply Scheme**

Urandangi is located 30km from the Northern Territory border, 160km southwest of Mt Isa and 220km northwest of Boulia.

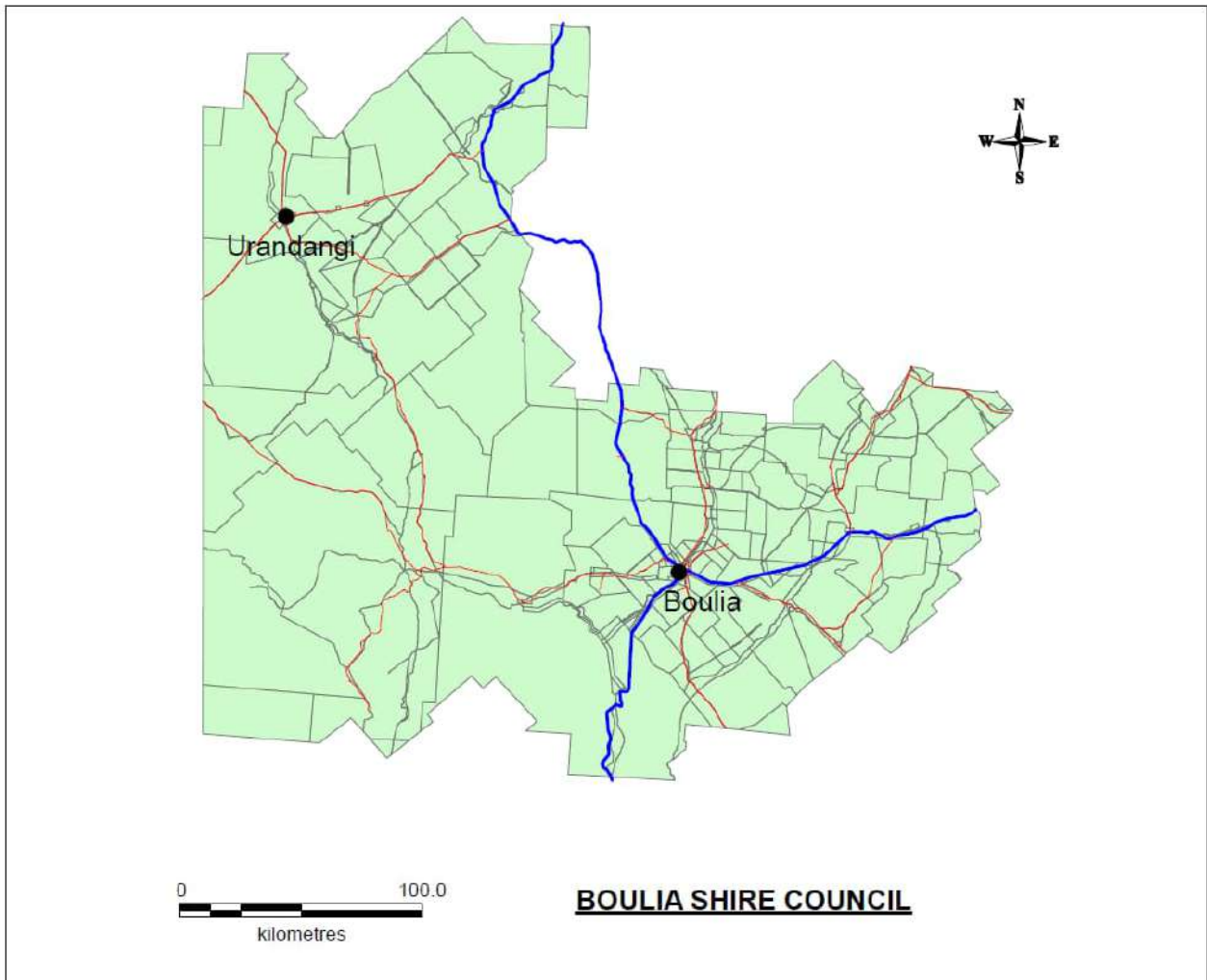


Figure 1.2: Boulia Shire Council.

BSC is a small Drinking Water Service Provider (DWSP) as defined in the Water Supply (Safety and Reliability) Act 2008 and provides drinking water for an approximate population of 274 with a total demand of approximately 831 kL/d. BSC may be referred to as the DWSP throughout this document.

Council's office is located in Boulia. Council's mailing address is:

Boulia Shire Council
18 Herbert Street Boulia
BOULIA QLD 4829

The Council contact in relation to this plan is:

Ajay Agwan

Director of Works

Phone: 07 4746 3188

Email: dwo@boulia.qld.gov.au

1.1. Approval Application Form

Refer to APPENDIX A

DRINKING WATER QUALITY MANAGEMENT PLAN APPROVAL APPLICATION.

1.2. Further information

Table 1-1 below lists the drinking water schemes, identifies the operational responsibilities for each scheme and details the current and future population and demand for each scheme.

Table 1-1: Listing of Drinking Water Schemes.

Scheme Name	Operator (organisation)	Current (2016)			Future (2026) ¹		
		Population Served	Connections	Demand kL/d	Population Served	Connections	Demand kL/d
Boulia Water Supply Scheme	Boulia Shire Council	280	119	770	274	117	755
Urandangi Water Supply Scheme		25	19	61	25	19	69
Total		305	138	831	299	136	824

1.3. Regulatory and Formal Requirements

The following table lists the regulatory requirements the DWSP is required to meet with regard to the management of drinking water.

¹ A population decline of -.2% per annum has been applied for Boulia in accordance with 2016 census data. Current population for Urandangi remains static with no foreseeable annual growth predicted due to the remoteness of the region.

Table 1-2: Regulatory and Formal Requirements.

Requirement	Council obligations and how they relate to the DWQMP
Water Supply (Safety and Reliability) Act 2008 Water Supply (Safety and Reliability) Regulation 2011	Council registered as a service provider, given powers to do certain things (e.g. disconnect customers, restrictions). Required to have an approved DWQMP and comply with the DWQMP. Required to report and respond to drinking water incidents.
Public Health Act 2005 Public Health Regulation 2018	Sets minimum sampling frequencies for <i>E. coli</i> as a provider. Council must not provide unsafe water.
Disaster Management Act 2003	Council is required to have a disaster management plan. This plan links to the Emergency Plan in this document.
Work Health and Safety Act 2011	Council must ensure safe work practices, including in the provision of drinking water.
Plumbing and Drainage Act 2018	Council must ensure that water infrastructure work is at a particular standard.
Qld Plumbing and Wastewater Code (QPW code)	The code defines how drinking water infrastructure can be constructed.

2.0 DETAILS OF INFRASTRUCTURE FOR PROVIDING THE SERVICE

BSC is the DWSP for two water supply schemes. The infrastructure for providing the service is detailed in the sections outlined below:

- 2.1 Boulia Water Supply Scheme
- 2.2 Urandangi Water Supply Scheme

For both water supply schemes, bore water is pumped into ground level reservoirs and then either elevated reservoirs or directly into reticulation. A chlorine gas disinfection system has been commissioned in Boulia which self regulates chlorine dosage rates based on water usage. In Urandangi the ground level reservoir is manually dosed with chlorine tablets.

2.1. Boulia Water Supply Scheme

The Boulia water supply scheme is comprised of five sub-artesian bores. Water is pumped on demand from the bores into a 1,140kL ground level reservoir and a 26m high 314kL elevated reservoir. The raw water lines are directed into a manifold which combines the raw water before entering the ground level reservoir.

A Chlorine gas disinfection system is positioned between the combined raw water manifold and the ground water reservoir, a small percentage of the combined raw water line is diverted through the chlorine gas disinfection system. The chlorination process consists of a single chlorinator unit, which shares a common gas inlet and has a one duty dosing stream. Chlorine gas flows from the chlorine gas cylinder into the vacuum regulator where its pressure is reduced to less than atmospheric. It is drawn through the transfer pipework into the chlorinator by the vacuum produced at the injector. The level of chlorine dosage (kg/hr) is set and controlled by the chlorine residual analyser/controller (upstream of the reservoir) mounted on the chlorine dosing panel. The desired chlorine feed rate is calculated by the analyser controller via an analogue 4-20mA. A flow pacing signal sent from the mains flowmeter (multiple bore pump supply line), and chlorine residual reading. This analyser/controller determines the actual gas feed rate of the V-notch plug. A display mounted on the side of the chlorinator indicates the flow meter reading.

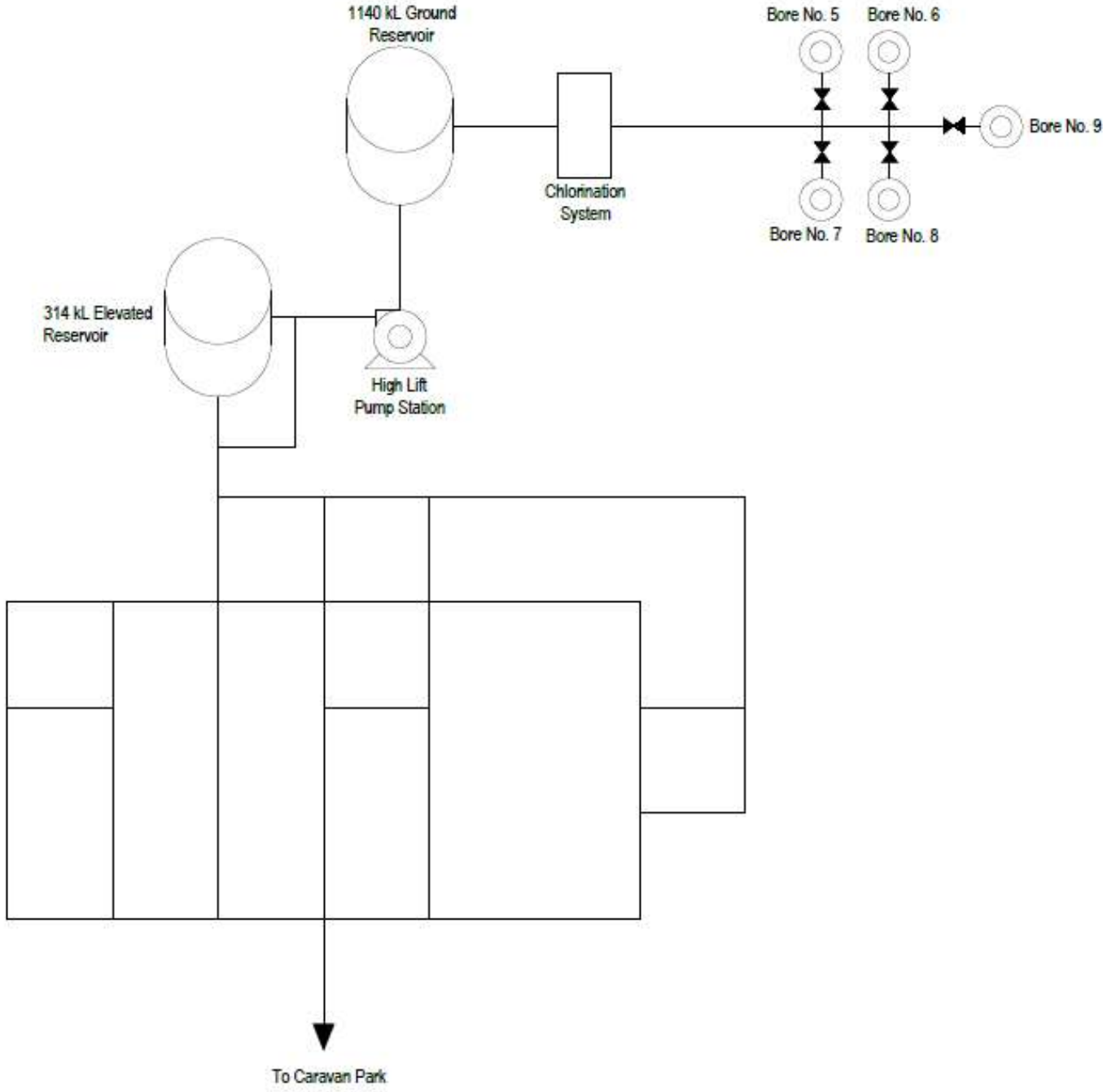
Chlorinated water is then pumped from the reservoirs directly into reticulation. A remote-controlled system activates the pumps when the elevated reservoir drops below 50% capacity which allows it to be refilled. When the elevated reservoir is at capacity the pumps deactivate. The remote-controlled system is accessible via the internet which displays graphs containing data on bore usage/rotation and reservoir levels. The system can be adjusted by contacting the system operators.

Alarms are in place for when the reservoir levels get too low or too high and for when the chlorine gas bottle is empty. There are no alarms in place for the bores or residual/critical chlorine levels as there is no SCADA telemetry system within the Boulia scheme.

2.1.1. Schematic

Figure 2.1 below shows a schematic of the Boulia Water Supply Scheme. Refer to APPENDIX B for water supply layouts.

Boulia Water Distribution Schematic



BORE INFORMATION	
BORE NO.	DATA
Town Bore No. 5 (Hospital) RN 93060	Constructed 1995 Depth 84.5m SWL 21.3m (1995) 5L/S (1995)
Town Bore No. 6 (Airport) RN 118071	Constructed 2003 Depth 82m SWL 31.1m (2003) 5L/S (2003)
Town Bore No. 7 (Power House) RN 146260	Constructed 2010 Depth 82m SWL 39m 2L/S
Town Bore No. 9 (Washdown) RN 146261	Constructed 2010 Depth 84m SWL 27m 4L/S
Town Bore No. 8 (SES / Backup Bore) RN146262	Constructed 2010 Depth 83m SWL 25m 3L/S

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Figure 2.1: Boulia Service Schematic Layout.

2.1.2. Source, Treatment and Distribution Details

Table 2-1 provides the following information for Boulia’s infrastructure:

- Source details;
- Distribution and reticulation.

Table 2-1: Boulia Infrastructure Details.

Component		Boulia Water Supply Scheme
Sources	Name	Boulia Town Bore No. 5 (Hospital)
	Type	Sub-artesian Bore (RN 93060)
	% of supply	Varies according to program
	Reliability	Does not run dry
	Water quality issues	Refer to Section 3.2.1
	Name	Boulia Town Bore No. 6 (Airport)
	Type	Sub-artesian Bore (RN 118071)
	% of supply	Varies according to program
	Reliability	Does not run dry
	Water quality issues	Refer to Section 3.2.1
	Name	Boulia Town Bore No. 7 (Powerhouse)
	Type	Sub- artesian Bore (RN 146260)
	% of supply	Varies according to program
	Reliability	Does not run dry
	Water quality issues	Refer to Section 3.2.1
	Name	Boulia Town Bore No. 9 (Washdown)
	Type	Sub-artesian Bore (RN 146261)
	% of supply	Varies according to program
	Reliability	Does not run dry
	Water quality issues	Refer to Section 3.2.1
Backup Source	Name	Boulia Town Bore No. 8 (SES/Backup Bore)
	Type	Sub-artesian Bore (RN 146262)
	% of supply	0% unless water shortage
	Reliability	Does not run dry
	Water quality issues	High turbidity

Component		Boulia Water Supply Scheme
Sourcing Infrastructure	Type Description	<p>Artesian Bores</p> <p>Town Bore No. 5 is located at the northern end of Wills Street. Town Bore No.6 is located at the western end of Herbert Street. Town Bore No. 7 is located on the corner of Herbert Street and Hamilton Street. Town Bore No 8 is located is located on the corner of Templeton St and Burke St. Town Bore No 9 is located on Diamantina St adjacent to the washdown bay. Town Bore No.5, Town Bore No.6, Town Bore No.7, Town bore No 8 and Town Bore 9 are 84.5m, 82m, 82m, 83 and 78 m deep respectively and yield 5 L/s, 5L/s, 2L/s, 3L/s and 4L/s respectively.</p> <p>All online bores are pumped into the ground level reservoir and then pumped into reticulation or the elevated reservoir. Refer to Appendix C for bore construction details.</p>
Are there any sources that do not undergo treatment prior to supply?	All bores flow to the ground level reservoir water treatment consists of disinfection only.	
Are there any sources that do not undergo disinfection prior to supply?	Chlorine gas disinfection occurs prior to source water entering the ground level reservoir.	
Disinfection	Location	Combined source water line
	Type	Chlorine Gas
	Dose rate	.04-.34kg/hr
	Target residual levels	Chlorine is dosed at a target rate of 1.5mg/L to achieve a target residual between 0.2- 0.5mg/L
	Duty/standby	Single duty
	Alarms	<p>The chlorination system has audible alarm and remote monitoring alarms. The remote terminal unit sends operators SMS notifications of alarms that require immediate operator attention. Alarms include:</p> <ul style="list-style-type: none"> • Weight scale 1 low inventory alarm • Mains flow meter fault/error alarm

Component		Boulia Water Supply Scheme
		<ul style="list-style-type: none"> Booster pump inlet low flow alarm Chlorine shutdown system leak detector alarm
	Auto shut-off arrangements	In the event of a chlorine gas leak, detectors are hard wired to shutdown
	Pipe material Age range Approx. % of total length	Poly 9-29 years (2022) 65%
	Pipe material Age range Approx. % of total length	Rural Poly 7 years (2022) 28%
	Pipe material Age range Approx. % of total length	uPVC 66 years (2022) 6%
	Pipe material Age range Approx. % of total length	Blue Brute 16-21 years (2022) 1%
	Areas where potential long detention periods could be expected	None
	Areas where low water pressure (e.g. < 12 m) could be expected during peak or other demand periods)	None
Reservoirs	Ground Level	
	Name	Boulia Ground Level Reservoir
	Capacity (ML)	1.140
	Roofed	Yes
	Vermin-proof	Yes
	Runoff directed off roof	Yes
	Construction materials	Concrete tank, aluminium roof
	Elevated	
Name	Boulia Elevated Reservoir	
Capacity (ML)	0.314	

Component		Bouli Water Supply Scheme
	Roofed	Yes
	Vermin-proof	Yes
	Runoff directed off roof	Yes
	Construction materials	Galvanised steel
Water quality responsibility changes	Entire water supply scheme	Bouli Shire Council

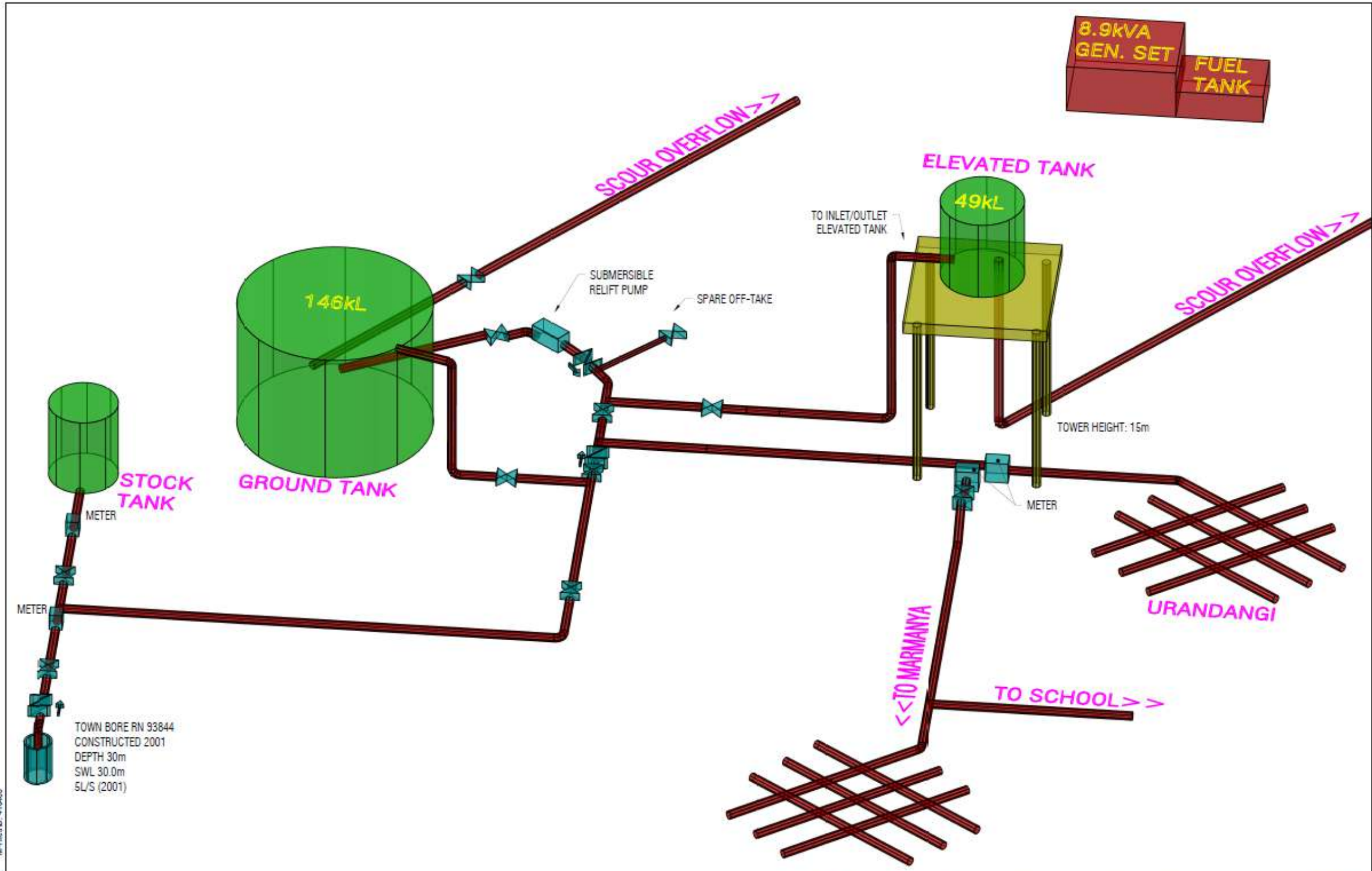
2.2. Urandangi Water Supply Scheme

Urandangi water supply scheme is comprised of one sub-artesian bore which pumps water to a 146kL ground reservoir and a 15m high 49kL elevated reservoir. Water is then fed from the reservoirs directly into reticulation. The water supplied into reticulation is manually treated with chlorine tablets. A remote-controlled system activates the pumps when the elevated reservoir drops below 50% capacity which allows it to be refilled. When the elevated reservoir is at capacity the pumps deactivate. The bore pumps and control system are powered by a solar array. Urandangi also provides water supply to Marmanya an Indigenous settlement on a private property 3km north-east of Urandangi. Marmanya is not subject to routine Council inspections. Currently, there are no residents in Marmanya and therefore, Council has turned off the water supply to the town, with a lock on the valve so it cannot be accessed by the public. However, the community is still connected to the Urandangi scheme, with the ability for the water to be turned back on should residents move in.

During power outages a back-up generator can be used to power pumps and the control system. There are no alarms in place for the Urandangi bore or chlorine residual levels. There is an alarm for when the reservoir levels get too low or too high.

2.2.1. Schematic

Figure 2.2 below shows a schematic of the Urandangi Water Supply Scheme. Refer to APPENDIX B for water supply layouts superimposed on aerial photos.



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B	SCHEMATIC UPDATE	BD	29/08/2016
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Client: BOULIA SHIRE COUNCIL
 Project: 220009 BOUSC RURAL - WATER TESTING & RECORDING
 Title: URANDANGI DWOMP WATER RETICULATION

Category: WATER	
Drawing No.	Rev.
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Size: A3	

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Figure 2.2 Urandangi Service Schematic Layout

2.2.2. Source, Treatment and Distribution Details

Table 2-2 provides the following information for Urandangi's infrastructure:

- Source details;
- Distribution and reticulation.

Table 2-2: Urandangi Infrastructure Details.

Component		Urandangi Water Supply Scheme
Source	Name	Urandangi Town Bore No.1
	Type	Sub Artesian Bore (RN 93844)
	% of supply	100%
	Reliability	Does not run dry
	Water quality issues	Refer to
Sourcing Infrastructure	Type	Sub Artesian Bore
	Description	The Urandangi town bore is located on the corner of Collins Street and Margaret Street. The bore is 30m deep. The bore currently yields 5 L/s. Refer to appendix C for bore construction details.
Are there any sources that do not undergo treatment prior to supply?	Ground level reservoir is treated manually with chlorine tablets.	
Are there any sources that do not undergo disinfection prior to supply?	No	
Disinfection	Location	Ground level reservoir
	Type	Chlorination
	Dose rate	Approx.3 tablets per week
	Target residual levels	Chlorine is dosed at a target rate of 1.5mg/L to achieve a target residual between 0.2- 0.5mg/L
	Duty/standby	N/A
	Alarms	None
	Auto shut-off arrangements	N/A

Component		Urandangi Water Supply Scheme
Distribution and Reticulation System	Pipe material	uPVC
	Age range	19 years (2022)
	Approx. % of total length	10.8%
	Pipe material	Poly
	Age range	19 years (2022)
	Approx. % of total length	89.2%
	Areas where potential long detention periods could be expected	None
Areas where low water pressure (e.g. < 12 m) could be expected during peak or other demand periods)	None	
Reservoirs	Ground Level	
	Name	Urandangi Ground Level Reservoir
	Capacity (ML)	0.146
	Roofed	Yes
	Vermin-proof	Yes
	Runoff directed off roof	Yes
	Construction materials	Concrete base, galvanised steel tank
	Elevated	
	Name	Urandangi Elevated reservoir
	Capacity (ML)	0.049
	Roofed	Yes
	Vermin-proof	Yes
	Runoff directed off roof	Yes
Construction materials	Galvanised steel	
Water quality responsibility changes	Entire water supply scheme	Boulia Shire Council

2.3. Key Stakeholders

Table 2-3 below outlines the relevant stakeholders for BSC water supply schemes in Boulia and Urandangi.

Table 2-3: Boulia Shire Council Stakeholders.

Organisation	Contact Name and Details	Relevance to management of drinking water quality	How the stakeholder is engaged in the DWQMP
Boulia Shire Council	Lynn Moore Chief Executive Officer P: (07) 4746 3188 E: ceo@boulia.qld.gov.au	Small Drinking Water Service Provider	Small Drinking Water Service Provider
Boulia Shire Council	Ajay Agwan Director of Works P: (07) 4746 3188 E: dwo@boulia.qld.gov.au	Manager of infrastructure and projects	Risk Assessment
SGS	P: (07) 3859 3000	Water Analysis Authority	Chemical Analysis/ Reporting Water Quality
GBA Engineers	P: (07) 4651 5177	Consultancy Services	Preparation of DWQMP
Boulia Primary Health Care Centre	P: (07) 4746 2300	Sensitive User	Sensitive User
Boulia Primary School	P: (07) 4746 3151	Sensitive User	Sensitive User
Urandangi Primary School	P: (07) 4748 3101	Sensitive User	Sensitive User

3.0 IDENTIFY HAZARDS AND HAZARDOUS EVENTS

3.1 Boulia and Urandangi Catchment Characteristics

Boulia and Urandangi are located in the Channel Country of Central Western Queensland. Boulia Shire is bordered by the Northern Territory to the west, the Diamantina Shire to the south, Winton to the east, and Mount Isa and Cloncurry to the north. The bulk of the Shire consists of flat channel type country. The area forms part of the Lake Eyre catchment area where the Georgina River system is the most prominent river system which flows through the area and is regularly subjected to flooding. Rainfall and floodwaters from the north flow down and can cause flooding without any rainfall occurring locally. The generally flat terrain is particularly suited to grazing.

The Georgina River and Eyre Creek system drains an area of approximately 210,000km². It rises to the north-west of Mt Isa with three main tributaries, the Buckle, Sander and Ranken Rivers. The latter two have their headwaters in the Northern Territory. Further inflow enters the system from numerous creeks and rivers, the two main tributaries being the Burke and Hamilton Rivers. The Burke River drains the area to the north of Boulia and enters the Georgina River about 20km upstream of Marion Downs, whilst the Hamilton rises to the north-east of Boulia and enters the main Georgina below Marion Downs.

The average annual rainfall for Boulia is 261.8mm² with a mean maximum temperature of 31.9°C. The average annual rainfall for Urandangi is 304.5mm³ with a mean maximum temperature of 32.4°C. For both towns, the majority of the rain falls during the wet season between late November and April. Very little rainfall is needed to bring the country to a standstill. Following flood rains, the main channel fills fairly quickly and then spreads out into the neighbouring channels and watercourses for kilometres on either side. In the event of severe flooding, the Georgina can vary in width in the upper reaches from 15-20km, and in the lower reaches it is estimated in some sections to be 25-30km wide. The Burke River (which passes by the southern end of the town of Boulia), often floods during the wet season resulting in the roads to the south of the town being regularly cut. For the rest of the year there is little rainfall in the area and the volume drops considerably until there is no water and the river dries up. The Georgina River is located to the West of Boulia and also plays a significant role in providing water for livestock and cutting access in times of flood. (Boulia LDMP 2020-21).

The Great Artesian Basin (GAB) covers approximately one-fifth of the Australian continent and contains 8.7 x 10⁶ GL of groundwater in the Jurassic sandstone aquifers. It is the largest groundwater and artesian basin in the world. The basin is located under mostly arid and semi-arid landscapes to the west of the Great Dividing Range. The GAB supports a wide array of activities such as pastoral, agriculture and mining as well as the rural communities, cultural and tourism activities. The GAB is recharged by rainfall and stream flow infiltrating into the exposed sandstone on the edges of the basin. Figure 3.7 shows the recharge, discharge and flow of the GAB.

² Climate statistics for Boulia – Bureau of Meteorology

³ Climate statistics for Urandangie – Bureau of Meteorology

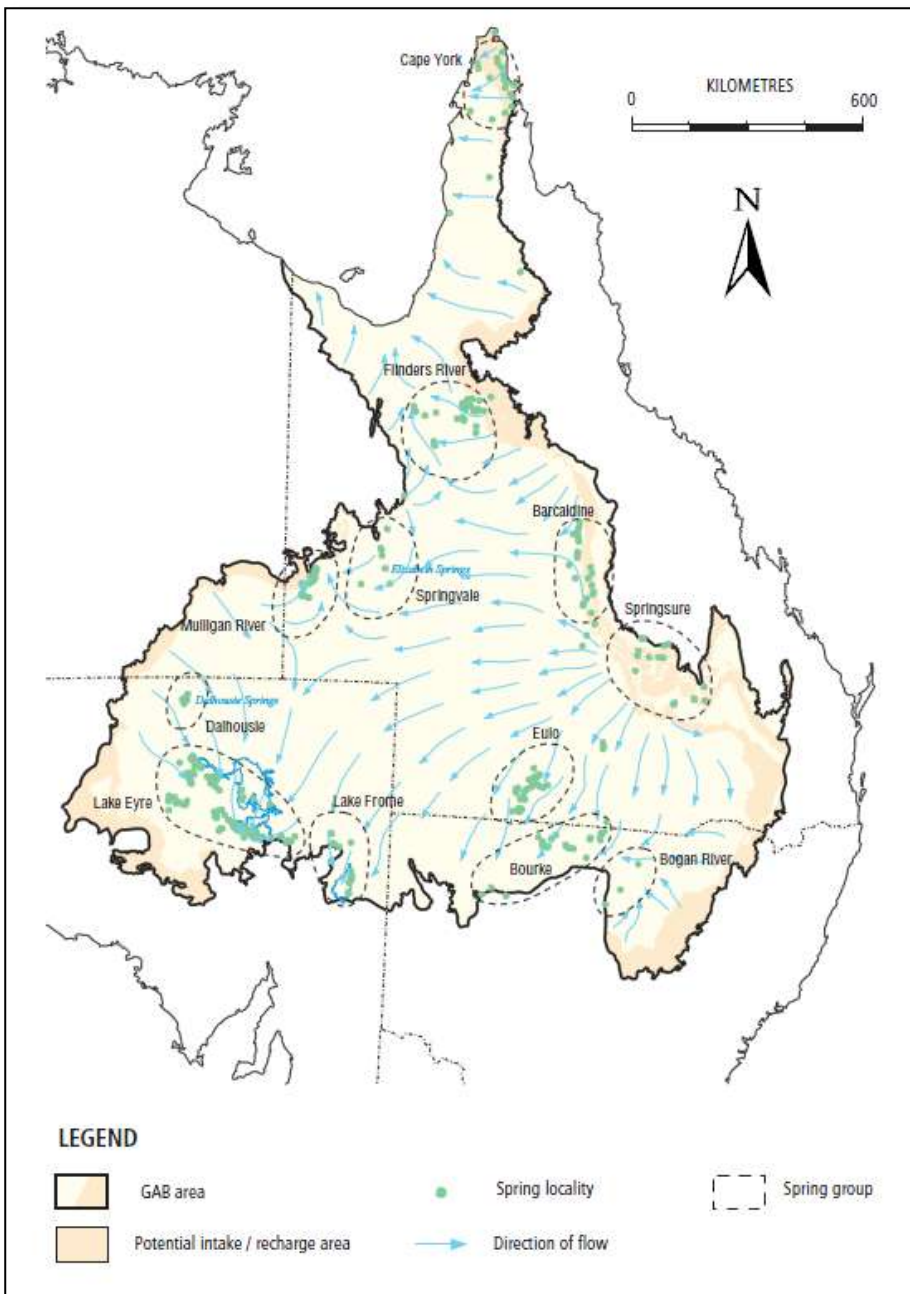


Figure 3.1: GAB Recharge, Discharge and Flow⁴.

The Boulia sewerage collection scheme is comprised of 150mm diameter relined and 225mm diameter asbestos cement reticulation mains, two pump stations, an Imhoff tank and effluent storage lagoons. The sewerage reticulation system has a total pipeline length of 7,010m.

There is no sewerage system for Urandangi. Sewerage treatment is provided by grease traps, septic tanks and effluent soakage trenches.

3.2. Boulia Water Quality Information

Water quality information for Boulia includes the following:

- (a) Summary
- (b) Interpretation

⁴ Great Artesian Basin, Resource Study Summary, Great Artesian Basin Consultative Council

3.2.1. Boulia Water Quality Summary

Table 3.1 below summarises the available reticulated water quality for the Boulia water supply scheme and Table 3.2 summarises the available raw water quality for the scheme.

Figure 3.2 to Figure 3.13 shows trends of the main characteristics contained in Tables 3.1 and 3.2.

Table 3-1 Boulia Distribution Water.

Boulia Distribution Water Supply													
Start Date: 24/03/2015							End Date: 24/11/2021						
Analyte	Units	Operational Sampling Frequency	Verification Sampling Frequency	Summary of Results						Guideline Values			
				Number of Samples	Max. Value	Mean Value	Min. Value	Std Dev	95 th %	Health	Exceedances	Aesthetic	Exceedances
Turbidity	FAU/NTU	Monthly (FAU)	Biannual (NTU)	369	31	8.12	0	3.85	14			15	10
Dissolved Organic Carbon	mg/L	-	Biannual	56	4.5	1.39	0.02	1.618	4.325				
Dissolved Oxygen	Hazen	-	Biannual	39	10.1	8.22	5.8	1.142	9.9				
Total Dissolved Solids	mg/L	-	Biannual	54	970	755.56	690	45.53	820			600	54
pH	pH	Monthly	Biannual	305	9.5	7.94	7.3	0.33	4.462			≥6.5 & ≤8.5	14
Conductivity	µS/cm	Monthly	Biannual	318	1500	1324	919	118.2	1400				
True Colour	HU	-	Biannual	73	57	18.92	5	8.46	33			15	44
Free Chlorine	mg/L	Weekly	Biannual	371	0.95	0.121	0	0.21	0.775			0.5	42
Chlorine Total	mg/L	-	Biannual	37	0.07	0.032	0	0.021	0.062	5	0		
Chloride	mg/L	-	Biannual	44	230	204.55	190	90404	220			250	0
Chlorate	mg/L	-	Biannual	3	0.01	0.01	0.01	0	0.01				
Fluoride	mg/L	-	Biannual	56	1.2	1.037	0.8	0.126	1.2	1.5	0		
Sodium	mg/L	-	Biannual	11	190	176.36	170	7.7	170			180	2
Soluble Iron	mg/L	-	Biannual	58	1	0.043	0.005	0.133	0.17				
Total Iron	mg/L	-	Biannual	136	1.73	0.176	0.005	0.181	0.32			0.3	6
Soluble Manganese	mg/L	-	Biannual	61	0.051	0.015	0.0006	0.017	0.047				
Total Manganese	mg/L	-	Biannual	61	0.11	0.029	0.001	0.024	0.065	0.5		0.1	1
Nitrate	mg/L	-	Biannual	2	0.05	0.0275	0.005	0.0225	0.048	50	0		

Boulia Distribution Water Supply													
Start Date: 24/03/2015							End Date: 24/11/2021						
Analyte	Units	Operational Sampling Frequency	Verification Sampling Frequency	Summary of Results						Guideline Values			
				Number of Samples	Max. Value	Mean Value	Min. Value	Std Dev	95 th %	Health	Exceedances	Aesthetic	Exceedances
Nitrite	mg/L	-	Biannual	2	0.031	0.0305	0.03	0.0005	0.031	3	0		
Uranium	mg/L	-	Biannual	56	0.001	0.001	0.001	0	0.001	0.017	0		
Lead	mg/L	-	Biannual	57	0.003	0.00097	0.0002	0.00034	0.001	0.01	0		
Trihalomethanes	mg/L	-	Biannual	42	0.01	0.0023	0.0005	0.0018	0.006	0.25	0		
<i>E.coli</i>	CFU/100mL	Monthly	Biannual	276	5.3	0.0489	0	0.42	0	1	6		
Coliforms	CFU/100mL	Monthly	Biannual	259	51	2.514	0	8.46	15.28				
Aesthetic Guideline Exceedance													
Health Guideline Exceedance													

Table 3-2: Boulia Source Water.

Boulia Source Water Supply													
Start Date: 24/03/2015							End Date: 1/06/2021						
Analyte	Units	Operational Sampling Frequency	Verification Sampling Frequency	Summary of Results						Guideline Values			
				Number of Samples	Max. Value	Mean Value	Min. Value	Std Dev	95 th %	Health	Exceedances	Aesthetic	Exceedances
Turbidity	FAU/NTU	Quarterly (FAU)	Annual (NTU)	204	13	6.36	0	2.09	9			15	0
Dissolved Organic Carbon	mg/L	-	Annual	87	5.4	0.68	0.03	1.039	3.4				
Dissolved Oxygen	Hazen	-	Annual	35	10.6	7.32	4.3	1.45	9.73				
Total Dissolved Solids	mg/L	-	Annual	30	860	770.3	690	35.8	825.5			600	30
pH	pH	-	Annual	70	7.92	7.43	6.67	0.321	7.9			≥6.5 & ≤8.5	0
Conductivity	µS/cm	-	Annual	70	1411	1358	1296	28.29	1400				
Free Chlorine	mg/L	Quarterly	Annual	60	0.05	0.029	0	0.015	215.5			0.5	0
Chlorine Total	mg/L	-	Annual	56	0.05	0.028	0	0.015	0.04	5	0		
Chloride	mg/L	-	Annual	30	230	200.67	190	9.64	215.5			250	0
Chlorate	mg/L	-	Annual										
Fluoride	mg/L	-	Annual	35	1.2	0.976	0.62	0.135	1.13	1.5	0		
Selenium	mg/L	-	Annual	33	0.005	0.0016	0.001	0.0014	0.005	0.01	0		
Sodium	mg/L	-	Annual	30	290	199.67	170	33.41	270			180	17
Soluble Iron	mg/L	-	Annual	72	0.28	0.07	0.005	0.063	0.22				
Total Iron	mg/L	Quarterly	Annual	223	0.97	0.244	0.01	0.112	0.39			0.3	24
Soluble Manganese	mg/L	-	Annual	67	0.51	0.056	0.001	0.059	0.0604				
Total Manganese	mg/L	-	Annual	92	0.51	0.054	0.001	0.051	0.066	0.5		0.1	2
Nitrate	mg/L	-	Annual	5	0.05	0.0232	0.005	0.0219	0.05	50	0		

Boulia Source Water Supply													
Start Date: 24/03/2015							End Date: 1/06/2021						
Analyte	Units	Operational Sampling Frequency	Verification Sampling Frequency	Summary of Results						Guideline Values			
				Number of Samples	Max. Value	Mean Value	Min. Value	Std Dev	95 th %	Health	Exceedances	Aesthetic	Exceedances
Nitrite	mg/L	-	Annual	5	0.009	0.007	0.005	0.0014	0.0088	3	0		
Silver	mg/L	-	Annual	5	0.001	0.001	0.001	0	0.001	0.1	0		
Uranium	mg/L	-	Annual	35	0.005	0.0016	0.001	0.0014	0.005	0.017	0		
Lead	mg/L	-	Annual	35	0.001	0.001	0.001	0	0.001	0.01	0		
<i>E.coli</i>	CFU/100mL	Quarterly	Annual	118	3.1	0.0432	0	0.337	0	1	2		
Coliforms	CFU/100mL	Quarterly	Annual	116	51	5.67	0	10.73	29.75				
Aesthetic Guideline Exceedance													
Health Guideline Exceedance													

Table 3-3: Boulia Turbidity operational results from June 2022- Current, measuring in NTUs.

Analyte	Units	Operational Sampling Frequency	Summary of Results					Targets	
			Number of Samples	Max. Value	Mean Value	Min. Value	Std Dev.	Target	Exceedances
Distribution System									
Turbidity	NTU	Monthly	16	2.11	0.43	0.15	0.46	<1	1
Source Water									
Turbidity	NTU	Quarterly	3	1.29	0.85	0.58	0.31	<1	1

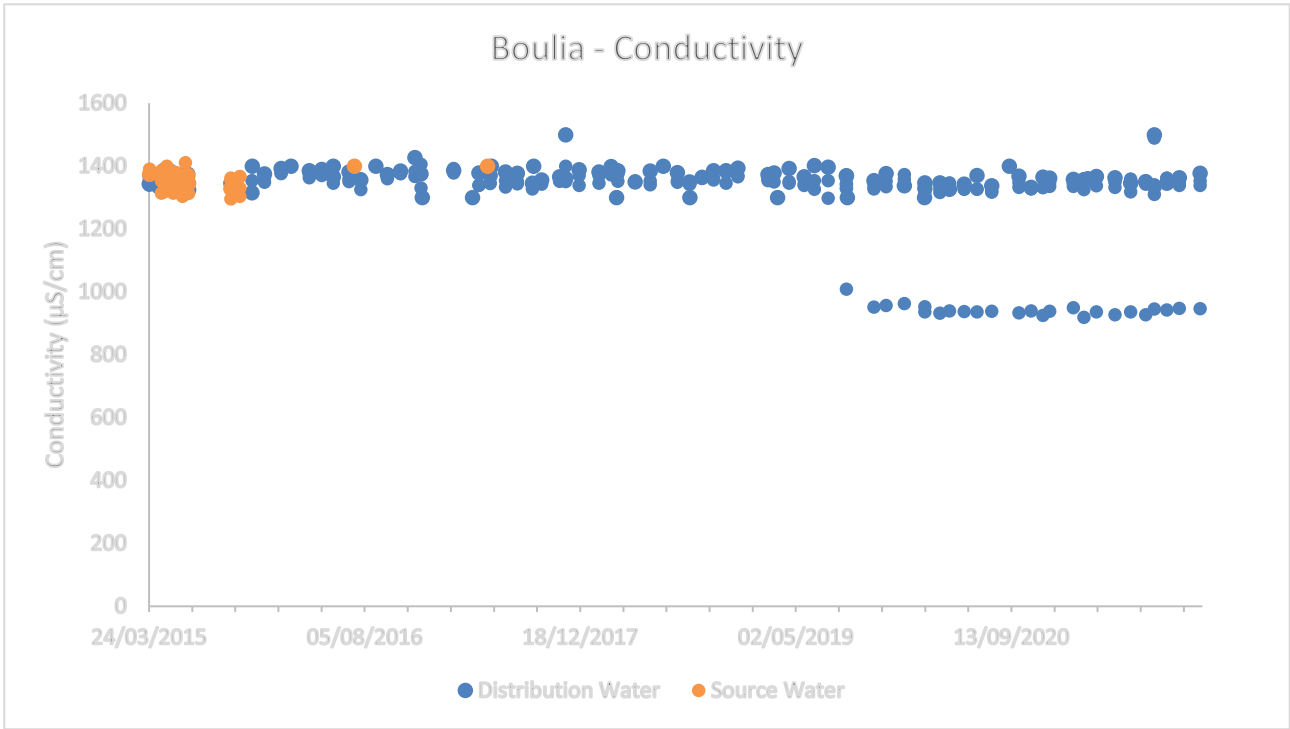


Figure 3.2: Boulia – Conductivity (µS/cm).

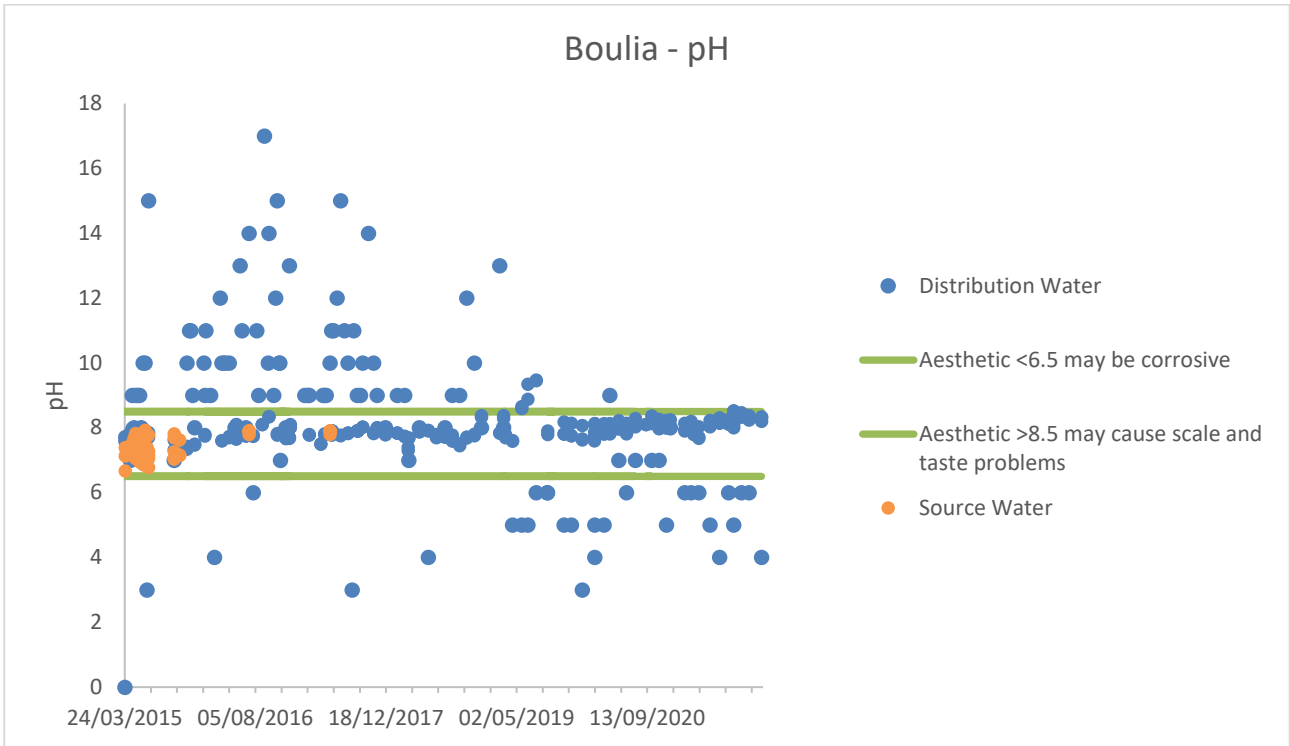


Figure 3.3: Boulia – pH at 25°C.

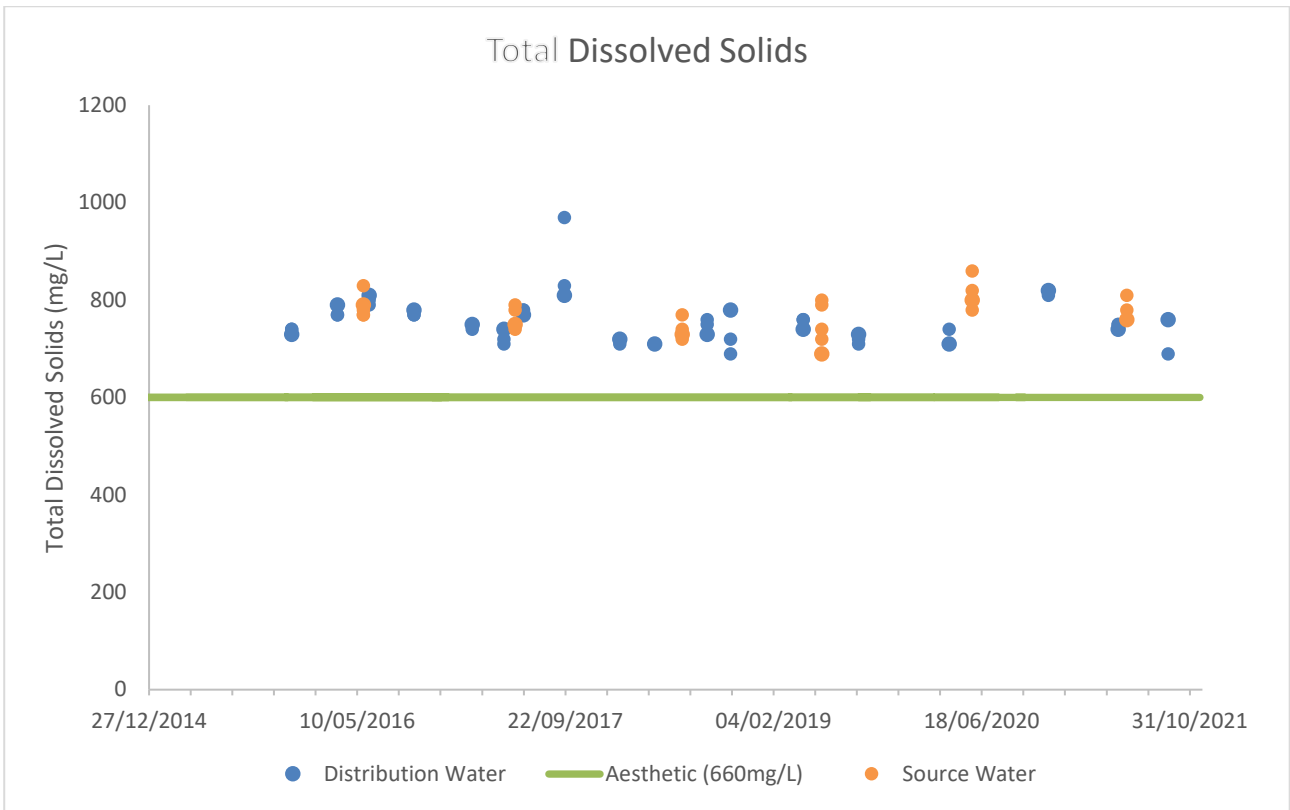


Figure 3.4: Total Dissolved Solids.

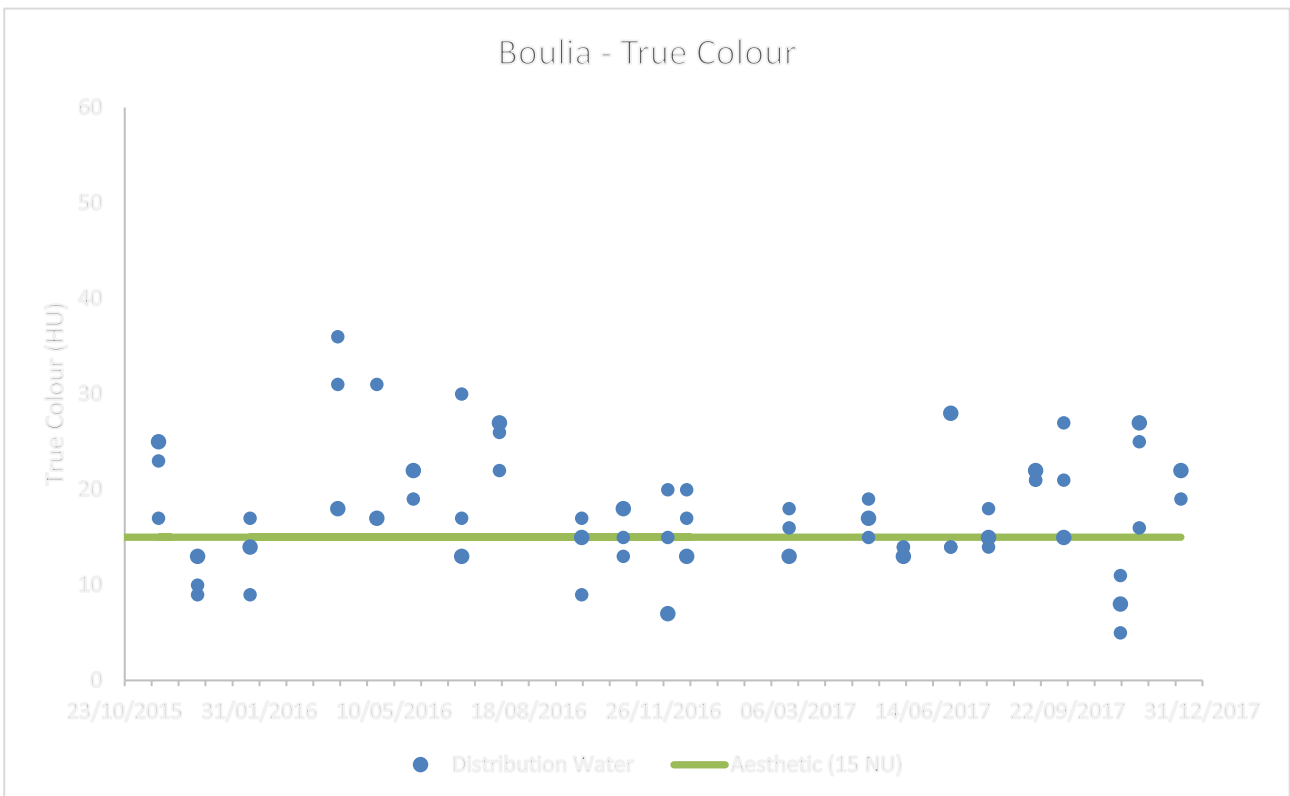


Figure 3.5: Bouliia – True Colour.

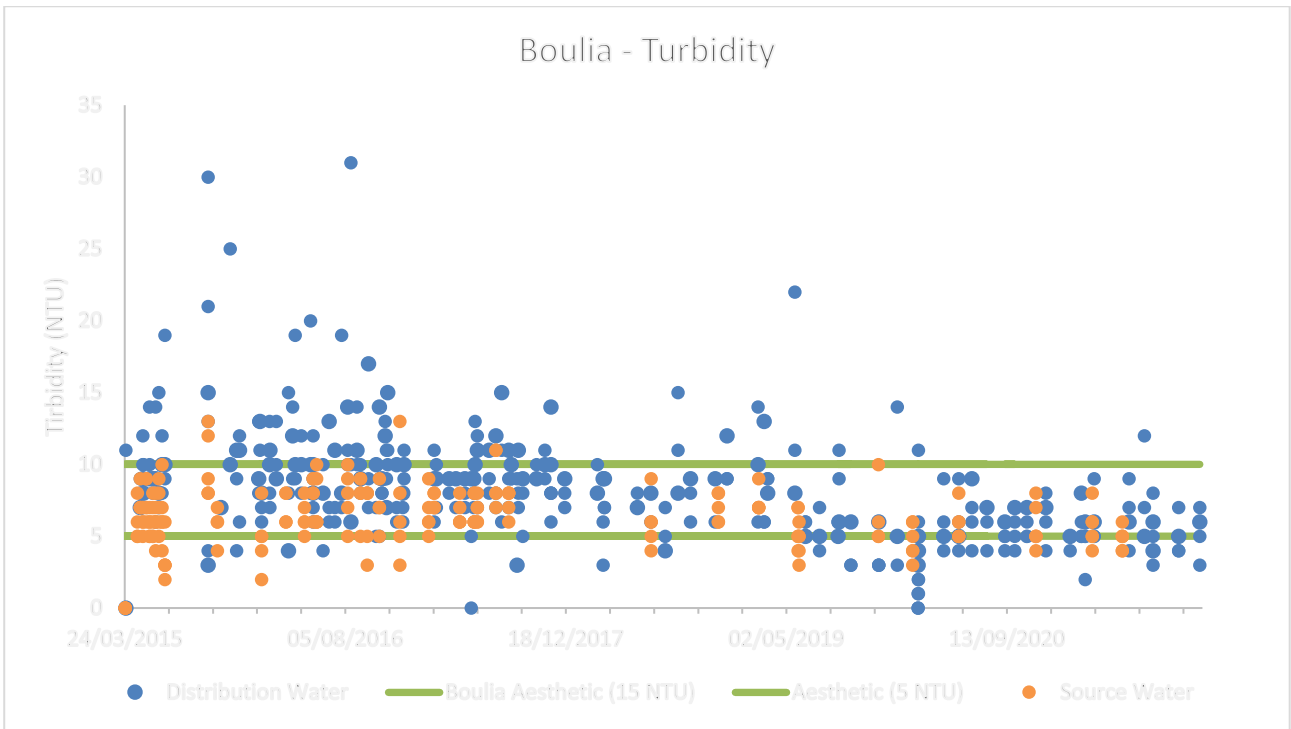


Figure 3.6: Boulia - Turbidity. NOTE: Verification testing was undertaken in NTUs, Operational testing was undertaken in FAUs.

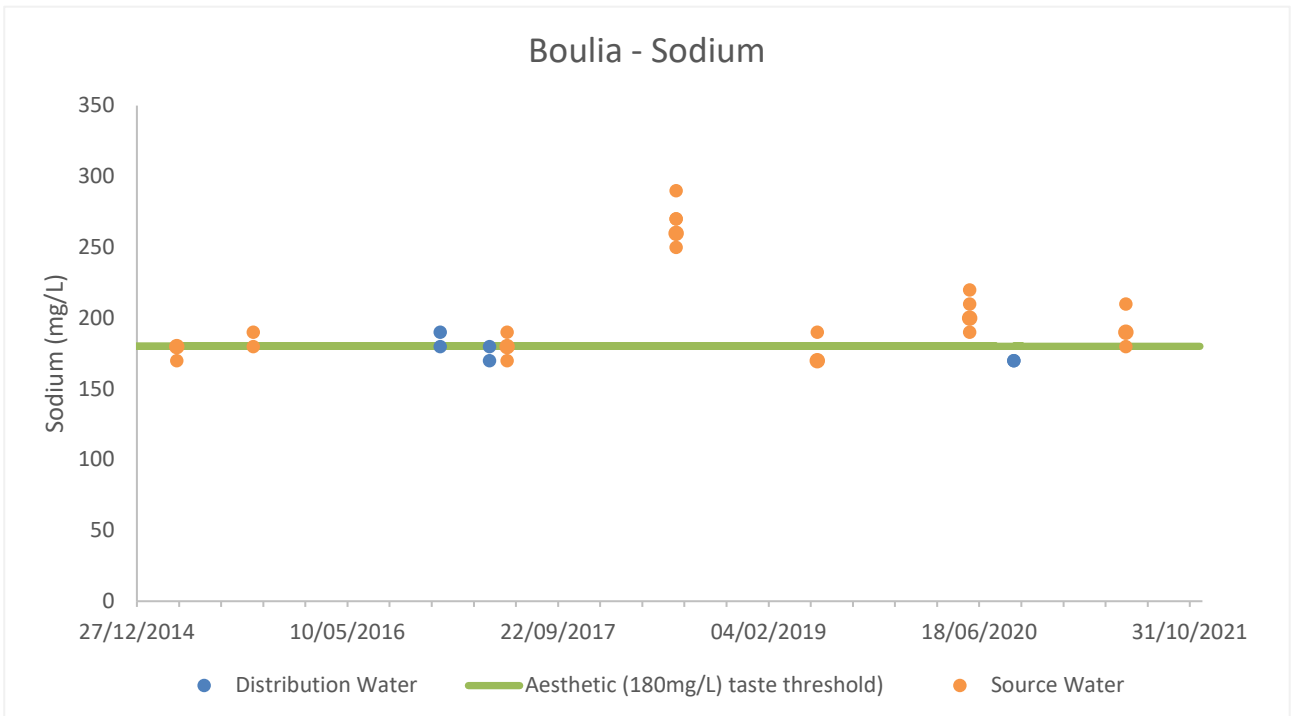


Figure 3.7: Boulia - Sodium.

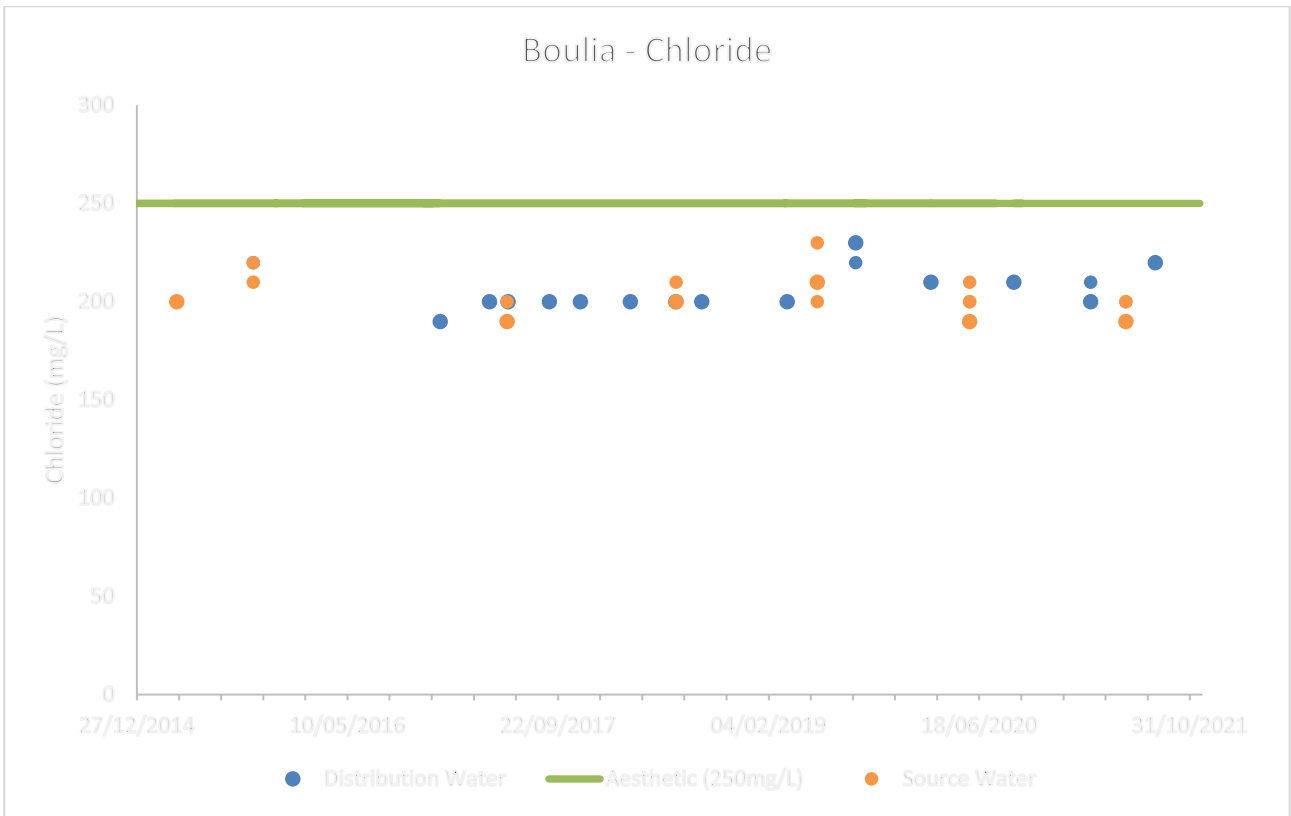


Figure 3.8: Boulia - Chloride.

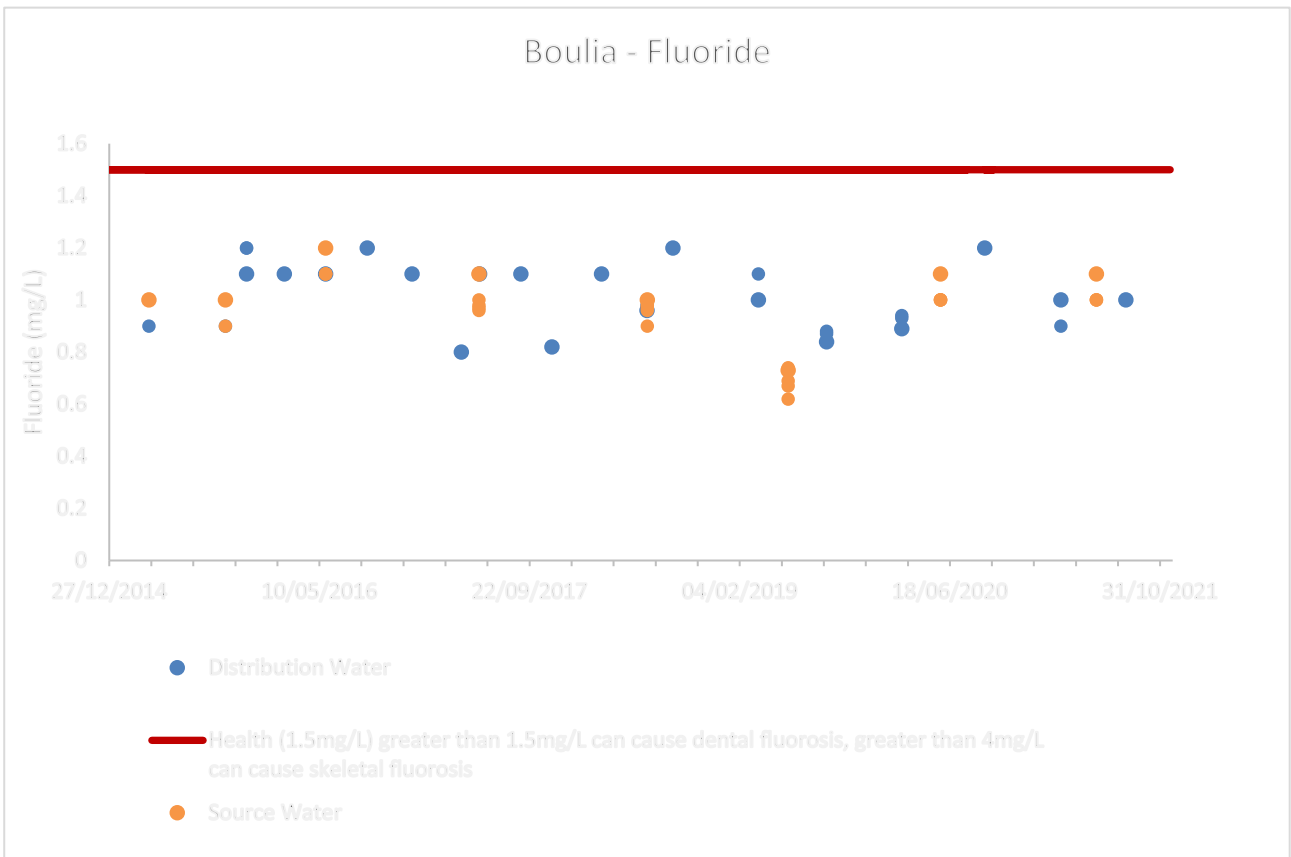


Figure 3.9: Boulia - Fluoride.

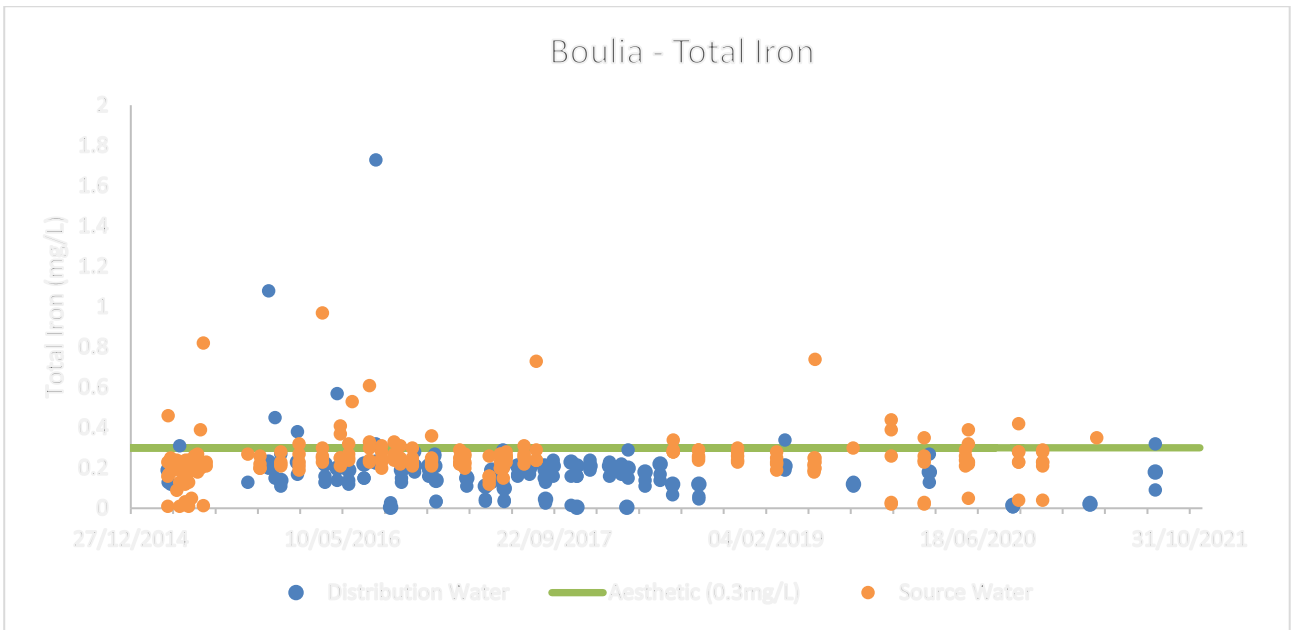


Figure 3.10: Boulia – Total Iron.

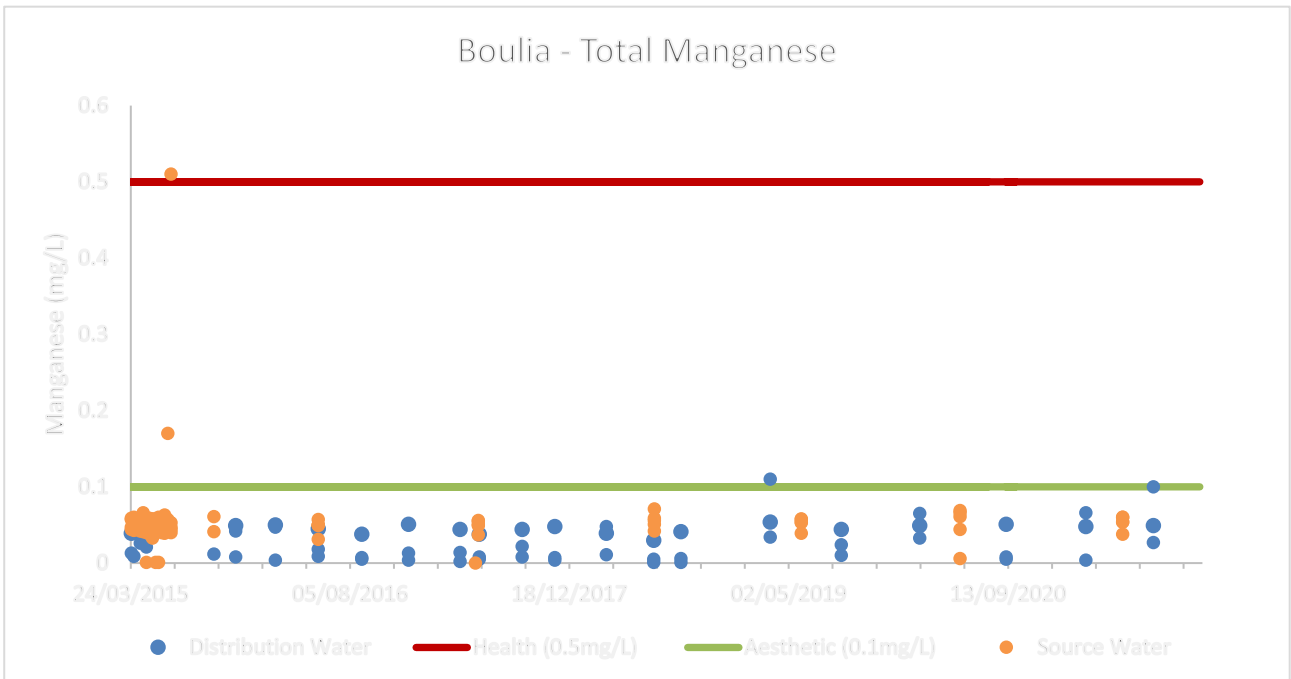


Figure 3.11: Boulia – Total Manganese.

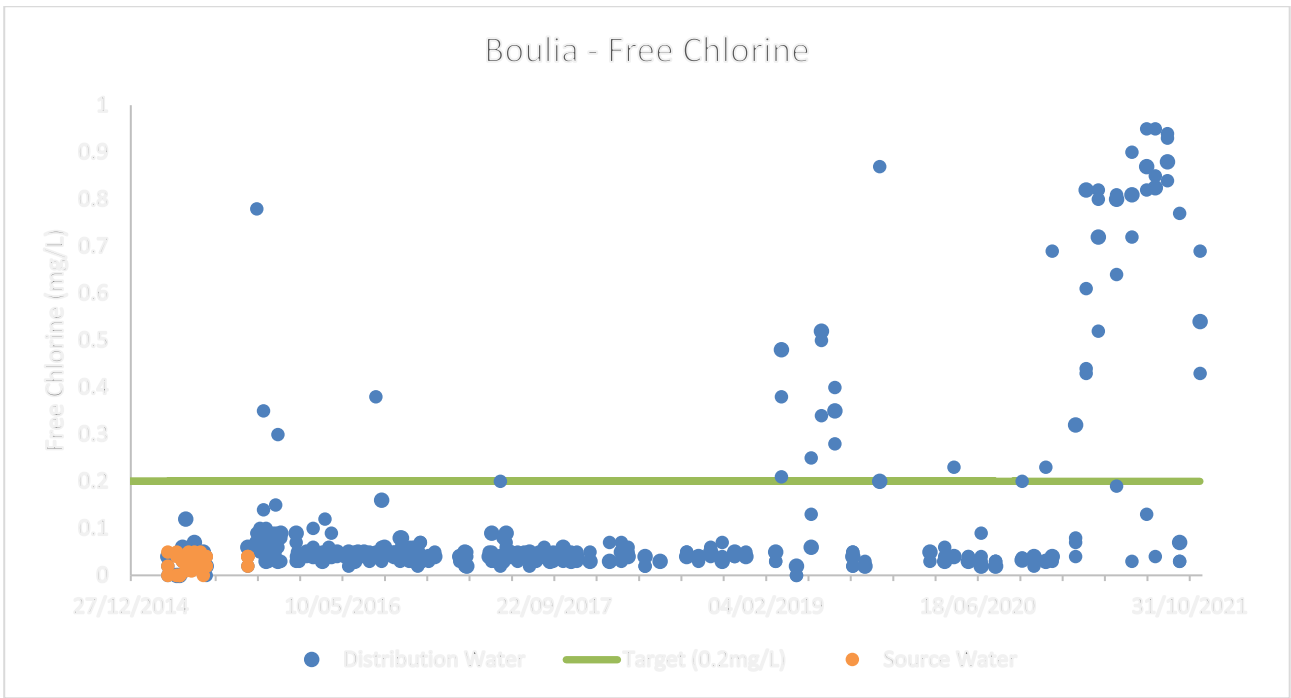


Figure 3.12: Boulia – Free chlorine.

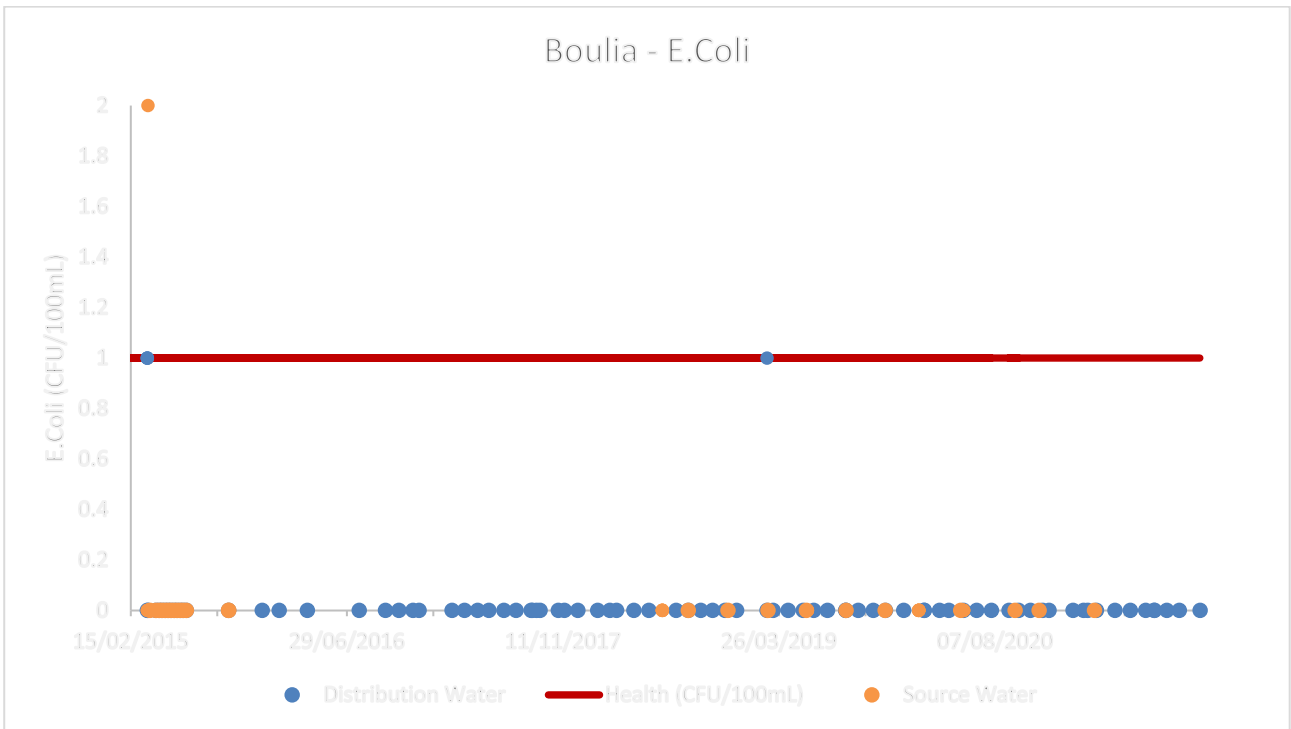


Figure 3.13: Boulia – E. coli.

3.2.2. Boulia Water Quality Interpretation

ADWG Health Exceedances

In 2015, ADWG health exceedances for *E.coli* were reported within Boulia's source water. This issue was resolved and follow-up intense *E.coli* monitoring in the 12 weeks following this incident reported no more *E.coli* within the Boulia scheme. Additionally, *E.coli* has not been reported within the Boulia scheme since.

ADWG Aesthetic Exceedances

The following parameters have reported increases above the ADWG aesthetic values:

- pH
- Total Dissolved Solids
- True Colour
- Turbidity
- Sodium
- Total Iron
- Total Manganese
- Free Chlorine

Figure 3.2 shows pH exceedances within the distribution system. The ADWG values stipulate an aesthetic range for pH between 6.5- 8.5. pH levels outside of these values is not necessarily unsafe but may result in a bitter aftertaste within the water. From 305 pH tests, there have been 14 exceedances. These exceedances were reported in 2019 with the average value for pH currently sitting at 7.94 which is well within the aesthetic range.

Figure 3.3 provides a trend for the analysis of Total Dissolved Solids; across the distribution and source water testing, all of the 84 tests since 2018 have exceeded the aesthetic guideline value of 600 mg/L. No health-based guideline is considered necessary; however, aesthetic guideline exceedances can cause taste issues with the water.

Figure 3.4 identifies True Colour trends for Boulia within the distribution system; from 73 values 44 exceed the aesthetic threshold of the ADWG. The aesthetic guideline value is 15Hu, the average for Boulia is 18.92 Hu. A health guideline value for true colour by the ADWG has been deemed unnecessary as aesthetic exceedances generally result in changes to the physical appearance of the water rather than the chemical composition.

Figure 3.5 provides values for Turbidity within Boulia's drinking water. The ADWG aesthetic threshold for turbidity is set at 5NTU, however, as discussed below in Section 5.3.1, in Boulia, the aesthetic value for turbidity has been set at 15NTU as elevated turbidity is an inherent characteristic of the Boulia scheme. Of the 369 values recorded for the distribution system, 10 have exceeded the Boulia aesthetic threshold. The last exceedance was recorded in 2019 and since then, turbidity has remained well under 15NTU (but not under the ADWG guideline value of 5 NTU). Elevated turbidity within the Boulia scheme is discussed further in Section 5.3.1. It should also be noted that until June of 2022, operational monitoring for turbidity was being measured in FAUs not NTUs.

Figure 3.6 identifies Sodium concentration values for Boulia's drinking water. Exceedances have been reported in both the distribution and source water, however, most commonly within the source water with 17 exceedances from 30 tests. The average value for sodium is 199.67 mg/L which is above the aesthetic value of 180 mg/L. For Sodium no health guideline is stipulated however, the taste threshold sits at approximately 135mg/L.

Figure 3.9 provides values for Total Iron levels in Boulia's source water and distribution system. The average value for Iron in Boulia's distribution system and source water is 0.176mg/L and 0.244mg/L (respectively) which is under the aesthetic guideline value of 0.3mg/L. Relatively high concentrations of iron in Boulia's water have caused some issues regarding water quality which is discussed further in section 4 Assessment of Risks.

Figure 3.10 shows three values exceeding the aesthetic threshold level for Total Manganese, one within the distribution system and one within the source water. These values were reported in 2015 (in the source water) and 2019 (distribution system) and are most likely to be outliers. Since 2019, no exceedances have been reported above the ADWG aesthetic value of 0.1mg/L. Due to the unprecedented nature of these exceedances Total Manganese levels are not considered to be a major concern within the Boulia scheme.

Figure 3.11 shows free chlorine exceedances within the Boulia distribution system with 42 exceedances from 371 tests. The average free chlorine value is 0.121mg/L which is not considered unsafe or indicative of other issues within the drinking water. For schemes such as Boulia that use chlorination for disinfection, the presence of free chlorine residual in the distribution system is evidence of initial disinfection and protection against recontamination from backflow or pipeline breaks. In general, a free chlorine residual between 0.2 and 0.5 mg/L is considered adequate. Total chlorine values for Boulia's distribution system have remained well under the ADWG health guideline value of 5mg/L.

3.3. Urandangi Water Quality Information

Water quality information for Urandangi includes the following:

- (a) Summary
- (b) Interpretation

3.3.1. Urandangi Water Quality Summary

Table 3-4 below summarises the available reticulated and source water quality for the Urandangi water supply scheme.

Figure 3.14 to Figure 3.28 shows trends of the main characteristics contained in Table 3-4.

Table 3-4: Urandangi Distribution and Source Water.

Urandangi Distribution and Source Water Supply														
Start Date: 25/03/2015					End Date: 24/11/2021									
Analyte	Scheme	Units	Operational Sampling Frequency	Verification Sampling Frequency	Summary of Results						Guideline Values			
					Number of Samples	Max. Value	Mean Value	Min. Value	Std Dev	95 th %	Health	Exceedances	Aesthetic	Exceedances
Turbidity	Distribution /Source	NTU/FAU	Monthly (FAU)	Biannual/Annual (NTU)	133	18	4.84	0	2.2	7.4			5	39
Dissolved Organic Carbon	Distribution /Source	mg/L	-	Biannual/Annual	47	5.9	1.32	0	1.55	4.27				
Dissolved Oxygen	Distribution /Source	Hazen	-	Biannual/Annual	29	10.6	8.7	4	1.34	10.32				
Total Dissolved Solids	Distribution /Source	mg/L	-	Biannual/Annual	41	2400	1252	270	286.7	1400			600	39
pH	Distribution /Source	pH	Monthly	Biannual/Annual	164	9.36	7.8	6.8	0.35	8.401			≥6.5 & ≤8.5	5
Conductivity	Distribution /Source	µS/cm	Monthly	Biannual/Annual	172	2200	1968	400	143.86	2100				
True Colour	Distribution	HU	-	Biannual	39	32	16.36	4	5.32	23.3			15	24
Free Chlorine	Distribution /Source	mg/L	Monthly	Biannual/Annual	120	1.85	0.319	0	0.404	1.316			0.5	23
Chlorine Total		mg/L	-		10	0.55	0.236	0.04	0.17	0.49	5	0		
Chloride	Distribution /Source	mg/L	-	Biannual/Annual	34	390	350.97	13	60.55	380			250	34
Chlorate	Distribution /Source	mg/L	-	Biannual/Annual	2	0.27	0.23	0.19	0.04	0.27				
Fluoride	Distribution /Source	mg/L	-	Biannual/Annual	45	2.7	1.908	0.16	0.348	2.3	1.5	44		
Selenium	Source	mg/L	-	Annual	42	0.005	0.0026	0.001	0.000	0.004	0.01			

Urandangi Distribution and Source Water Supply

Start Date: 25/03/2015

End Date: 24/11/2021

Analyte	Scheme	Units	Operational Sampling Frequency	Verification Sampling Frequency	Summary of Results						Guideline Values			
					Number of Samples	Max. Value	Mean Value	Min. Value	Std Dev	95 th %	Health	Exceedances	Aesthetic	Exceedances
									7					
Sodium	Distribution /Source	mg/L	-	Biannual/ Annual	15	280	201.33	190	22.76	238			180	15
Soluble Iron	Distribution /Source	mg/L	-	Biannual/ Annual	45	0.069	0.0085	0.001	0.013	0.02				
Total Iron	Distribution /Source	µg/L	-	Biannual/ Annual	40	150	13.025	2	25.52	23.25			300	
Soluble Manganese	Distribution /Source	mg/L	-	Biannual/ Annual	45	0.08	0.004	0.0005	0.012	0.014				
Total Manganese	Distribution /Source	mg/L	-	Biannual/ Annual	49	0.071	0.0052	0.001	0.012	0.0238	0.5	0	0.1	0
Nitrate	Distribution /Source	mg/L	-	Biannual/ Annual	4	0.05	0.027	0.002	0.023	0.05	50			
Nitrite	Distribution /Source	mg/L	-	Biannual/ Annual	4	0.82	0.75	0.68	0.06	0.817	3			
Silver	Source	µg/L	-	Annual	4	1	1	1	0	1	100			
Uranium	Distribution /Source	mg/L	-	Biannual/ Annual	43	0.017	0.0125	0.001	0.003	0.014	0.017			
Lead	Distribution /Source	µg/L	-	Biannual/ Annual	43	15	2.11	0.2	3.23	11.41	10	5		
Trihalomethanes	Distribution	µg/L	-	Biannual/ Annual	13	10	5	2	3.606	10	250			
<i>E.coli</i>	Distribution /Source	mg/L	Monthly	Biannual/ Annual	139	13	0.123	0	1.147	0	1	2		

Urandangi Distribution and Source Water Supply														
Start Date: 25/03/2015					End Date: 24/11/2021									
Analyte	Scheme	Units	Operational Sampling Frequency	Verification Sampling Frequency	Summary of Results						Guideline Values			
					Number of Samples	Max. Value	Mean Value	Min. Value	Std Dev	95 th %	Health	Exceedances	Aesthetic	Exceedances
Coliforms	Distribution /Source	mg/L	Monthly	Biannual/ Annual	130	57	5	0	12.62	42.2				
Aesthetic Guideline Exceedance														
Health Guideline Exceedance														

Table 3-5: Urandangi Turbidity operational results from June 2022- Current, measuring in NTUs.

Analyte	Units	Operational Sampling Frequency	Summary of Results					Targets		
			Number of Samples	Max. Value	Mean Value	Min. Value	Std Dev.	Target	Exceedances	
Distribution System										
Turbidity	NTU	Monthly	8	0.57	0.25	0.1	0.14	<1	0	

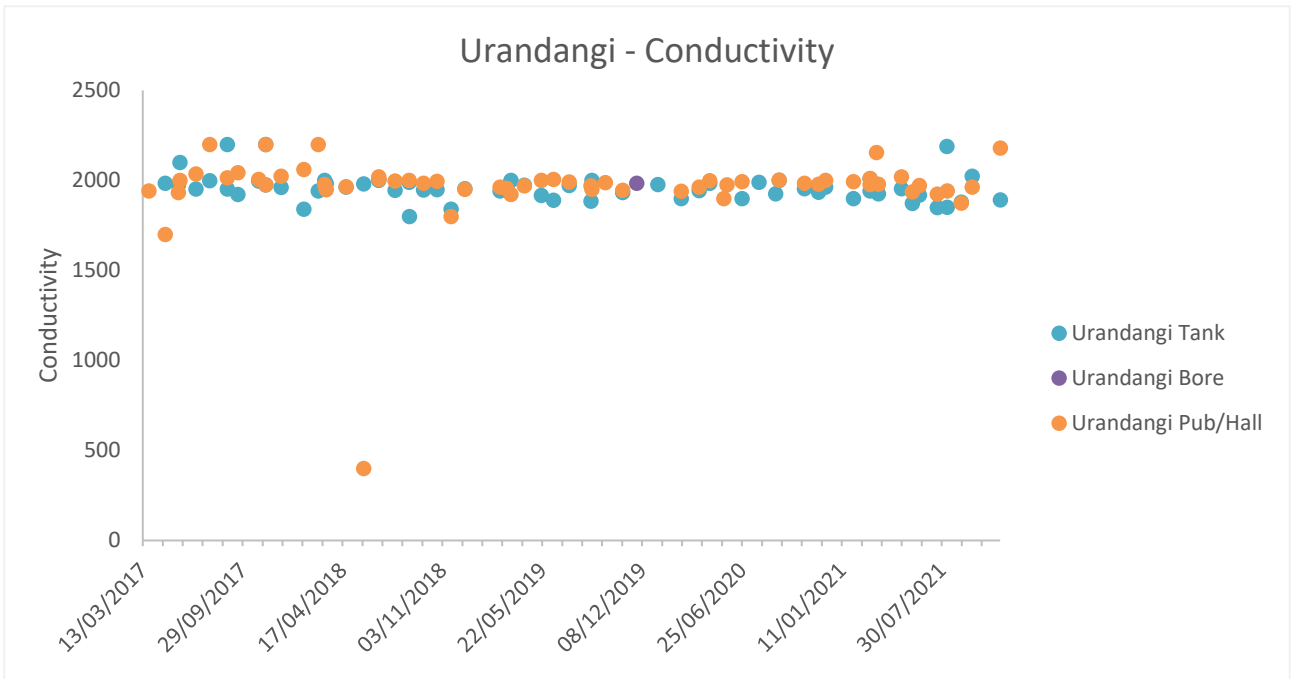


Figure 3.14: Urandangi – Conductivity.

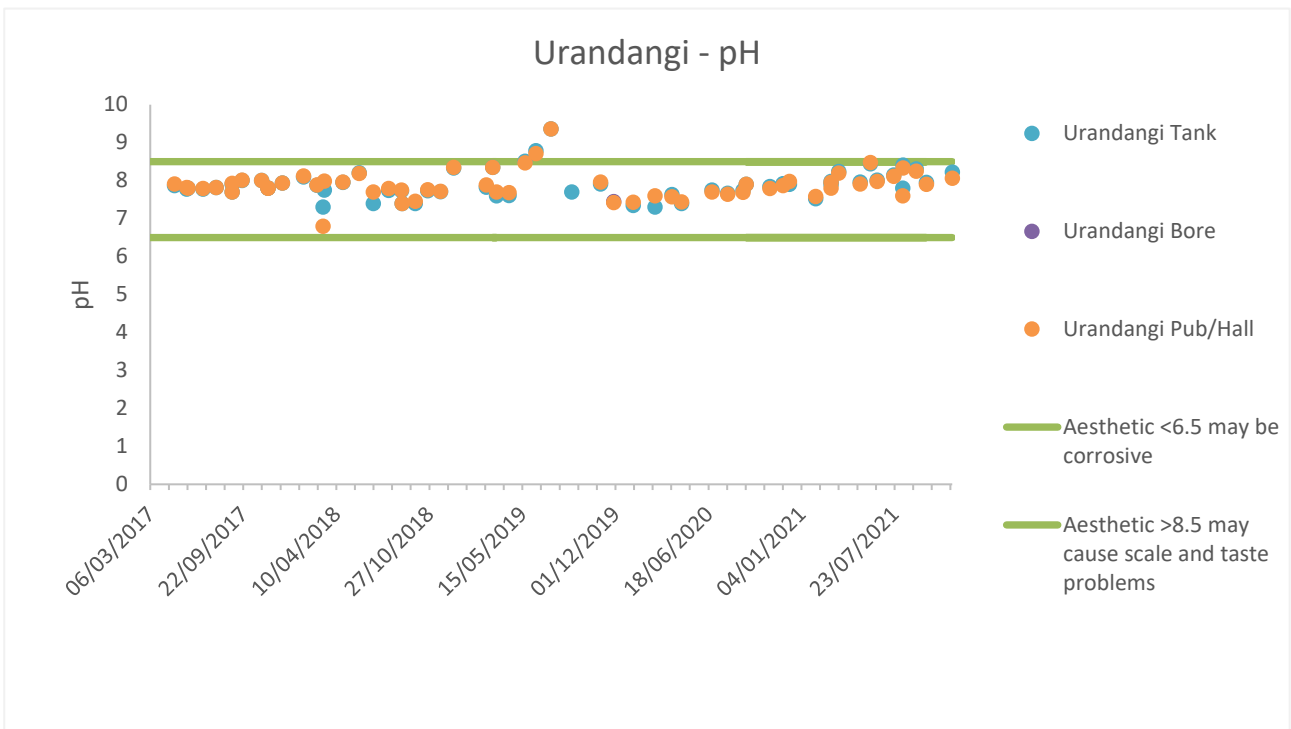


Figure 3.15: Urandangi – pH @ 23°C.

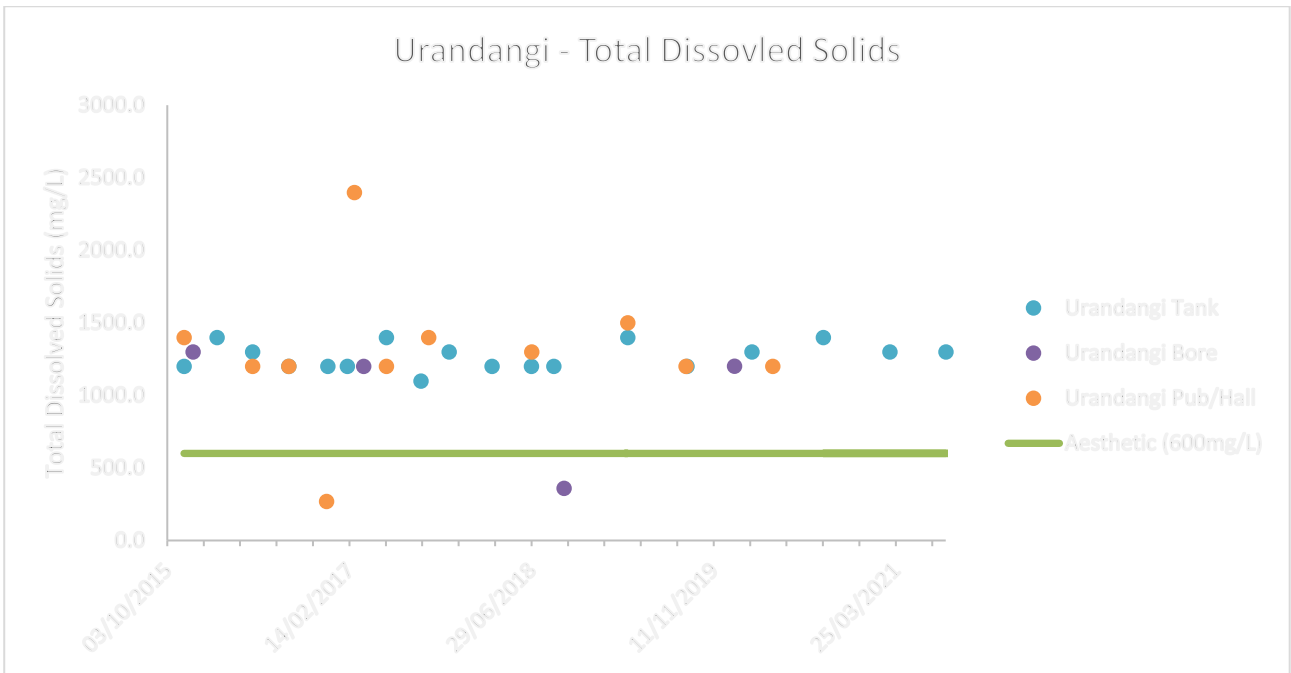


Figure 3.16: Urandangi – Total Dissolved Solids.

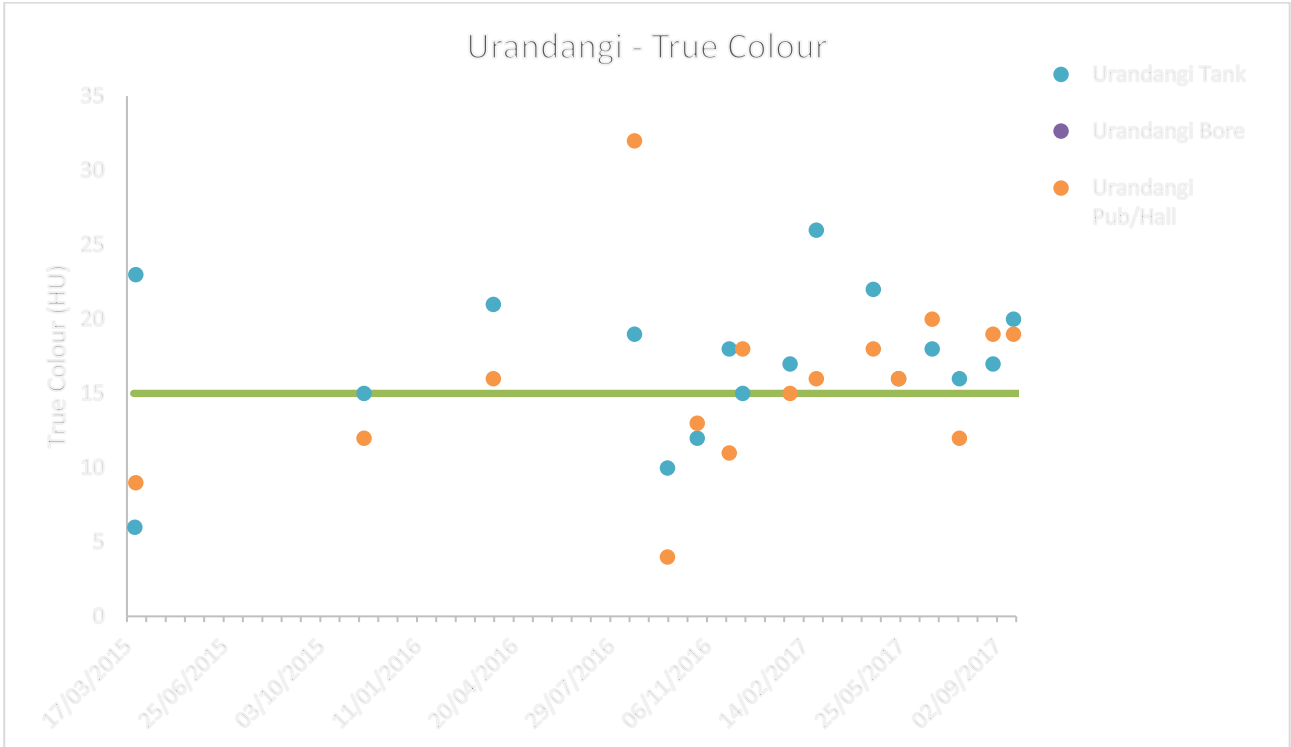


Figure 3.17: Urandangi – True Colour.

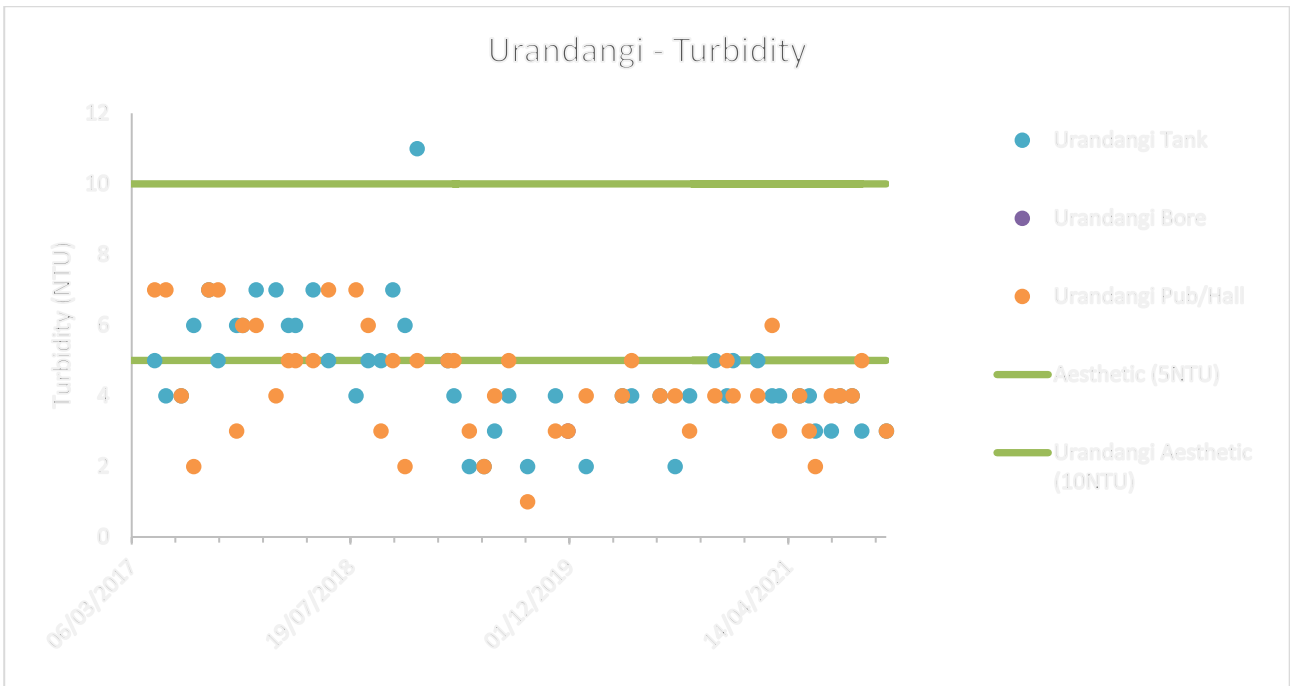


Figure 3.18: Urandangi - Turbidity. NOTE: Verification testing was undertaken in NTUs, Operational testing was undertaken in FAUs.

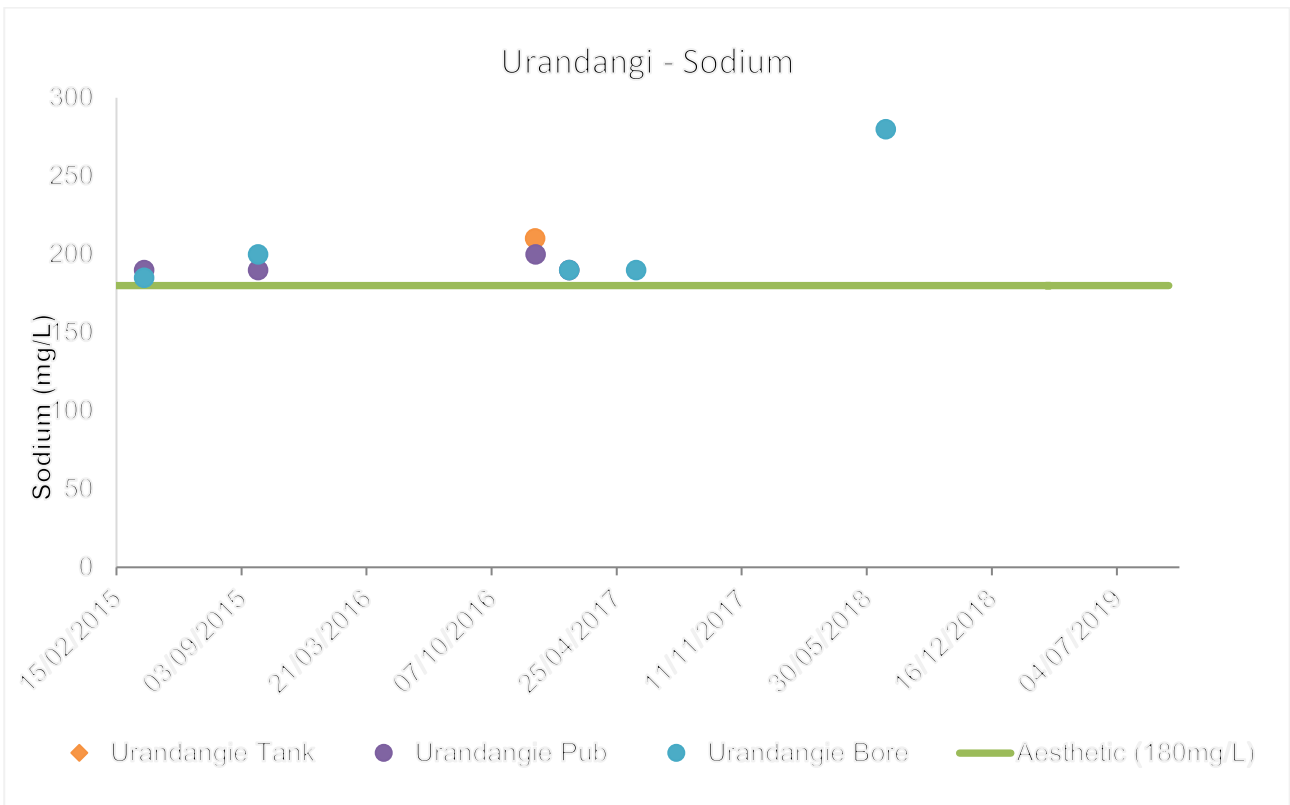


Figure 3.19: Urandangi - Sodium.

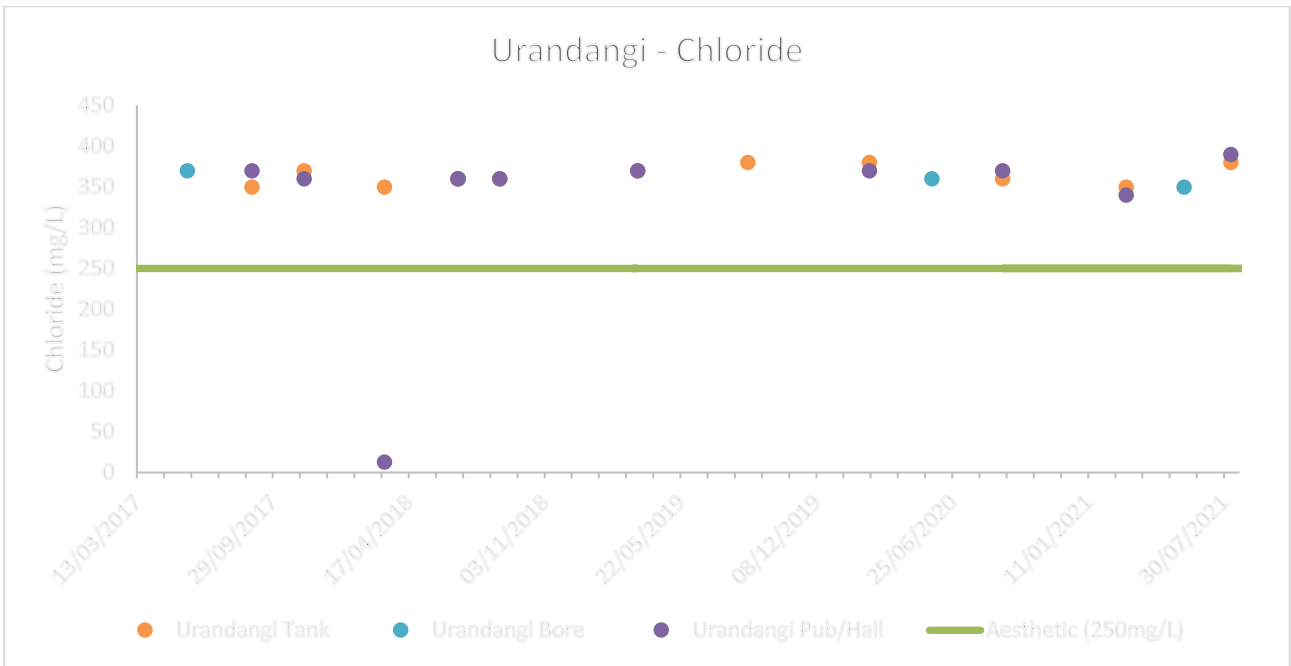


Figure 3.20: Urandangi - Chloride.

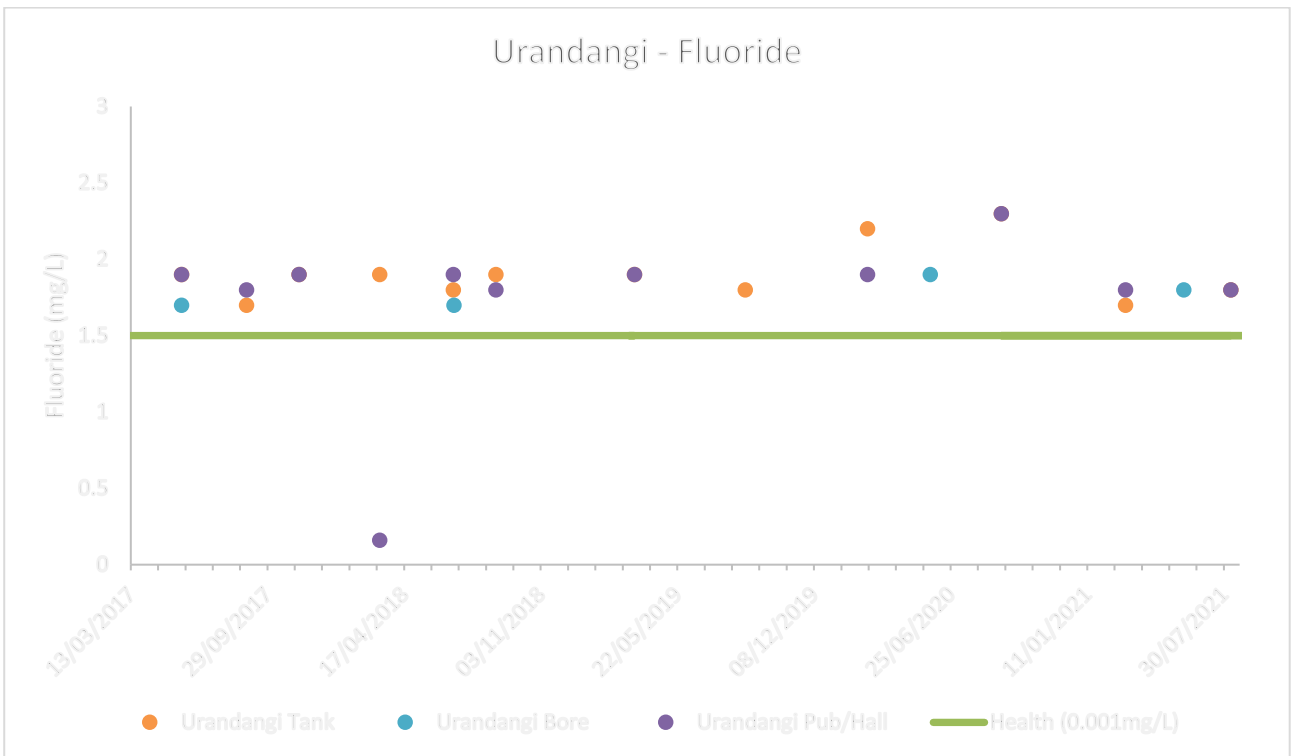


Figure 3.21: Urandangi - Fluoride.

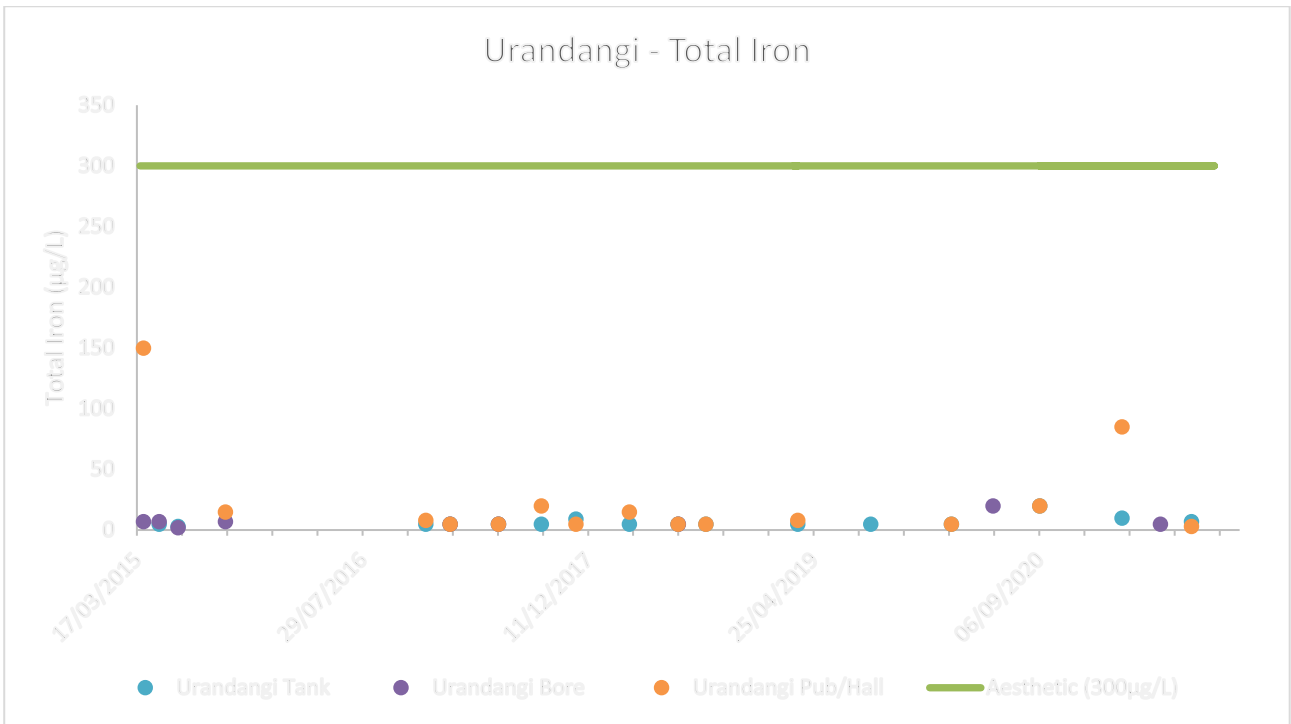


Figure 3.22: Urandangi – Iron (25°C).

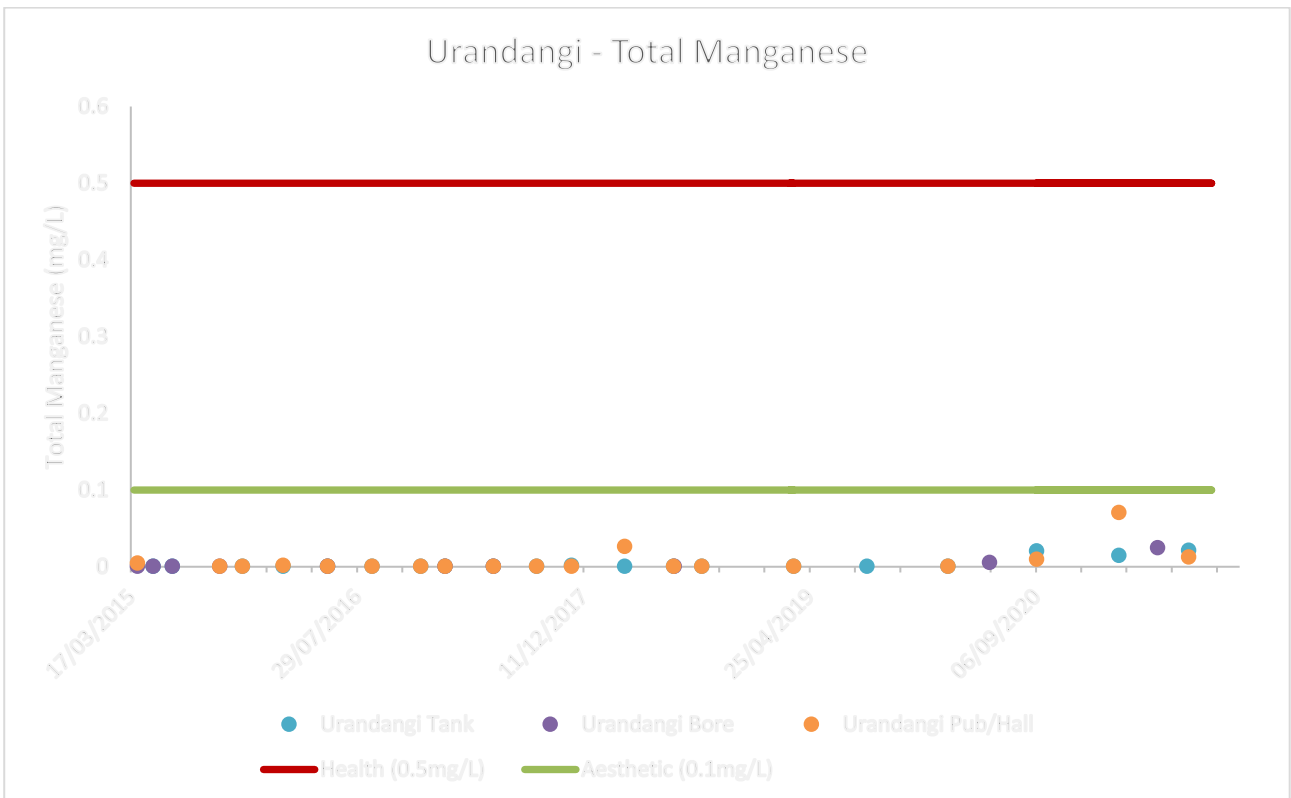


Figure 3.23: Urandangi – Manganese.

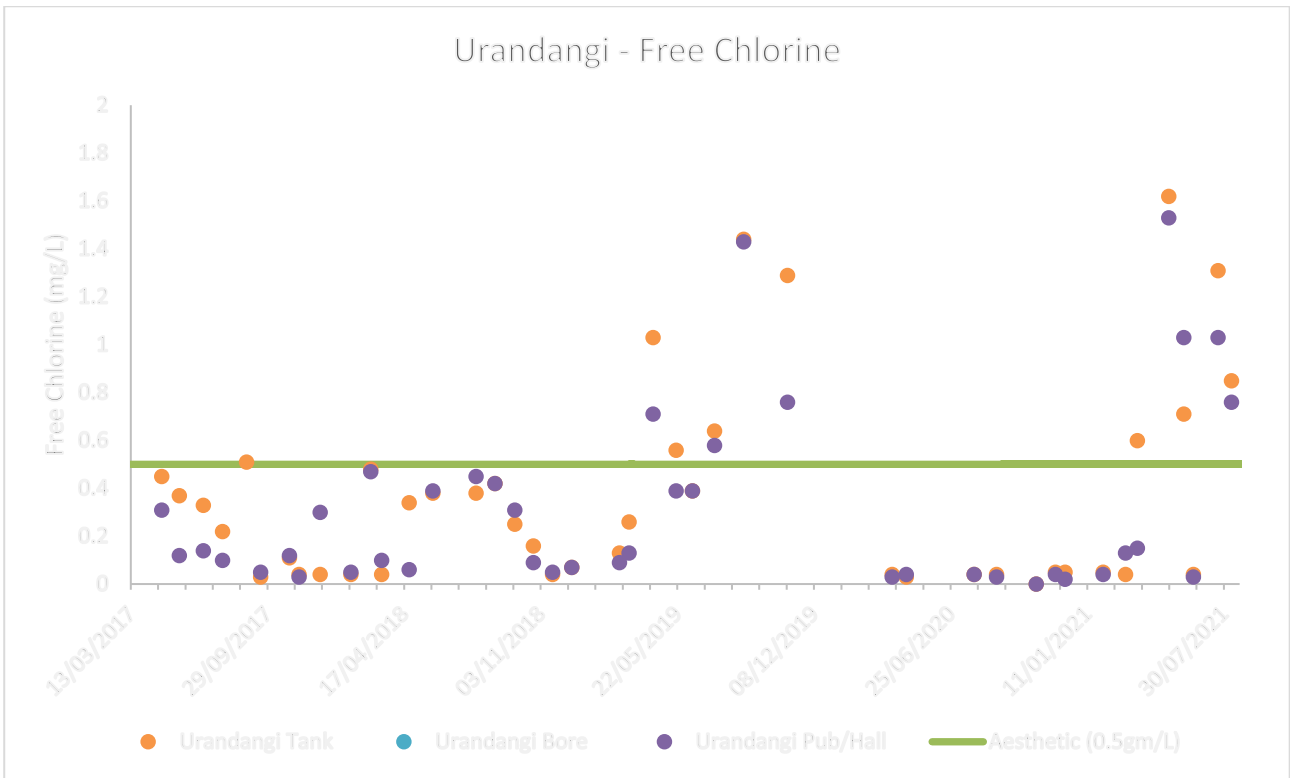


Figure 3.24: Urandangi - Free Chlorine.

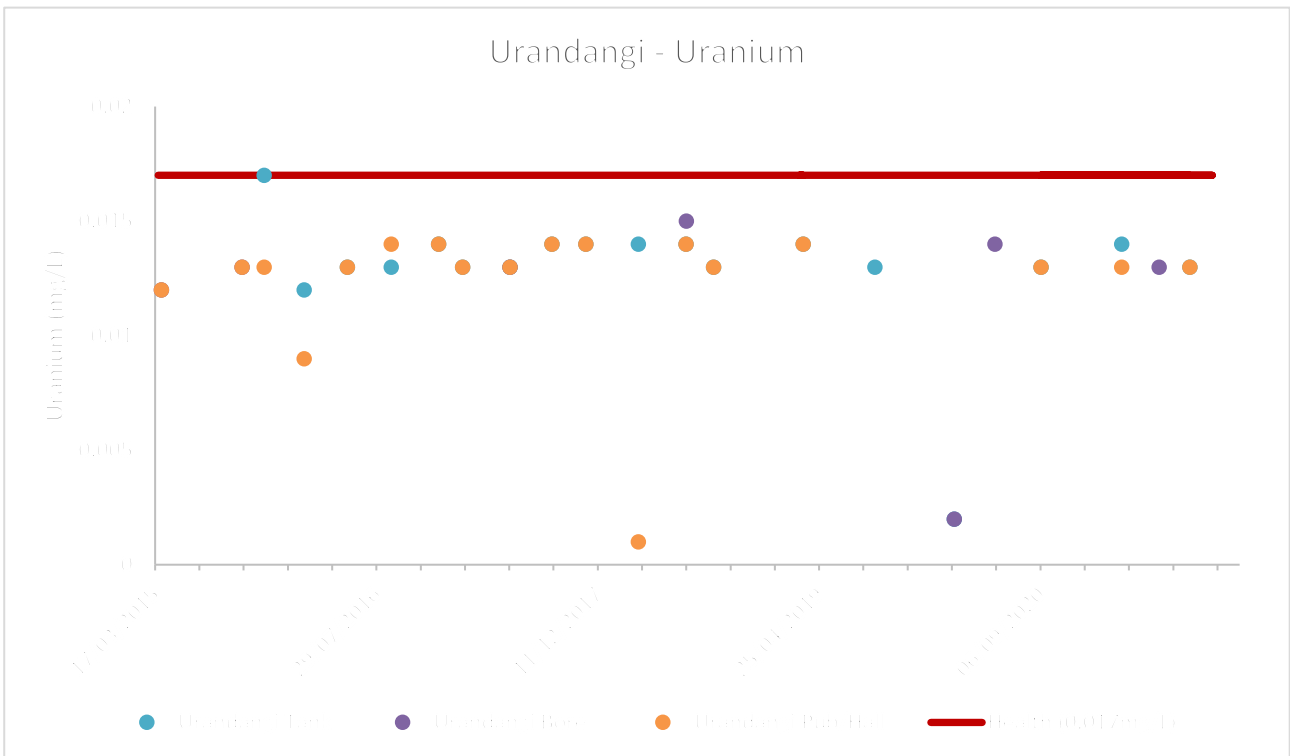


Figure 3.25: Urandangi - Uranium.

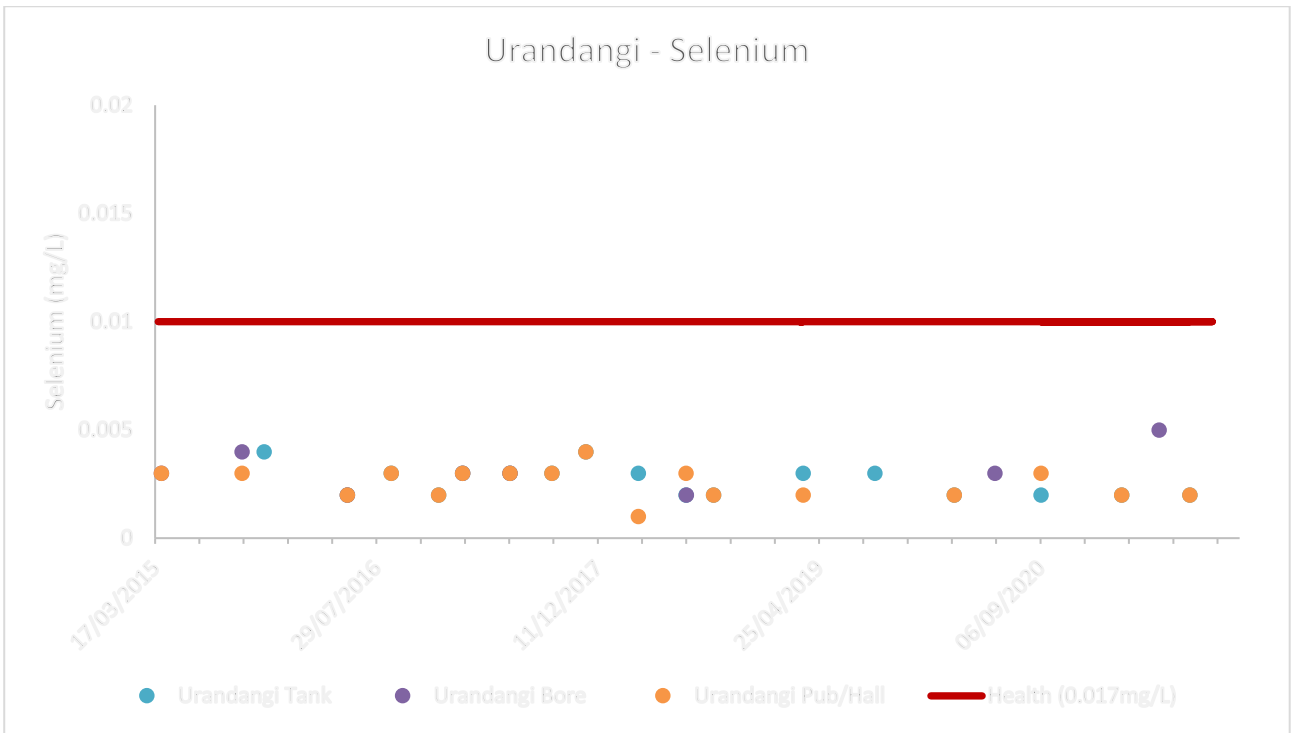


Figure 3.26: Urundangi - Selenium.

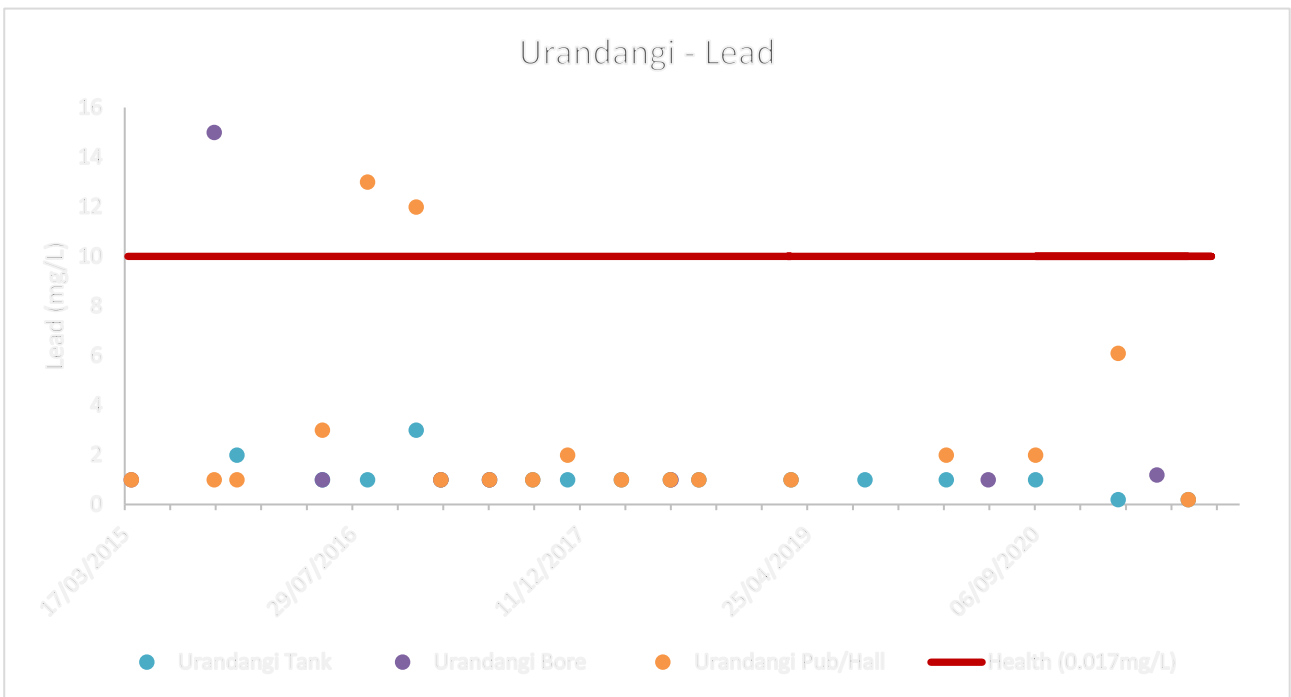


Figure 3.27: Urundangi - Lead.

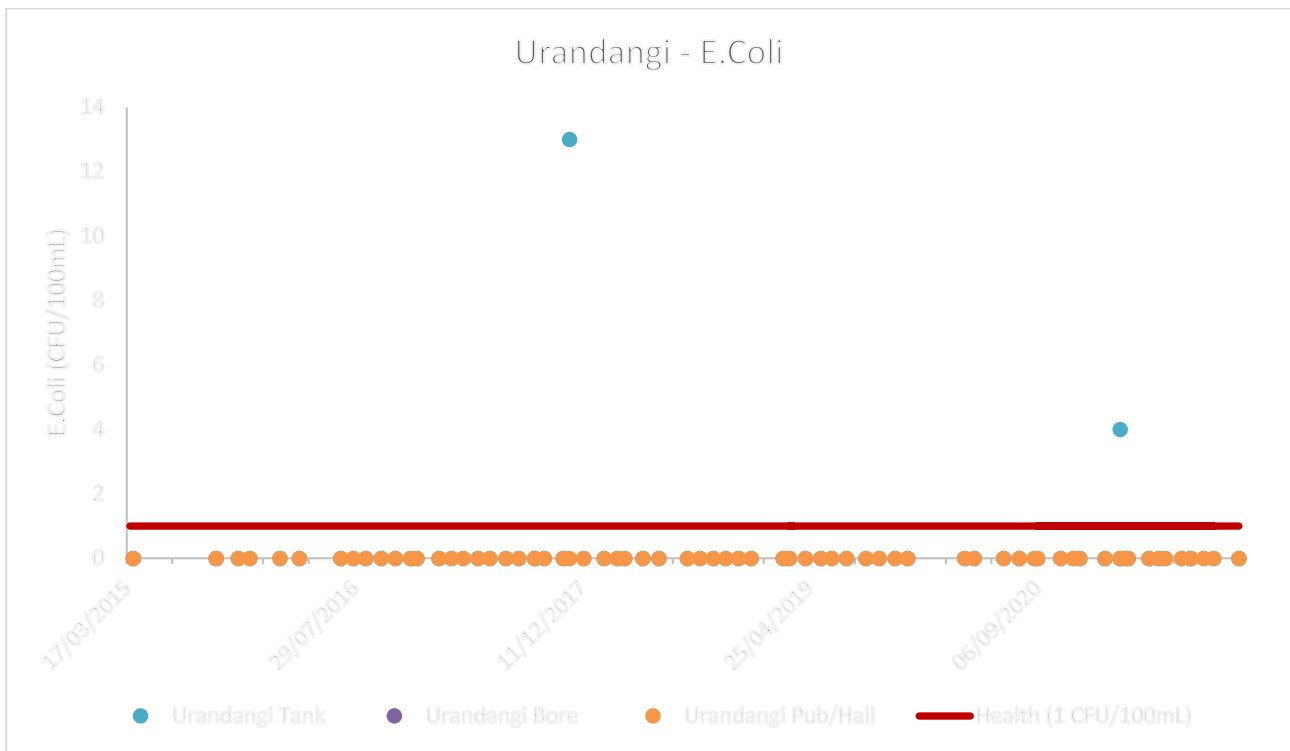


Figure 3.28: Urandangi – E.coli.

3.3.2. Urandangi Water Quality Interpretation

ADWG Health Exceedances

The following parameters were detected as showing exceedances of the ADWG health values:

- Fluoride
- Lead
- *E. coli*

Figure 3.21 provides a trend for the analysis of Fluoride; of 45 samples taken, 44 have exceed the ADWG health threshold. The health guideline value is set at 1.5 mg/L. A maximum value of 2.7 mg/L and average value of 1.9mg/L have been reported within the Urandangi scheme. Fluoride values greater than 1.5 mg/L can cause dental fluorosis while values greater than 4 mg/L can cause skeletal fluorosis. Urandangi has an ongoing drinking water incident for fluoride exceedances, this is discussed further in Section 5.6 below and has been included in the Risk Management Improvement Programme.

Figure 3.25 provides a trend for the analysis of Uranium; of the 24 samples taken there are no exceedances however values are regularly recorded close to ADWG health guidelines and therefore this parameter requires close monitoring. The health limit is based on animal studies and includes chemical toxicity as well as possible radiological effects. Conventional treatment processes do not effectively remove Uranium from water supplies.

Figure 3.27 provides a trend for Lead values; 43 values have been recorded over the sampling period, 4 of which have exceeded the ADWG health guideline of 10µg/L, with an average value of 2.11µg/L. High levels of lead can have serious effects on health, as a high concentration of lead in the body can severely affect the central nervous system. Due to the high variability in recorded lead concentrations, it is likely that values exceeding the ADWG health limits are due to contamination, most likely from lead sources in the domestic water lines such as solders, galvanising or brass fittings. Additionally, no exceedances have been reported since 2016.

Figure 3.28 provides a trend for *E.coli* values; from 130 tests, there have been 2 exceedances reported in 2021. A low level of bacterial contamination has been detected at the Urandangi bore and is potentially associated with the ingress of pathogens from the deterioration of bore seals. This is discussed further in Section 5.3.2 below.

ADWG Aesthetic Exceedances

The following aesthetic characteristics were detected as showing exceedances of the ADWG aesthetic values:

- pH
- Total Dissolved Solids
- True Colour
- Turbidity
- Sodium
- Chloride
- Free Chlorine

Figure 3.15 provides trends for pH; there are 5 exceedances from 164 tests. The ADWG values stipulate an aesthetic range for pH between 6.5- 8.5. pH levels outside of these values are not necessarily unsafe but may result in a bitter aftertaste within the water. These exceedances were reported in 2019 with the average value for pH currently sitting at 7.8 which is well within the aesthetic range.

Figure 3.16 provides a trend for the analysis of Total Dissolved Solids; there are 39 exceedances from 41 tests with a maximum value of 2400 mg/L, average value of 1252 mg/L recorded. For Total Dissolved Solids no health-based guideline is considered necessary, however, exceedances may result in taste issues with the water.

Figure 3.17 Provides True Colour values for Urandangi's drinking water. There have been 24 exceedances of the ADWG aesthetic guideline value of 15HU from 39 tests, with an average of 16.36 HU. For true colour no health guideline has been deemed necessary as aesthetic exceedances generally result in changes to the physical appearance of the water rather than the chemical composition.

Figure 3.18 provides values for Turbidity; there have been 39 exceedances from a total of 133 tests, with an average value of 4.97 NTU. The ADWG aesthetic guideline value for turbidity is 5 NTU, however, due to elevated turbidity being an inherent characteristic of the Urandangi scheme, the aesthetic guideline has been set at 10NTU. This is further explained below in Section 5.3.1. It should also be noted that until June of 2022, operational monitoring for turbidity was being measured in FAUs not NTUs.

Figure 3.20 provides values for Sodium; there have been 15 exceedances from 15 tests. The aesthetic guideline value is 180 mg/L. For sodium no health-based guideline is considered necessary, however the taste threshold sits at approximately 135mg/L.

Figure 3.20 provides values for Chloride: there have been 34 exceedances from 34 tests with an average value of 350.97mg/L. The aesthetic guideline value is 250 mg/L. For Chloride no health-based guideline is considered necessary, but exceedances may result in taste issues. The chloride taste threshold is between 200- 300mg/L. A high chloride concentration can affect the corrosion of pipes and fittings.

Figure 3.24 provides values for free chlorine; there have been 23 exceedances from 130 tests. The average value for free chlorine is 0.319mg/L which is not considered unsafe or indicative of other issues within the drinking water. Total chlorine values have remained well under the ADWG health guideline value of 5mg/L with an average of 0.236mg/L.

3.4. Boulia and Urandangi Hazard Identification and Documentation

The personnel responsible for the hazard identification and risk assessment process, their roles and responsibilities are detailed in Table 3-6 below.

Table 3-6: Hazard Identification and Risk Assessment Team.

Typical job title for key personnel	What role did each person play on the team?	What expertise and system knowledge did the person bring?
Director of Works	Identify time or budgetary constraints, assess and identify improvement actions	Experience managing water schemes. Forecast budgeting and delivering projects.
Foreman Utilities and Services	Identifying hazards risks	Detailed knowledge of individual schemes
Licensed Plumber	Identifying hazards risks	Detailed knowledge of individual schemes
Water Operator	Identifying hazards risks	Understanding of water quality and associated risks.
Engineer (Consultant)	Management of DWQMP Process, Risk Assessment Procedure & Chairing Risk Assessment Workshop	High level knowledge, risk assessment and general engineering experience in the management of the systems.

The hazards and hazardous events and their sources that adversely affect water quality are documented in Table 3-7 and Table 3-8 below and include those affecting:

- Catchment
- Sourcing infrastructure
- Disinfection process
- Distribution system
- Whole of System

These hazards and hazardous events were identified using data contained in the plan, following site inspections and a risk assessment workshop which was conducted in Boulia on 7/12/2017 and in Urandangi in December 2019.

Table 3-7: Boulia Hazard Identification, Risk Assessment and Uncertainty.

Scheme Component / Sub-component	Hazardous Event	Hazard	Maximum Risk			Existing Preventive Measures / Barriers.	Residual Risk			Uncertainty	Comments/ Proposed Further Risk Reduction Actions
			Consequence	Likelihood	Risk level		Consequence	Likelihood	Risk level		
Bore	Ingress contaminated run-off	Biological	Major	Possible	High 12	Automated Disinfection System	Major	Rare	Medium 5	Estimate	Acceptable risk Bore headworks sealed in 2019
	Hazard that arises from the natural geological processes in the aquifer.	Chemical/Biological	Major	Possible	High 12	Automated Disinfection System Verification and operational monitoring	Major	Rare	Medium 5	Reliable	Acceptable risk
	High Turbidity	Chemical/Biological	Major	Possible	High 12	Disinfection Verification monitoring	Major	Rare	Medium 5	Reliable	Acceptable risk
	Power Outage	Physical	Major	Possible	High 12	Elevated reservoir and back-up generator	Insignificant	Rare	Low 1	Confident	Acceptable risk
	3G Network Outage	Lowering of water volume in the reservoirs and subsequent loss of water supply to Boulia	Major	Possible	High 12	Inspection of ground level reservoir on working days	Moderate	Rare	Low 3	Confident	B4. Upgrade the Boulia pump telemetry from 3G to 4G B5. Update operational and maintenance procedures to include a process to follow to bring the water supply back on to the town should it runout
	Radiological activity in the groundwater supply	Chemical	Major	Possible	High 12	Verification monitoring	Major	Rare	Medium 5	Confident	B9. Verification monitoring for gross alpha and gross beta in the source water
	Leaching of surface water into aquifer	Biological	Major	Rare	Medium 5	Chlorine disinfection	Major	Rare	Medium 5	Reliable	Acceptable risk - Boulia aquifer is not under the influence of surface water
Disinfection System	Chlorine dosing equipment failure or underdosing	Bacteria/ Virus (Source Water)	Major	Possible	High 12	Target Dose 1.5mg/L	Major	Rare	Medium 5	Estimate	Acceptable risk

Scheme Component / Sub-component	Hazardous Event	Hazard	Maximum Risk			Existing Preventive Measures / Barriers.	Residual Risk			Uncertainty	Comments/ Proposed Further Risk Reduction Actions
			Consequence	Likelihood	Risk level		Consequence	Likelihood	Risk level		
	Turbidity impact disinfection effectiveness	Bacteria/ Virus (Source Water)	Major	Likely	High 16	Oxidisation through chlorine gas disinfection Operational Monitoring Target Dose 1.5mg/L	Minor	Possible	Medium 6	Estimate	Acceptable risk
	Chlorine overdosing	chemical	Major	Possible	High 12	Target Dose 1.5mg/L	Moderate	Rare	Low 3	Estimate	Acceptable risk
	Disinfection by-products (Degradation of chemicals)	Chlorate THM's	Major	Possible	High 12	Chlorine gas system Verification Monitoring Automated chlorine monitoring	Moderate	Unlikely	Medium 6	Estimate	Acceptable risk
	System Malfunction	Lack of expertise/ knowledge of system	Major	Possible	High 12	System Telemetry Operations Manual	Major	Possible	High 12	Estimate	B1. Provide training for staff to manage the disinfection system B5. Upgrade disinfection system
Sourcing Infrastructure	Vermin barrier not secured/ Degraded	Biological	Major	Unlikely	High 12	Low residual alarm Renewal of vermin barrier protection Regular inspections	Moderate	Rare	Low 3	Confident	Acceptable risk
	Accidental or intentional contamination	Chemical/Biological	Major	Unlikely	High 12	Renewal of vermin barrier protection Security fencing O & M procedures in place	Major	Rare	Medium 5	Confident	Acceptable risk
	Flood Event	Biological	Major	Unlikely	High 12	O & M Procedures in place Back up bore water source (Bore # 8) Boil water alert	Major	Rare	Medium 5	Reliable	Acceptable risk
	Iron oxidisation/precipitation	Biological/Physical	Major	Possible	High 12	Disinfection Regular Air Scouring	Major	Unlikely	Medium 8	Reliable	B3. Engineering Modifications – improved turbidity
	Cross contamination/Backflow	Biological	Major	Possible	High 12	Disinfection	Major	Unlikely	Medium 8	Reliable	B2. Install non return valves at high-risk locations, town common

Scheme Component / Sub-component	Hazardous Event	Hazard	Maximum Risk			Existing Preventive Measures / Barriers.	Residual Risk			Uncertainty	Comments/ Proposed Further Risk Reduction Actions
			Consequence	Likelihood	Risk level		Consequence	Likelihood	Risk level		
											stables, STP
	Unable to locate assets	Outdated records	Major	Possible	High 12	Asset register Reticulation drawings	Major	Unlikely	Medium 8	Reliable	Acceptable Risk (drawings updated to reflect rising main manifold 2021)
	Reticulation maintenance and repair	Biological	Major	Possible	High 12	O & M Procedures in place	Major	Rare	Medium 5	Reliable	Acceptable risk
	Sediment disturbance in reservoirs due to loss of water supply	Sludge and biofilm accumulating in reservoirs	Major	Possible	High 12	Working day visual inspections of reservoir to ensure constant water supply Annual cleaning of reservoirs	Major	Unlikely	Medium 8	Reliable	B5. Update O & M procedures to include a process to follow should the water supply to town be lost
Whole of System	Flights carrying water samples delayed/cancelled	Chemical/Biological	Major	Unlikely	High 10	Collect new samples and schedule testing for next available flight	Moderate	Rare	Low 3	Estimate	Acceptable risk
	Local trained staff unavailable to sample water	Chemical/Biological	Major	Possible	High 12	Samples to be collected by external parties	Major	Rare	Medium 5	Confident	Acceptable risk
	Shortage of supply of essential materials for treatment purposes due to weather/flooding	Biological	Major	Possible	High 12	Store sufficient materials to allow for distributions to freight	Major	Rare	Medium 5	Confident	Acceptable risk
	Cyber security breach	Cyber security threat	Moderate	Rare	Low 3	Council data stored on document management system with high grade security protection User authentication Restricted admin privileges Backup systems in place	Moderate	Rare	Low 3	Reliable	Acceptable risk - BSC does not rely on computerised technologies within the water supply schemes
	Inability to attract and retain skilled staff	Shortage of skilled staff	Moderate	Possible	Medium 9	Interim skilled staff are able to be obtained while permanent positions are filled	Moderate	Possible	Medium 9	Confident	Acceptable risk

Table 3-8: Urandangi Hazard Identification, Risk Assessment and Uncertainty.

Scheme Component / Sub-component	Hazardous Event	Hazard	Maximum Risk			Existing Preventive Measures / Barriers.	Residual Risk			Uncertainty	Comments/ Proposed Further Risk Reduction Actions
			Consequence	Likelihood	Risk Level		Consequence	Likelihood	Risk Level		
Bore	Contamination of bore	Biological	Major	Possible	High 12	Disinfection Operational monitoring of infrastructure	Major	Rare	Medium 5	Reliable	U1. Seal Bore
	Hazard that arises from the natural geological processes in the aquifer.	Chemical/Biological	Major	Possible	High 12	Distribute health fact sheet to community Verification monitoring	Moderate	Possible	Medium 9	Estimate	U2. 6-monthly formal fluoride notification to residents and update the fluoride factsheet so it is more comprehensible to the public
	High Turbidity	Chemical/Biological	Major	Possible	High 12	Disinfection Verification monitoring	Major	Rare	Medium 5	Reliable	Acceptable risk
	Bore Failure	Physical	Major	Possible	High 12	Operational monitoring of bore headworks and pump operation Routine CCTV inspection at 5-year interval	Major	Rare	Medium 5	Reliable	Acceptable risk
	Power Outage	Physical	Major	Possible	High 12	Elevated reservoir and back-up generator	Moderate	Rare	Low 3	Confident	Acceptable risk
	Radiological activity in the groundwater supply	Chemical	Major	Possible	High 12	Verification monitoring	Major	Rare	Medium 5	Confident	U6. Verification monitoring for gross alpha and gross beta in the source water
	Leaching of surface water into aquifer	Biological	Major	Rare	Medium 5	Chlorine disinfection	Major	Rare	Medium 5	Reliable	Acceptable risk - Urandangi aquifer is not under the influence of surface water
Sourcing Infrastructure	Equipment Failure/ Leaking Tank	Ageing Infrastructure	Major	Likely	High 16	Operational Monitoring	Major	Possible	High 12	Reliable	Acceptable Risk (elevated reservoir leaking addressed 2021)
	Vermin barrier not secured/degraded	Biological	Major	Possible	High 12	Security fencing Vermin barrier protection Hatches secured Vermin barrier inspection O & M procedures in place	Moderate	Rare	Low 3	Confident	Acceptable risk

Scheme Component / Sub-component	Hazardous Event	Hazard	Maximum Risk			Existing Preventive Measures / Barriers.	Residual Risk			Uncertainty	Comments/ Proposed Further Risk Reduction Actions
			Consequence	Likelihood	Risk Level		Consequence	Likelihood	Risk Level		
	Accidental or intentional contamination	Chemical/Biological	Major	Possible	High 12	Security fencing Vermin barrier protection Hatches secured Vermin barrier inspection O & M procedures in place	Major	Rare	Medium 5	Confident	Acceptable risk
	Flood Event	Biological	Major	Possible	High 12	O & M procedures in place Boil water alert	Major	Rare	Medium 5	Confident	Acceptable risk
Disinfection Process	Over Chlorination	Chemical	Major	Unlikely	Medium 8	O & M procedures in place	Moderate	Rare	Low 3	Reliable	U3. Update operational and maintenance procedures with the new dosing and testing regime and actions to take if chlorine levels drop too high/low
	Under Chlorination	Biological	Major	Possible	High 12		Major	Rare	Medium 5	Reliable	
Distribution System	Reticulation maintenance and repair	Biological	Major	Possible	High 12	O & M procedures in place	Major	Rare	Medium 6	Reliable	Acceptable risk
Whole of System	Flights carrying water samples delayed/cancelled	Chemical/Biological	Major	Unlikely	Medium 8	Collect new samples and schedule for next available flight	Moderate	Rare	Low 3	Estimate	Acceptable risk
	Contamination of water samples	Chemical/Biological	Moderate	Possible	Medium 9	Water sampling procedures Inhouse water training	Moderate	Rare	Low 3	Reliable	Acceptable risk
	Widespread flooding causing road closures and inability to undertake water sampling and testing	Chemical/Biological	Major	Possible	High 12	Monitor weather patterns. Schedule monthly sampling for early in the month, providing a greater window for sampling	Major	Unlikely	Medium 8	Reliable	Acceptable risk
	Equipment failure	Ageing Infrastructure	Major	Likely	High 16	Operational Monitoring	Major	Possible	High 12	Reliable	Acceptable risk (Live drawings updated 2021)
	Local trained staff unavailable to sample water due to illness/weather	Chemical/Biological	Major	Possible	High 12	Samples to be collected by external parties	Major	Rare	Medium 5	Confident	Acceptable risk

Scheme Component / Sub-component	Hazardous Event	Hazard	Maximum Risk			Existing Preventive Measures / Barriers.	Residual Risk			Uncertainty	Comments/ Proposed Further Risk Reduction Actions
			Consequence	Likelihood	Risk Level		Consequence	Likelihood	Risk Level		
	Shortage of supply of essential materials for treatment purposes due to weather	Biological	Major	Possible	High 12	Ensure storage of sufficient materials to allow for disruptions to freight	Major	Rare	Medium 5	Confident	Acceptable risk
	Cyber security breach	Cyber security threat	Moderate	Rare	Low 3	Council data stored on document management system with high grade security protection User authentication Restricted admin privileges Backup systems in place	Moderate	Rare	Low 3	Estimate	Acceptable risk - BSC does not rely on computerised technologies within the water supply schemes
	Inability to attract and retain skilled staff	Shortage of skilled staff	Moderate	Possible	Medium 9	Interim skilled staff are able to be obtained while permanent positions are filled	Moderate	Possible	Medium 9	Confident	Acceptable risk

4.0 ASSESSMENT OF RISKS

The plan details the risk assessment methodology used for the scheme in Section 4.1 below. Section 4.2 explains how the risks were assessed. Section 4.3 tabulates the relevant stakeholders in the risk assessment process.

4.1. Methodology

The methodology adopted for the risk assessment is described below. The methodology is based on the methodology explained in the document “Drinking Water Quality Management Plan Guideline” (September 2010).

Table 4-1 below shows the qualitative measures of likelihood that was adopted in the risk assessment.

Table 4-1: Measures of Likelihood Utilised in the Risk Assessment.

Likelihood	Descriptors
Rare	Occurs less than or equal to once every 5 years
Unlikely	Occurs more often than once every 5 years and up to once per year
Possible	Occurs more often than once per year and up to once a month (12/yr.)
Likely	Occurs more often than once per month (12/yr.) and up to once per week (52/yr.)
Almost Certain	Occurs more often than once per week (52/yr.)

Table 4-2 below shows the qualitative measures of consequence that was adopted in the risk assessment.

Table 4-2: Measures of Consequences Utilised in the Risk Assessment.

Consequence	Descriptors
Insignificant	Isolated exceedance of aesthetic parameter with little or no disruption to normal operation
Minor	Potential local aesthetic, isolated exceedance of chronic health parameter
Moderate	Potential widespread aesthetic impact or repeated breach of chronic health parameter
Major	Potential acute health impact, no declared outbreak expected
Catastrophic	Potential acute health impact, declared outbreak expected

Table 4-3 below shows the degrees of uncertainty adopted for the risk assessment. Some of the risks assessed for all the Water Supply Schemes remain an estimate or uncertain.

Table 4-3: Degrees of Uncertainty.

Level of Uncertainty	Definition
Certain	There is 5 years of continuous monitoring data, which has been trended and assessed, with at least daily monitoring; or The processes involved are thoroughly understood.
Confident	There is 5 years of continuous monitoring data, which has been collated and assessed, with at least weekly monitoring or for the duration of seasonal events; or There is a good understanding of the processes involved.
Reliable	There is at least a year of continuous monitoring data available, which has been assessed; or There is reasonable understanding of the processes involved.
Estimate	There is limited monitoring data available; or There is limited understanding of the processes involved.
Uncertain	There is limited or no monitoring data available; or The processes are not well understood.

Table 4.4 below shows the risk analysis matrix utilised, detailing the various levels of risk that was adopted in the risk assessment.

Table 4-4: Risk Analysis Matrix – Level of Risk.

Likelihood	Consequence				
	Insignificant	Minor	Moderate	Major	Catastrophic
Almost certain	Medium (6)	High (10)	High (15)	Extreme (20)	Extreme (25)
Likely	Medium (5)	Medium (8)	High (12)	High (16)	Extreme (20)
Possible	Low (3)	Medium (6)	Medium (9)	High (12)	High (15)
Unlikely	Low (2)	Low (4)	Medium (6)	Medium (8)	High (10)
Rare	Low (1)	Low (2)	Low (3)	Medium (5)	Medium (6)

Table 4-5 below details the acceptable risk levels for the water supply schemes.

Table 4-5: Defined Acceptable Risk Levels.

Low	Acceptable	manage for continuous improvement
Medium	Acceptable	Implement short term measures, longer term risk reduction measures may be implemented within a reasonable timeframe
High	Unacceptable	Implement short term measures immediately, longer term risk reduction measures need to be a priority
Extreme	Unacceptable	Implement short term measures immediately, implementation of longer term risk reduction measures given top priority

4.1.1. DWQMP Review and Risk Assessment Workshop

The DWQMP risk assessment was conducted in association with the DWQMP regular review in collaboration between GBA Engineering staff and BSC management and operational staff. The collaboration process between GBA and BSC included a review of the DWQMP by both parties, discussing potential risks in the Boulia and Urandangi drinking water schemes. Table 4.6 below identifies the DWQMP Review and Risk Assessment Team.

Table 4-6: Stakeholders – Risk Assessment.

Stakeholder	Contact Name and Details	Rationale for engagement and how engagement occurred
Boulia Shire Council	Ajay Agwan Director of Works & Operations P: (07) 4746 3188 E: dwo@boulia.qld.gov.au	Manager of infrastructure and projects Experience managing water schemes. Risk assessment
	Ronnie Calliope Foreman Utilities and Services P: (07) 4746 3188 E: rus@boulia.qld.gov.au	Detailed knowledge of water infrastructure. Risk assessment
	Mari Gunderson Water Operator P: (07) 4746 3188 E: store@boulia.qld.gov.au	Undertakes operational and verification monitoring, understanding of water quality and associated risks. Risk assessment
	Brent Krause Licensed Plumber P: (07) 4746 3188	Detailed knowledge of water infrastructure. Risk assessment

Stakeholder	Contact Name and Details	Rationale for engagement and how engagement occurred
Consultants	Stuart Bourne Engineer P: (07) 4651 5177 E: gbourne@gbaengineers.com.au	Manage Engineering Services for Boulia Shire Council ⁵ Review and Endorse DWQMP. Risk Assessment
	Isabeau Gavel Environmental Scientist P (07) 4651 2177 E: igavel@gbaengineers.com.au mailto:	Review and amendment of DWQMP. Risk Assessment

4.2. Assessment of Risk

Details of the risk assessment results for each scheme's identified hazards and hazardous events include:

- Maximum risk level or equivalent process (i.e. without existing barriers in place, e.g. no treatment and/or disinfection);
- Existing preventive measures including multiple barriers (i.e. treatment process steps)
- Residual risk level (i.e. with existing barriers in place for example, treatment and/or disinfection); and any uncertainties.

The following sections will discuss each of these dot points in further detail.

4.2.1. Assessment of Maximum Risk

For all hazards, maximum risk (e.g. the risk from an uncontrolled hazard) was first assessed. Where there was insufficient data or information to complete a reliable assessment, this was highlighted as an uncertainty and discussed further in the Risk Management Improvement Program in Section 5.4 below.

4.2.2. Existing Preventative Measures/Barriers

All existing preventative measures are listed in the Risk Assessment. Existing preventative measures include all actions, barriers or measures currently in place to reduce the maximum risk. They include active measures that protect raw water quality prior to treatment and measures to protect treated water quality.

4.2.3. Residual Risk

The residual risk is determined once existing preventive measures have been applied. Residual risk is the level of risk a particular hazard is assessed as posing to the safety of the drinking water once the existing preventative measure/s have been applied.

Residual risk is determined using the same methodology (e.g. likelihood and consequence descriptors) as the initial maximum risk assessment; however changes to the assessed likelihood (or consequence) should result in a lower resultant risk level.

⁵ BSC engages a civil engineering consultancy (GBA Consulting Engineers) to manage Engineering Services.

5.0 MANAGING RISKS

Managing risks for both the Boulia and Urandangi schemes are discussed in the following sections below:

- 5.1 Risk Management Measures
- 5.2 Operation and Maintenance Procedures
- 5.3 Management of Incidents and Emergencies
- 5.4 Risk Management Improvement Program
- 5.5 Information Management

5.1. Risk Management Measures

Existing and proposed preventative risk management measures are detailed in 5.1.1 for Boulia and 5.1.2 below for Urandangi.

5.1.1. Boulia Existing and Proposed Preventative Measures

Table 5-1 below provide details of the existing and proposed preventative measures for Boulia. Proposed measures are included in the Risk Management Improvement Program (RMIP) in Table 5-7 below.

Table 5-1: Boulia Existing and Proposed Preventative Measures.

Scheme Component / Sub-component	Hazard	Hazardous event/s	What is/are the existing preventative measure/s?	Which risk factor/s does the existing preventative measure/s impact on	How effective is/are the existing preventative measure/s & on what basis has this been determined?	Is the level of residual risk acceptable	Proposed measures to reach an acceptable level of residual risk	Responsible Organisations
Bore	Biological	Ingress contaminated run-off	Automated Disinfection System	Likelihood	Effective - Initial results are achieving effective disinfection	Yes - medium risk	B6. Assessment of other more reliable disinfection options	Boulia Shire Council
	Chemical/Biological	Hazard that arises from the natural geological processes in the aquifer - High Iron concentrations and turbidity.	Automated Disinfection System Verification Monitoring	Likelihood	Moderately effective residual risk persists	Yes - Medium risk	B3. Monitoring of turbidity to determine if chlorine dosing has assisted in reducing turbidity	
	Physical	Power Outage	Elevated reservoir Back-up generator	Likelihood	Effective	Yes - low risk		
	Chemical	Radiological activity in the Boulia raw water	Verification monitoring	Likelihood	Effective	Yes - medium risk	B9. Verification monitoring for gross alpha and gross beta in the raw water	
	Biological	Leaching of surface water into aquifer	Ground water protection and chlorine disinfection	Likelihood	Effective - Boulia aquifer is not under the influence of surface water	Yes - low risk		
Disinfection Process	Bacteria/ Virus (Source Water)	Chlorine dosing equipment failure or under dosing	Target Dose 1.5mg/L Low residual alarm	Likelihood	Effective	Yes - Medium risk	B6. Assess other more reliable disinfection options	Boulia Shire Council
	Bacteria/ Virus (Source Water)	Turbidity impact disinfection effectiveness	Oxidisation through chlorine gas disinfection Operational Monitoring Target Dose 1.5mg/L	Likelihood/Consequence	Effective	Yes - Medium risk	B3. Monitoring of turbidity to determine if chlorine dosing has assisted in reducing turbidity	
	Chemical	Chlorine overdosing	Target Dose 1.5mg/L High Residual Alarm	Likelihood/Consequence	Effective	Yes - Low Risk		
	Chlorate THM's	Disinfection by-products (Degradation of chemicals)	Chlorine gas system Verification Monitoring Automated chlorine monitoring	Likelihood/Consequence	Effective - Initial results show low levels of disinfection by-products	Yes - Medium risk		
	Lack of expertise/ knowledge of system	System Malfunction	System Telemetry Operations Manual	Likelihood	Residual risk resides - System shutdowns have occurred in the initial commissioning stages of the plant.	No - High Risk	B1. Provide further training for staff B6. Upgrade disinfection	

Scheme Component / Sub-component	Hazard	Hazardous event/s	What is/are the existing preventative measure/s?	Which risk factor/s does the existing preventative measure/s impact on	How effective is/are the existing preventative measure/s & on what basis has this been determined?	Is the level of residual risk acceptable	Proposed measures to reach an acceptable level of residual risk	Responsible Organisations
							system	
Sourcing infrastructure	Biological	Vermin barrier not secured/Degraded	Low residual alarm	Likelihood	Effective	Yes – low risk		
			Renewal of vermin barrier protection					
			Regular inspections					
	Chemical/Biological	Accidental or intentional contamination	Renewal of vermin barrier protection	Likelihood	Effective	Yes – medium risk		
			Security fencing					
			O & M procedures in place					
Biological	Flood event	O & M Procedures	Likelihood	Effective	Yes – Medium risk			
		Back up bore water source (Bore # 8)						
		Boil water alert						
Distribution System	Biological/Physical	Iron oxidisation/precipitation	Regular Air scouring Disinfection	Likelihood	Effective however residual risk resides	Yes – medium risk	B3. Engineering Modifications – improved turbidity	
	Biological	Cross contamination/Backflow	Disinfection	Likelihood	Temporary control, does not provide continuous mitigation	No – high Risk	B2. Install non return valves at high-risk locations, town common, STP	
	Outdated records	Unable to locate assets	Asset register Reticulation drawings	Likelihood	Moderately effective _ live drawings of water assets require updating	Yes – medium risk		
	Biological	Reticulation maintenance and repair	O & M Procedures in place	Likelihood	Effective	Yes – medium risk		
	Physical	Sediment disturbance in the distribution system and reservoirs due to loss of water supply	Working day reservoir visual inspections to ensure reservoirs are full Annual cleaning of reservoirs	Likelihood	Effective	Yes – medium risk	B4. Update operation and maintenance procedures	

Scheme Component / Sub-component	Hazard	Hazardous event/s	What is/are the existing preventative measure/s?	Which risk factor/s does the existing preventative measure/s impact on	How effective is/are the existing preventative measure/s & on what basis has this been determined?	Is the level of residual risk acceptable	Proposed measures to reach an acceptable level of residual risk	Responsible Organisations
Whole of System	Chemical/Biological	Flights for transportation water samples delayed/cancelled	Collect new samples and schedule testing for next available flight	Likelihood/Consequence	Effective however risk cannot be completely controlled	Yes - low risk		
	Chemical/Biological	Local trained staff unavailable to sample water	Samples to be collected by consultant engineers	Likelihood	Effective	Yes - medium risk		
	Biological	Shortage of supply of essential materials for treatment purposes due to weather	Consultant Engineers provide relief by use of light aircraft	Likelihood	Effective	Yes - medium risk		
	Cyber Security Threat	Cyber security breach	Council data stored on Info expert system with high grade security protection. Backup systems in place	Likelihood	Residual risk resides - cyber security risk is not fully understood.	Yes - medium risk	BSC does not rely on computerised technologies within the water supply scheme	
	Failure of 3G Network	Lowering of water in the reservoirs and subsequent loss of water supply to Boulia	Visual inspections of the ground level reservoir on working days	Consequence	Effective	Yes - low-risk	B4. Update operation and maintenance procedures	
	Inability to attract and retain skilled staff	Shortage of skilled staff	Interim skilled staff are able to be obtained while permanent positions are filled	Likelihood	Effective however risk cannot be completely controlled	Yes - low-risk		

5.1.2. Urandangi Existing and Proposed Preventative Measures

Table 5-2 below provide details of the existing and proposed preventative measures for Urandangi. Proposed measures are included in the RMIP in Table 5.7 below.

Table 5-2: Urandangi Existing and Proposed Preventative Measures.

Scheme Component / Sub-component	Hazard	Hazardous event/s	What is/are the existing preventative measure/s?	Which risk factor/s does the existing preventative measure/s impact on	How effective is/are the existing preventative measure/s & on what basis has this been determined?	Is the level of residual risk acceptable	Proposed measures to reach an acceptable level of residual risk	Responsible Organisations
Bore	Biological	Contamination of bore	Disinfection Operational Monitoring	Likelihood	Effective	Yes – medium risk	U1. Seal bore heads to reduce contamination risk	Boulia Shire Council
	Chemical/Biological	Hazards that arise from the natural geological process in the aquifer	Distribute fluoride facts sheet to community informing them of potential health risks	Likelihood	Moderately effective – residual risk resides	Yes – medium risk	U2. Continue to inform community of the potential impacts of elevated fluoride	
			Verification Monitoring					
	Turbidity		Water disinfection Verification Monitoring	Likelihood	Effective	Yes – medium risk	Manual chlorine dosing regime has been implemented	
	Physical	Power Outage	Elevated reservoir and back-up generator	Likelihood/Consequence	Effective	Yes – low risk		
		Bore Failure	Operational monitoring of bore headworks and pump operation Routine CCTV inspection at 5-year interval	Likelihood/Consequence	Effective	Yes – low risk		
	Chemical	Radiological activity in the Urandangi raw water	Verification monitoring	Likelihood	Effective	Yes – medium risk	U6. Verification monitoring for gross alpha and gross beta in the raw water	
Biological	Leaching of surface water into aquifer	Ground water protection and chlorine disinfection	Likelihood	Effective – Boulia aquifer is not under the influence of surface water	Yes – low risk			
Sourcing infrastructure	Ageing Infrastructure	Equipment Failure/ Leaking Tank	Operational Monitoring	Likelihood	Residual risk resides	No - high Risk		
	Biological	Vermin barrier not secured	Security fencing	Likelihood/Consequence	Effective	Yes – medium risk		
			Vermin barrier protection					
			Hatches secured					
			Vermin barrier inspection					
O & M procedures in place								
Chemical/Biological	Accidental or intentional	Security fencing	Likelihood	Effective	Yes – medium risk			

Scheme Component / Sub-component	Hazard	Hazardous event/s	What is/are the existing preventative measure/s?	Which risk factor/s does the existing preventative measure/s impact on	How effective is/are the existing preventative measure/s & on what basis has this been determined?	Is the level of residual risk acceptable	Proposed measures to reach an acceptable level of residual risk	Responsible Organisations
		contamination	Vermin barrier protection					
			Hatches secured					
Vermin barrier inspection								
O & M procedures in place								
	Biological	Flood event	O & M Procedures	Likelihood	Effective	Yes – medium risk		
			Boil water alert					
Disinfection Process	Chemical	Over Chlorination	Manual Disinfection	Likelihood/Consequence	Effective	Yes – low risk	U3. Residual risk, continue to monitor residual levels and update the operational and maintenance procedures for actions to take should chlorine levels drop too low/high	
			O & M Procedures					
	Biological	Under Chlorination	Manual Disinfection	Likelihood	Moderately effective – residual risk resides	Yes – medium risk		
			O & M Procedures					
Distribution System	Biological	Reticulation maintenance and repair	O & M Procedures	Likelihood	Effective however residual risk resides	Yes – medium risk		
Whole of System	Chemical/Biological	Flights for transportation water samples delayed/cancelled	Collect new samples and schedule testing for next available flight	Likelihood/Consequence	Effective however risk cannot be controlled	Yes – medium risk		
	Chemical/Biological	Contamination of water samples	Water sampling procedures Inhouse water training	Likelihood	Effective, ongoing training is necessary	Yes – low risk		
	Chemical/Biological	Widespread flooding causing road closures and inability to undertake water sampling and testing	Monitor weather patterns	Likelihood	Moderately effective – residual risk resides	Yes – medium risk		
			Schedule monthly sampling for early in the month, providing a greater window for sampling					
	Equipment failure	Ageing Infrastructure	Operational Monitoring	Likelihood	Residual risk resides	No - high risk		
Chemical/Biological	Local trained staff unavailable to sample water	Samples to be collected by consultant engineers	Likelihood	Effective	Yes – medium risk			

Scheme Component / Sub-component	Hazard	Hazardous event/s	What is/are the existing preventative measure/s?	Which risk factor/s does the existing preventative measure/s impact on	How effective is/are the existing preventative measure/s & on what basis has this been determined?	Is the level of residual risk acceptable	Proposed measures to reach an acceptable level of residual risk	Responsible Organisations
	Biological	Shortage of supply of essential materials for treatment purposes due to weather	Consultant Engineers provide relief by use of light aircraft	Likelihood	Effective	Yes – medium risk		
	Cyber security threat	Cyber security breach	Council data stored on Info expert system with high grade security protection. Backup systems in place	Likelihood	Residual risk resides - cyber security risk is not fully understood.	Yes –Low risk	BSC does not rely on computerised technologies within the water supply scheme	
	Inability to attract and retain skilled staff	Shortage of skilled staff	Interim skilled staff are able to be obtained while permanent positions are filled	Likelihood	Effective however risk cannot be completely controlled	Yes – low-risk		

5.2. Operation and Maintenance Procedures

During the initial risk assessment in 2012 it was identified that a large number of procedures were non-existent. Since 2012, Operational and Maintenance Procedures have been developed as part of the DWQMP review process. The procedures provide operational personnel with the necessary information to implement safe work practices in order to optimise drinking water quality.

Procedures adopted and currently in use are listed in Table 20 below. All procedures are reviewed every two years and amended as required.

Table 5-3: Boulia Shire Council Operation and Maintenance Procedures.

Procedure	Status	Last Reviewed	Person Responsible for Review
Water Sampling and Operational Monitoring (Boulia & Urandangi)	Implemented	2022	Director of Works
Safe Work Method Statement (SWIMS; Boulia & Urandangi): - Maintenance and repair of water infrastructure	Implemented	2022	Director of Works
BSC Gas Chlorination Building Operation and Maintenance Manual	Implemented	2022	Director of Works
Chlorination WTP Y Out Adjustment Instructions	Implemented	2022	Director of Works
Boulia Digital Weigh Indicator Transmitter - Setup, Calibration & Troubleshooting	Implemented	2022	Director of Works
Reservoir Inspection and Maintenance Procedure - Boulia & Urandangi	To be Written	N/A	Director of Works
Loss of Water Supply – Boulia	To be Written	N/A	Director of Works
Chlorine Dosing Procedure – Urandangi	To be Written	N/A	Director of Works
E.coli Detection Procedure - Boulia & Urandangi	To be Written	N/A	Director of Works

In accordance with Council's quality management systems, procedures are given a procedure number, title, revision date, process used for maintaining the documented procedure, and the process for implementing the procedure.

5.3. Management of Incidents and Emergencies

Table 5-3 shows the different levels of incidents for the entire drinking water service. There are five levels of incidents and emergencies ranging from Level 5 (most severe) to Level 1 (least severe). Boulia Shire Council has developed a Local Disaster Management Plan (2021-22, adopted March 2021). Level 5 incidents and emergencies should be handled under the Boulia Shire Council Local Disaster

Management Plan and are likely to be the result or cause of other emergencies which are covered under the plan.

Table 5-4: Incident / Emergency Levels.

Incident / Emergency Level	Description of Level
Level 5	<ul style="list-style-type: none"> • Widespread outbreak of waterborne disease • Declared disaster • Supply unable to be maintained • Gross exceedances of ADWG health guideline values for a chemical parameter (> five times the ADWG health guideline limit).
Level 4	<ul style="list-style-type: none"> • High level of E. coli (> 5 CFU/ 100 mL) or any pathogens detected in reticulation • Failure of infrastructure (severe or emergency level supply restrictions required to ensure continuity of supply) • Major cyber security breach resulting in interference of the operation of the water supply scheme water supply scheme.
Level 3	<ul style="list-style-type: none"> • Detection of 1-5 CFU/100 mL E. coli in reticulation • Failure of infrastructure (ability to supply water compromised – short term water restrictions may be required) • Minor exceedances of ADWG health guideline value for chemical parameter (determined value is close to guideline value). • Low chlorine residual detected or disinfection failure (ability to supply disinfected water within the target free chlorine residual compromised)
Level 2	<ul style="list-style-type: none"> • Failure of infrastructure or source supply (water quality or supply unlikely to be compromised) • Exceedances of ADWG aesthetic guideline (customer complaints possible) • Cyber security breach resulting in interference of the operation of the water supply scheme water supply scheme.
Level 1	<ul style="list-style-type: none"> • Exceedances of operational limit managed through operational and maintenance procedures

Table 5-5 details how incidents and emergencies are managed relevant to drinking water quality. Table 5-6 details the emergency contact details for and protocols to be followed when a particular emergency or incident occurs. All other contact details for incident and emergency management are included in Bouliā Shire Council's Local Disaster Management Plan.

Table 5-5: Management of Incidents and Emergencies.

Level	Incident or Emergency	Summary of Actions to be Taken (with Documented Procedures Listed)	Position/s Responsible for Action/s
5	Disaster levels - Implement Bouliá Shire Council Local Disaster Management Plan Report to the Drinking Water Incident Hotline by phone and written incident report to RDMW		
4	High level of <i>E. coli</i> (> 5 CFU/ 100 mL) or any pathogens detected in reticulation	<ol style="list-style-type: none"> 1. Alert Chief Executive Officer 2. Determine potentially affected area, isolate if possible. Issue Boil Water alert. Escalate emergency further if situation worsens. 3. Report detection to Drinking Water Incident Hotline by phone (Immediately by phone, written incident report – Part 1 incident form - within 24 hours) 4. Resample for <i>E. coli</i> and disinfectant residual in potentially affected infrastructure 5. Undertake comprehensive contamination investigation 6. Undertake necessary corrective actions 7. Upon resolution, provide written report to regulator (Part 2 incident form) and Chief Executive Officer 8. Non-compliance will be raised and will require signing off by the Chief +Executive Officer after corrective actions have taken place. 	<ol style="list-style-type: none"> 1. Water Operator 2. Water Operator 3. Water Operator 4. Water Operator 5. Director of Works 6. As Appropriate 7. Water Operator 8. Water Operator / Chief Executive Officer
4	Failure of infrastructure including Major cyber security breach where electronic water supply infrastructure operation could be compromised, such as security breach of SCADA	<ol style="list-style-type: none"> 1. Alert Chief Executive Officer, Director of Works and IT support services/infrastructure providers where major cyber security breach has occurred. 2. Determine reason for failure, isolate if possible. Consider options to recommence supply. 	<ol style="list-style-type: none"> 1. Water Operator 2. Water Operator

Level	Incident or Emergency	Summary of Actions to be Taken (with Documented Procedures Listed)	Position/s Responsible for Action/s
	system (severe or emergency level supply restrictions required to ensure continuity of supply)	<ol style="list-style-type: none"> 3. Report detection to Drinking Water Incident Hotline by phone (Immediately by phone, written incident report – Part 1 incident form - within 24 hours). 4. Undertake comprehensive failure investigation. 5. Undertake necessary corrective actions to recommence supply and provide an estimate of when the supply can be recommenced 6. Implement severe or emergency level supply restrictions. Consider escalating to a Level 5 incident. Notify the public. 7. Upon resolution, provide written report to regulator (Part 2 incident form). Provide written report to the Chief Executive Officer. 8. Non-compliance will be raised and will require signing off by the Water Operator and the Chief Executive Officer after corrective actions have taken place. 	<ol style="list-style-type: none"> 3. Water Operator / Consulting Engineer 4. Water Operator 5. Director of Works 6. Water Operator / Chief Executive Officer 7. Water Operator 8. Water Operator / Chief Executive Officer
3	Detection of 1-5 CFU/100mL <i>E.coli</i> in reticulation	<ol style="list-style-type: none"> 1. Alert Chief Executive Officer and Director of Works. 2. Determine potentially affected area, isolate if possible. Consider Boil Water alert. Escalate emergency further if situation worsens. 3. Report detection to Drinking Water Incident Hotline by phone (Immediately by phone, written incident report – Part 1 incident form - within 24 hours). 4. Resample for E. coli and disinfectant residual in potentially affected infrastructure. 5. Undertake comprehensive contamination investigation. 	<ol style="list-style-type: none"> 1. Water Operator 2. Water Operator 3. Water Operator 4. Water Operator 5. Director of Works

Level	Incident or Emergency	Summary of Actions to be Taken (with Documented Procedures Listed)	Position/s Responsible for Action/s
		<ol style="list-style-type: none"> 6. Undertake necessary corrective actions. 7. Upon resolution, provide written report to regulator (Part 2 incident form). 8. Non-compliance will be raised and will require signing off by the Water Operator and the Chief Executive Officer after corrective actions have taken place. 	<ol style="list-style-type: none"> 6. As appropriate 7. Water Operator 8. Water Operator / Chief Executive Officer
3	Minor exceedances of ADWG health guideline value for chemical parameter (determined value is close to guideline value).	<ol style="list-style-type: none"> 1. Alert Chief Executive Officer and Director of Works. 2. Determine potentially affected area, isolate if possible (i.e. individual bore). Consider Water alert. Escalate emergency further if situation worsens. 3. Report detection to Drinking Water Incident Hotline by phone (Immediately by phone, written incident report – Part 1 incident form - within 24 hours). 4. Resample for detected health parameter for all bores and combined bores (if possible). 5. Undertake comprehensive contamination investigation. 6. Undertake necessary corrective actions. 7. Upon resolution, provide written report to regulator (Part 2 incident form). Provide Report to Chief Executive Officer also. 8. Non-compliance will be raised and will require signing off by the Water Officer and the Chief Executive Officer after corrective actions have taken place. 	<ol style="list-style-type: none"> 1. Water Operator 2. Water Operator 3. Water Operator 4. Water Operator 5. Water Operator 6. Water Operator 7. Water Operator 8. Water Operator / Chief Executive Officer
3	Failure of infrastructure (ability to supply water compromised – short	<ol style="list-style-type: none"> 1. Alert Chief Executive Officer and Director of Works. 2. Determine reason for failure, isolate if possible. Consider options to 	<ol style="list-style-type: none"> 1. Water Operator 2. Water Operator

Level	Incident or Emergency	Summary of Actions to be Taken (with Documented Procedures Listed)	Position/s Responsible for Action/s
	term water restrictions may be required)	<p>recommence supply.</p> <ol style="list-style-type: none"> 3. Undertake comprehensive failure investigation. 4. Undertake necessary corrective actions to recommence supply and provide an estimate of when the supply can be recommenced. 5. Implement Short Term Water restrictions if required. 6. Provide written report to the Chief Executive Officer. 7. Non-compliance to be raised and will require signing off by the Water Operator and the Chief Executive Officer after corrective actions have taken place. 	<ol style="list-style-type: none"> 3. Water Operator 4. As appropriate 5. Water Operator 6. Director of Works 7. Water Operator / Chief Executive Officer
3	Low chlorine residual detected or disinfection failure (ability to supply disinfected water within the target free chlorine residual compromised)	<ol style="list-style-type: none"> 1. Alert Chief Executive Officer and Director of Works. 2. Determine reason for failure, isolate if possible. Consider options to recommence supply. Issue Boil Water Alert. 3. Report incident to Drinking Water Hotline by phone (Immediately by phone, written incident report – Part 1 incident form - within 24 hours). 4. Manually dose reservoirs with chlorine until disinfection system is back online. Or undertake corrective actions to bring residual chlorine levels back up via. disinfection system. 5. Re-test for <i>E.coli</i> and free chlorine. If no <i>E.coli</i> and chlorine residual is within target range then remove boil water alert. 6. Upon resolution, provide written report to regulator (Part 2 incident form). Provide Report to Chief Executive Officer also. 	<ol style="list-style-type: none"> 1. Water Operator 2. Water Operator 3. Water Operator 4. Water Operator 5. Water Operator 6. Water Operator / Chief Executive Officer
2	Failure of infrastructure, including minor cyber security breach, such as	<ol style="list-style-type: none"> 1. Alert Director of Works. 2. Monitor the situation to provide warning if supply may be compromised – 	<ol style="list-style-type: none"> 1. Water Operator 2. Water Operator

Level	Incident or Emergency	Summary of Actions to be Taken (with Documented Procedures Listed)	Position/s Responsible for Action/s
	computer virus or security breach on council server (supply unlikely to be compromised)	<p>initiate appropriate action if so Rectify the problem.</p> <ol style="list-style-type: none"> 3. CEO to alert IT support services/infrastructure providers if cyber security breach has occurred. 4. Inform Director of works of malfunction, communicate ongoing issues and improvement actions. 	<ol style="list-style-type: none"> 3. Water Operator 4. Water Operator
2	Abnormal exceedance of ADWG aesthetic guideline (customer complaints possible), or exceedance of Boulia/Urandangi aesthetic values for turbidity.	<ol style="list-style-type: none"> 1. Determine potentially affected area, isolate if possible (i.e. individual bore). Consider Water alert. 2. Resample for detected aesthetic parameter for all bores and combined bores (if possible). 3. Aesthetic exceedances posing a potential health concern for customers, represent a reportable event. Report detection to Drinking Water Incident Hotline by phone (Immediately by phone, and written incident report – Part 1 incident form - within 24 hours). 4. Undertake contamination investigation. 5. Undertake necessary corrective actions. 	<ol style="list-style-type: none"> 1. Water Operator 2. Water Operator 3. Director of Works
1	Exceedances of operational limit managed through operational and maintenance procedures	<ol style="list-style-type: none"> 1. Implement corrective actions immediately if simple malfunction. 2. Rectify exceedance and bring parameter within operational limits. Parameter shall be corrected same day. 3. Inform Director of works of exceedance, communicate ongoing issues and improvement actions to Director of Works. 	<ol style="list-style-type: none"> 1. Water Operator 2. Water Operator / Chief Executive Officer 3. Water Operator / Director of Works

Table 5-6: Emergency Contact Details and Protocols.

Description of Incident/ Emergency	Level	Business Unit / Organisation	Contact person(s) details	Communication protocols
All	5	Refer to Boulia Shire Council Local Disaster Management Plan		
All	Levels 3-5	Boulia Shire Council	Chief Executive Officer Lynn Moore Herbert Street, Boulia QLD 4829 Phone 07 4746 3188 ceo@boulia.qld.gov.au	Phone Email Written Reports
	Levels 1 - 5	Boulia Shire Council	Director of Works Ajay Agwan Herbert Street, Boulia QLD 4829 Phone (07) 4746 3188 dwo@boulia.qld.gov.au	Phone Email Written Reports
	All levels	Boulia Shire Council	Water Operator Boulia QLD 4829 Phone (07) 4746 3188	Phone Email Written Reports
All in Table 5-5	5, 4, 3, 2 Where outlined in Table 5-5	Drinking Water Incident Hotline: 1300 596 709 (24-hour hotline) E: drinkingwater.reporting@rdmw.qld.gov.au		Phone Written Report by email
All health related	5, 4, 3	Central Queensland Public Health Unit 82-86 Bolsover Street Rockhampton Queensland 4700 Ph: (07) 4920 6989		Phone Written

Description of Incident/ Emergency	Level	Business Unit / Organisation	Contact person(s) details	Communication protocols
Cyber security related	4, 2	Queensland Government Chief Information Office P: (07) 3215 3951 E: ggisvrt@qld.gov.au		Phone Written
For all other contacts and contact numbers refer to the Boulia Shire Council Local Disaster Management Plan including media, police, state agencies, health etc.				

5.4. Risk Management Improvement Program

Unacceptable residual risks or risks identified in the plan have been included in the Risk Management Improvement Program (RMIP) below for Boulia and Urandangi in 5.4.1.

The RMIP also include improvements to parts of the plan where deficiencies in information or uncertainties exist. Priorities of the improvements and target dates for completion have also been included.

5.4.1. Boulia and Urandangi RMIP

Table 5-7 and 5.7 below outline the proposed RMIP to be implemented for Boulia and Urandangi.

Table 5-7: Boulia Risk Management Improvement Program.

Code	Improvement	Scheme Component/Sub-component	Hazardous event	Priority	Action(s)			Estimated Cost (\$)	Target date/s	Responsibility
					Interim	Short-term	Long-term			
B1	Provide required training for staff to manage Disinfection System	Disinfection System	System Malfunction	High	Identify additional training requirements (actioned)	Have necessary training completed (actioned)	Assess other more reliable disinfection options		June 2023	Director of Works
B2	Install non return valves at high-risk locations, town common stables, STP	Distribution system	Cross contamination/Backflow	High	Identify all high-risk areas such as stock watering points, low use areas and potential contaminant sites	Install non-return valves at strategic locations			June 2023	
B3	Investigate Turbidity Levels	Bore Sourcing infrastructure Sourcing infrastructure	Harbour pathogens Reduced disinfection capacity Discolouration	Medium	Purchase of new turbidity meters that will measure in NTUs (actioned)	Monitoring of turbidity to determine if chlorine dosing has assisted in reducing turbidity levels within each of the schemes	If turbidity levels are still high, look into oxidisation, optimisation investigation improvement options and conduct a feasibility study	\$5,000	June 2023	
B4	Upgrade the Boulia pump telemetry system from the 3G to 4G network	Whole of System	Failure of the 3G network resulting in a loss of water supply to the town	High	N/A	Upgrade from 3G to 4G network	N/A	\$20,000	June 2023	
B5	Update operation and maintenance procedures with a protocol to follow if water to the town is lost and required to be brought back on again to address the sediment disturbance hazard	Whole of System	Loss of water to Boulia and sediment disturbance in the reservoirs and distribution system	High	Working day visual inspection of the ground water reservoir (actioned)	Update of operation and maintenance procedures	N/A		April 2023	
B6	Upgrades to the chlorine gas disinfection system	Disinfection System	System Malfunction and potential pathogenic ingress	High	N/A	Application for funding	System upgrades so that it is robust enough for the Boulia environment	\$250,000	December 2023	

Code	Improvement	Scheme Component/Sub-component	Hazardous event	Priority	Action(s)			Estimated Cost (\$)	Target date/s	Responsibility
					Interim	Short-term	Long-term			
B7	Investigate and develop an improved process for verification testing for <i>E.coli</i> within the 24-hour holding period	Verification Water Monitoring	Unreliable verification testing	High	Continue to send water samples to SGS lab for verification monitoring	Investigate the possibility of sending samples to Mt Isa (or another Council/lab) for verification monitoring	Implementation of new verification monitoring process for <i>E.coli</i> samples		April 2023	
B8	Formal collation and documentation of operation and maintenance procedures	Whole of System	Lack of formal procedures to follow in the case of a drinking water incident/event	High	Staff are aware of procedures to follow in regards to water testing and operation/maintenance of the scheme, however, formal documentation is lacking	Collation of current procedures and identification of missing procedures	Writing up of any missing procedures and collating everything into one formal document (e.g. reservoir inspection procedure and procedure for managing low chlorine residual/disinfection failure)		April 2023	
B9	The presence of radiological activity in Boulia's source water	Source Water	Exceedances of ADWG health values for gross alpha and gross beta	High	N/A	Radiological testing for gross alpha and gross beta to be incorporated into the verification monitoring regime	Long-term monitoring of results to determine if these parameters are present in the source water above ADWG guideline values.		Short-term: (actioned) Long-term: Dec 2023	

Table 5-8: Urandangi Risk Management Improvement Program.

Code	Improvement	Scheme Component / Sub-component	Hazardous event	Priority	Action(s)			Estimated Cost (\$)	Target date/s	Responsibility
					Interim	Short-term	Long-term			
U1	Seal Urandangi Bore	Bore	Contamination of source water	Very High	Determine bore seal design and cost (actioned)	Sealing of bore in canvas (actioned)	Sealing of bore with a vermin-proof cap	\$10,000	June 2023	Director of Works
U2	Continue to inform community of potential impacts of elevated Fluoride levels	Bore	Hazard that arises from the natural geological processes in the aquifer	Medium	N/A	Update fluoride factsheet so that it is more comprehensible to the Community and ensure that it is advertised within the Community	6-monthly formal notification to residents to alert them to the hazard.	\$5,000	December 2022	
		Sourcing Infrastructure								
U3	Update operational and maintenance procedures to include the new chlorine dosing and testing regime, the risks associated with chlorine dosing and procedures to follow of chlorine levels drop too low/high	Source	Biological contamination	High	Implementation of new chlorine dosing and testing regime (actioned)	Update to operational and maintenance procedures	Monitoring of the programme to assess the reliability Sealing of the Bore		April 2023	
U4	Cap old Urandangi Bore	Bore	Contamination of source water	Medium	N/A	Capping of old Urandangi Bore	N/A		June 2023	
U5	Investigate and develop an improved process for verification testing for <i>E.coli</i> within the 24-hour holding period	Verification Water Monitoring	Unreliable verification testing	High	Continue to send water samples to SGS lab for verification monitoring	Investigate the possibility of sending samples to Mt Isa (or another Council/lab) for verification monitoring	Implementation of new verification monitoring process for <i>E.coli</i> samples		April 2023	
U6	The presence of radiological activity in Urandangi's source water	Source Water	Exceedances of ADWG health guideline values for gross alpha and gross beta	High	N/A	Radiological testing for gross alpha and gross beta to be incorporated into the verification monitoring regime	Long-term monitoring of results to determine if these parameters are present in the source water above ADWG guideline values.		Short-term: (actioned) Long-term: Dec 2023	

5.5. Information Management

The Water Operator is responsible for operational issues such as monitoring bore pressures, bore water quality and reading water meters by completing visual inspections. The Water Operator maintains an inspection and maintenance report which is lodged on a monthly basis with operational monitoring water quality data detailing maintenance issues or identified hazards.

In order to monitor water quality in the Boulia and Urandangi schemes regular water analysis is conducted in alignment with the Operational and Verification Monitoring Program outlined in Tables 5.10 - 5.14 below. The Water Operator is responsible for organising water quality analysis to be undertaken. The Water Operator collects samples from the sampling points in the systems and for in-house testing conducts analysis in the council depot, results are then recorded and filed chronologically by date on the council server, test results are also sent to GBA Consulting Engineers who update data records and file sample record sheets. For external testing the laboratory delivers sampling equipment on scheduled dates, after the samples are taken a chain of custody certificate is signed and the samples are put on a flight to Brisbane and couriered to the lab. External water quality results are received by GBA Consulting Engineers who manage the water quality data which is stored in electronic format in a chronological order to ensure information is accessible, accurate and up to date. Water quality data is maintained in electronic format in a spreadsheet to maintain a single record of all water quality data. The spreadsheet is maintained with trends graph to provide visual guides depicting trends over time.

Infrastructure and asset records are managed by GBA Consulting Engineers who maintain reticulation plans.

5.6. Management of Sub-optimal Drinking Water Quality parameters for Boulia and Urandangi

Water testing data for both schemes have identified sub-optimal levels of turbidity and fluoride within the Boulia and Urandangi schemes respectively. Council have attempted to identify alternate water sources for improved water quality in Boulia. Nonetheless, an investigation into alternate water aquifers (preferably an artesian supply) with improved water quality found that the likelihood of striking significantly higher quality aquifers in the vicinity of the Boulia supply scheme was unlikely.

Since the implementation of BSC's DWQMP Council has implemented a range of improvement strategies to provide safe drinking water to its customers. These include:

Boulia:

- Identifying the highest turbidity bore in the bore field supplying Boulia and turning this bore off (for use in Emergency situations only)
- Diverting all source water into a common manifold to allow for dosing/ treatment
- Install a chlorine disinfection system after the manifold to disinfect and oxidize iron and manganese to help reduce turbidity
- Aerate the source water into the Ground level reservoir to increase the precipitation of iron
- Regular cleaning of the ground level reservoir to remove oxidized iron/ minerals
- Investigation of alternate source water (improved quality through a deeper aquifer)
- Visual inspections of the Boulia ground level reservoir on working days to ensure that if there is a 3G network failure, the town will not run-out of water

Urandangi:

- Distribution of fact sheets regarding high fluoride levels in the source water
- Chlorine disinfection and monitoring programme at the Urandangi Bore

5.6.1. Managing Elevated Turbidity Levels in the Boulia and Urandangi Schemes

The high turbidity levels within Boulia's sub-artesian water source are an inherent characteristic of the water within the aquifer which have been determined to be caused by elevated iron concentrations, which become oxidised and form precipitates in the drinking water. The presence of iron and the subsequent elevated turbidity does not directly create a risk to public health. However, the presence of iron in high concentrations, can increase the likelihood of biological contamination, providing a suitable habitat for proliferation.

Currently, Council does not have the capacity to treat the water to reduce the turbidity to the recommended ADWG turbidity values. Given that the health risks associated with high turbidity values in drinking water are not directly associated with the turbidity but the increased likelihood of biological contamination. To date, Council's main strategy to manage the health risks associated with elevated turbidity in the drinking water is to disinfect the drinking water prior to distribution. The chlorine gas assists to settle out the iron in the ground level reservoir, reducing iron concentrations in the distribution system and the overall turbidity. However, the current chlorine disinfection system at the Boulia scheme has not been in effect long enough to reliably determine if chlorine dosage is an effective measure to manage iron and turbidity levels. Council will continue to monitor turbidity and iron in Boulia's distribution system to determine the effect of chlorine dosing on the oxidation and settlement of iron in the ground level reservoir. This will then be used to determine if further management measures will be required to reduce turbidity levels.

Nonetheless, Council has a high level of confidence that the potential risks of elevated turbidity can be managed through the disinfection of the drinking water. Subsequently, amended aesthetic guideline values for turbidity have been implemented within each of the schemes so as not to trigger notification to the OWSR each time turbidity is tested for within the schemes. An incident in relation to typically elevated turbidity values would be raised in circumstances where the risk to public health is deemed to be unacceptable. Thus, for Boulia the aesthetic guideline value has been set at 15 NTU and the Urandangi value has been set at 10 NTU.

The circumstances for a notification to the Regulator include one of the following:

1. **An event:** An incident will be raised where turbidity values have been determined to be uncharacteristically high and pose a risk to public health. Based on historical data values exceeding 15 NTU for Boulia and 10 NTU for Urandangi would represent an event; and
2. **Low free chlorine residuals are detected:** If low chlorine residual levels below 0.2mg/L are detected an incident should be raised as the *E.coli* health risk associated with elevated turbidity is not being effectively managed.

Finally, it should also be noted that historically, Council has been measuring turbidity in FAUs which is a less accurate measurement. A new turbidity meter that measures in NTUs was obtained by Council in June 2022, however, testing with this new meter has not been in effect long enough to determine if this will have an impact upon the turbidity levels in the schemes.

5.6.2. Managing Elevated Fluoride Levels within the Urandangi Source Water

Elevated Fluoride levels associated with Urandangi's source water pose a potential health risk to the local residents, where high fluoride levels in the body can lead to health issues such as dental or even skeletal fluorosis in extreme cases. An advanced water treatment system (such as reverse osmosis) to reduce the fluoride concentrations in Urandangi's water is not considered to be financially viable for the same reasons as mentioned above. Council's management strategy at this stage is to ensure an effective communication with the community. This includes 6-monthly notification to residents and the

distribution of fluoride fact-sheets throughout the town informing residents of the potential risks associated with the elevated fluoride levels.

5.6.3. Evaluation and Response to the presence of *E. coli* and Low Chlorine Values at the Urandangi Bore

In March 2021, *E. coli* was detected in the Urandangi water supply. It is likely that this was due to a low level of bacterial contamination present at the Urandangi Bore supply. Council's main strategy to manage the health risks associated with the presence of *E. coli* was to implement a more stringent chlorine dosing and monitoring programme at the Urandangi Bore. This included weekly *E. coli*, coliform, total chlorine, free chlorine and turbidity verification testing for three months, with an ongoing requirement for weekly total and free chlorine operational testing, and continuation of the annual, biannual and monthly verification and operational monitoring outlined in Table 6.7. Chlorine dosing was undertaken by adding chloring tablets to floating dispensers within the Urandangi reservoir. A new residual free chlorine target of >0.2 <0.5 mg/L has been set for the Urandangi distribution system, with a chlorine dosing target rate of 1.5mg/L. Free chlorine levels are monitored weekly within the Urandangi distribution system. If levels drop below 0.2 mg/L, a boil water alert will be issued for the town and additional chlorine tablets added to the reservoir to bring the free chlorine residual back up to the target level. Follow-up *E.coli* and free chlorine testing will be undertaken and the boil water alert will be lifted once free chlorine levels in the distribution system are above 0.2 mg/L (providing that there is also no *E.coli* detected). This will also be reported to the Regulator as a Drinking Water Event. BSC staff are now familiar with the chlorine dosage requirements and have demonstrated the ability to maintain adequate disinfection on an ongoing basis. This has been confirmed through verification testing which has since recorded no *E. coli* present within the Urandangi Drinking Water. Following on from this incident, there is a high level of confidence that the health risks can be managed through the disinfection of the drinking water and continuation of the verification and operational monitoring outlined in Table 6.7 below.

Council are now working toward sealing the Urandangi Bore with a vermin proof cap as a priority. This will help to stop the ingress of pathogens into the Urandangi drinking water. Further Drinking Water Incidents will be raised if *E. coli* is detected in Urandangi drinking water as any concentration of *E. coli* is deemed a risk to public health.

5.6.4. Evaluation and Response to the Malfunctioning of the Control Platform that Regulates Bore and Water Treatment Pumps

In December 2021, Boulia experienced a failure in its 3G network resulting in the malfunctioning of the remote monitoring and control platform which automatically regulates water pumps from the bores and water treatment plant. This resulted in a loss of water supply to Boulia with ground and elevated tanks empty. Furthermore, the monitoring system did not activate the alarms to alert staff via their mobiles. Once notified, council were able to manually operate the water pumps while the 3G network was being fixed.

As outlined in Table 5.6, Council are now undertaking visual monitoring of the ground level reservoir on all working days to ensure there are no further issues with the town's water supply should the 3G network fail again.

5.6.5. Boulia Disinfection System Maintenance

Prior to the implementation of Boulia's DWQMP the potential hazards associated with Boulia's drinking water scheme were not fully appreciated. However, since formal systems analysis and risk evaluation processes have been undertaken the risk profile has become more apparent. In 2014, the Outback Regional Water Alliance implemented specialist reviews of the members systems, where it was

identified that there was a significant risk of biological contamination of the drinking water. The identification of these risks led to the implementation of a basic disinfection system in 2014, suspending chlorine tablets in the ground level reservoir. This measure was temporary until sufficient funding could be obtained to install a more conventional chlorine dosing system. In late 2019, BSC commissioned an automated chlorine gas disinfection plant, the commissioning of this plant has provided greater disinfection of drinking water in Boulia's distribution system when operational. A chlorine gas disinfection system was chosen as the preferred disinfection method for Boulia, as the chlorine gas system had the added benefit of increasing the oxidization of the iron, with the potential to increase the precipitation of iron from the water prior to reaching the reticulation system.

Nonetheless, Council has experienced a number of challenges in keeping the chlorine gas dosing system operational within the Boulia scheme. The system has elements that require specialist expertise to troubleshoot and repair with the system clearly not operating as designed, due to its unsuitability to Boulia's harsh environment. Recently 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 issues, order the parts and fit them. A process that can take several weeks to resolve. Additionally, chlorine gas bottles are sourced from Adelaide which poses logistical challenges to allow for the timely arrival of gas (a second standby bottle is located on-site). Furthermore, staff are not confident in their training and use of the system. Additionally, the chlorine dosing system is not a SCADA system, making it difficult for Council to undertake corrective actions before reaching insufficient chlorine residual/critical limits, as a chlorine residual alert range cannot be applied to the system.

A residual free chlorine target of >0.2 , <0.5 mg/L has been set for the Boulia distribution system, with a chlorine dosing target of 1.5mg/L. When the system is down or the free chlorine residual target cannot be maintained, chlorine tablets are manually added to the ground level reservoir as an interim measure, however, the high iron content of Boulia's water makes it harder for the chlorine tablets to dissolve and so this is not a viable long-term solution. In 2022, a chlorine dosing options assessment was undertaken by MJM Environmental. This assessment identified several disinfection options available to BSC including upgrades to the existing gas chlorination system, on-site chlorine generation, storage and dosing and finally electrochlorination. This study recommended that the most viable option for Council was an upgrade to the current chlorine gas disinfection system so that it is robust enough for the Boulia environment.

5.6.6. Customer Complaints

Customers are able to lodge complaints directly with Council via email, letter or in person to the Council head office in Herbert Street. However, with Boulia and Urandangi being small towns, it is not uncommon for complaints to be made directly to the person responsible (e.g. the Director of Works or Water Operator).

6.0 OPERATIONAL AND VERIFICATION MONITORING PROGRAMS

Details of the operational monitoring programs are tabulated below for Boulia and Urandangi in Table 6.1 and 6.2 below.

Details of the verification monitoring programs for Boulia and Urandangi are tabulated in Tables 6.3 – 6.7.

6.1. Operational Monitoring

6.1.1. Boulia and Urandangi Operational Monitoring

Operational monitoring for Boulia and Urandangi water supply schemes are provided in Tables 6.1 and 6.2 below.

The Water Operator is responsible for conducting operational monitoring.

The Water Operator is required to log all maintenance issues in a monthly report and a copy of this is sent to the Director of Works. While the Water Operator is encouraged to maintain informal lines of communication, formal communications shall also be required so as to enable a means for improved record keeping. Maintenance monitoring includes but is not limited to visual inspections to ensure that access to bore sites is restricted.

Currently, BSC has two turbidity and two chlorine meters, this enables for operational testing to continue when one meter needs to be sent externally for calibration. Council have one conductivity and pH metre which is calibrated externally on an annual basis. To date, external calibration has not resulted in any missed operational testing. All operational testing for Boulia and Urandangi is conducted in Boulia.

Table 6-1: Boulia Operational Monitoring Parameters.

Location in System	Parameter	Sampling			Chlorine Target Dosing Limit	Action if target limit exceeded	Critical Free Chlorine Limit	Action if critical limit exceeded	Positions Responsible for Monitoring
		Frequency	Method	Location					
				Boulia					
Treatment Plant	Free chlorine	Continuous	Online Meter	Combined raw water line downstream of treatment plant	1.5mg/L	Recalibrate chlorine monitor Check and clean sensors	< 0.2 mg/L	Recalibrate chlorine monitor Check and clean sensors If low: Manually dose into reservoir	Water Operator
Bores, System Wide	General Maintenance	Weekly	Visual Inspection	Bore 5 (Hospital) Bore 6 (Airport) Bore 7 (Powerhouse) Bore 8 (SES, Backup bore) Bore 9 (Washdown Bay) Reticulation	N/A	N/A	N/A	On a weekly basis the Water Operator is required to visually inspect the scheme for maintenance issues. A copy of the maintenance register is sent to the Director of Works on Monthly Basis with operational monitoring data. Visual checks ensure all barriers such as bore condition, seals and valves, Reservoir condition, roof hatches or doors remain closed for the Reservoirs.	Water Operator
Reservoirs	General Maintenance	Working Days	Visual Inspection	Boulia Ground Level and Elevated Reservoir	N/A	N/A	N/A	A visual inspection of the ground level reservoir is required on working days to ensure that the water pumps from the bores and water treatment plant are functioning properly and that Boulia is being supplied with water.	Water Operator

Table 6-2: Urandangi Operational Monitoring Parameters.

Location in System	Parameter	Sampling			Target limit	Action if target limit exceeded	Critical limit	Action if critical limit exceeded	Positions Responsible
		Frequency	Method	Location					
				Urandangi					
Bores, System Wide	General Maintenance	Weekly	Visual inspection	Bore Reservoir (ground level & elevated) Reticulation	N/A	N/A	N/A	On a weekly basis the Water Operator is required to visually inspect the scheme for maintenance issues. A copy of the maintenance register is sent to the Director of Works on Monthly Basis with operational monitoring data. Visual checks ensure all barriers such as bore condition, seals and valves, Reservoir condition, roof hatches or doors remain closed for the Reservoirs.	Water Operator

6.2. Verification and Operational Monitoring

The verification and operational monitoring programmes have been developed and modified in response to historical data analysis. This analysis was undertaken by an independent specialist to provide advice on potential hazards within the schemes and appropriate monitoring to detect potential contaminants.

Tables 6-3, 6-4 and 6-5 outline the operational monitoring requirements for Boulia and Urandangi. Tables 6-6 and 6-7 outline the verification monitoring requirements for Boulia and Urandangi.

Water sampling in Urandangi requires staff to travel over 300km on unsealed roads which may be impassable for prolonged periods during the wet season, it is therefore imperative for BSC to monitor weather and road conditions and take advantage of desirable conditions, when possible, particularly in the wet season. Only having one mid-week flight out of Boulia which can take water samples to the testing laboratory within recommended timeframes can cause difficulties for laboratory analysis of samples as flights can be cancelled or postponed on occasions. Where adverse weather conditions cause variation to scheduled monitoring programs BSC will endeavour to make alternate arrangements to meet verification monitoring requirements.

Despite the frequent exceedance of the ADWG health value for fluoride, biannual verification monitoring has been deemed to be suitable for the Urandangi scheme based on the historical data which identifies the fluoride concentrations to be within a consistent range. Additional verification monitoring would provide little value.

Table 6-3: Boulia Inhouse Operational Monitoring Program – Source Water.

Characteristic	Parameter	Sampling				Positions Responsible
		Frequency	Target Limit	Method	Location	
					Boulia	
Microbial quality	<i>E. coli</i>	Biannually	<1	Grab sample	Bore 5 (Hospital) Bore 6 (Airport) Bore 7 (Powerhouse) Bore 8 (SES, Backup bore) Bore 9 (Washdown Bay)	Overall Responsibility: Chief Executive Officer
Physical	Turbidity	Biannually	15 NTU	Grab sample		
Inorganic	Iron	Biannually	0.3 mg/L	Grab sample		Combined raw water line downstream of treatment plant
	Free chlorine	Continuous	>0.2 <0.5 mg/L	Online meter	Operations: Water Operator	

Table 6-4: Boulia Inhouse Operational Monitoring Program – Distribution System.

Characteristic	Parameter	Sampling				Positions Responsible
		Frequency	Target Limit	Method	Location	
					Boulia	
Microbial quality	<i>E. coli</i>	Monthly	<1	Grab sample	GLR Outlet Caravan Park Council Depot Others as necessary if adverse results	Overall Responsibility: Chief Executive Officer
Inorganic	Free chlorine	Weekly	>0.2 <0.5 mg/L	Grab sample		
Physical	Turbidity	Monthly	15 NTU	Grab sample		Implementation, review and actions: Director of Works
	pH	Monthly	Between 6.5 - 8.5	Grab sample		
	Conductivity	Monthly	N/A	Grab sample		

* Note the aesthetic Turbidity value for Boulia is 15NTU.

Table 6-5: Urandangi Inhouse Operational Monitoring Program.

Characteristic	Parameter	Sampling				Positions Responsible
		Frequency	Target Limit	Method	Location	
					Urandangi	
Microbial quality	<i>E. coli</i>	Monthly	<1	Grab sample	From two of the following locations; Urandangi Tank	Overall Responsibility: Chief Executive Officer
Inorganic	Free chlorine	Weekly	>0.2 <0.5 mg/L	Grab sample		
Physical	Turbidity	Monthly	10 NTU	Grab sample	Urandangi Bore Urandangi Pub	Implementation, review and actions: Director of Works
	pH	Monthly	Between 6.5 - 8.5	Grab sample	Urandangi Hall Others as necessary	
	Conductivity	Monthly	N/A	Grab sample	if adverse results	

* Note the aesthetic Turbidity value for Urandangi is 10NTU.

Table 6-6: Boulia and Urandangi Outsourced Verification Monitoring Program – Distribution System.

Characteristic	Parameter	ADWG &/or Regulation Value	Associated Hazard	Sampling Locations		Analysing Authority	Response to Exceedances	Positions Responsible
				Boulia	Urandangi			
Microbial quality	<i>E.coli</i>	Nil detect	Bacteria	All locations including: Tap located at ground level reservoir, Council Depot & Caravan Park	Tap located at ground level reservoir & one of the following locations in the distribution system: Tap located at Urandangi Pub or tap at Urandangi Hall	SGS Environmental Services Australia PTY LTD	Refer to Incident Management Plan. For ADWG health value exceedances, notify OWSR and complete incident reporting forms. For aesthetic exceedances, continue to monitor and escalate further if no longer an acceptable risk.	<p>Overall Responsibility: Chief Executive Officer</p> <p>Implementation, review and actions: Director of Works</p> <p>Operations: Water Operator</p>
	Total Coliforms	Nil detect						
Physical	Conductivity	N/A						
	True Colour	N/A						
	Dissolved Organic Carbon	N/A						
	Dissolved Oxygen	> 85% - Aesthetic						
	pH	pH 6.5 - 8.5						
	Total Dissolved Solids	N/A						
Inorganics	Turbidity	15 NTU - Boulia Aesthetic 10 NTU - Urandangi Aesthetic	<i>Hazard that arises from the natural geological processes in the aquifer.</i>					
	Chlorate	N/A						
	Chloride	250mg/L - Aesthetic						
	Fluoride	1.5mg/L - Health						
	Lead	0.010mg/L - Health						
	Nitrate	50mg/L - Health						
	Nitrite	3mg/L - Health						
	Sodium	180mg/L - Aesthetic						
	Uranium	0.017mg/L - Health						
	Total Iron	0.3mg/L - Aesthetic						
	Soluble Iron	N/A						
	Total Manganese	0.5mg/L - Health						
Soluble Manganese	N/A							
Trihalomethanes	.25mg/L - Health							

Testing Frequency for verification monitoring in the distribution system is to be conducted on a biannual basis, once in the wet season and dry season.

Table 6-7: Boulia and Urandangi Outsourced Verification Monitoring Program – Source Water.

Characteristic	Parameter	ADWG &/or Regulation Value	Associated Hazard	Sampling Locations		Analysing Authority	Response to Exceedances	Positions Responsible
				Boulia	Urandangi			
Microbial quality	<i>E.coli</i>	Nil detect	Bacteria					
	Total Coliforms	Nil detect						
Physical	Conductivity	N/A	<i>Hazard that arises from the natural geological processes in the aquifer.</i>	All locations including: Bore 5 Bore 6 Bore 7 Bore 8 Bore 9	Town Bore	SGS Environmental Services Australia PTY LTD	Refer to Incident Management Plan. For ADWG health value exceedances, notify OWSR and complete incident reporting forms. For aesthetic exceedances, continue to monitor and escalate further if no longer an acceptable risk.	Overall Responsibility: Chief Executive Officer Implementation, review and actions: Director of Works Operations: Water Operator
	Dissolved Organic Carbon	N/A						
	Dissolved Oxygen	> 85% - Aesthetic						
	pH	pH 6.5–8.5						
	Total Dissolved Solids	N/A						
	Turbidity	15 NTU - Boulia Aesthetic 10 NTU - Urandangi Aesthetic						
Inorganics	Chlorate	0.8 mg/L - Health						
	Chloride	250mg/L - Aesthetic						
	Fluoride	1.5mg/L - Health						
	Lead	0.010mg/L - Health						
	Nitrate	50mg/L - Health						
	Nitrite	3mg/L - Health						
	Selenium	0.010mg/L - Health						
	Silica	80mg/L - Aesthetic						
	Silver	0.1mg/L - Health						
	Sodium	180mg/L - Aesthetic						
	Total Iron	0.3mg/L - Aesthetic						
	Soluble Iron	N/A						
	Total Manganese	0.5mg/L - Health						
	Soluble Manganese	N/A						
Uranium	0.017mg/L - Health							
Gross Alpha	0.5 Bq/L - Aesthetic							
Gross Beta	0.5 Bq/L - Aesthetic							

Testing Frequency for verification monitoring of the source water is to be conducted on an annual basis.

APPENDIX A
DRINKING WATER QUALITY MANAGEMENT PLAN APPROVAL APPLICATION

Drinking Water Quality Management Plan Amendment Application

Water Supply (Safety and Reliability) Act 2008



Queensland
Government

Privacy notice: Personal information on this form is being collected for the purpose of applying for approval of the proposed amendment to the approved drinking water quality management plan. Your personal information will not be otherwise disclosed to any other parties without your consent unless authorised or required by law, such as under the *Right to Information Act 2009* or the *Evidence Act 1977*. Further information about privacy is available on the department's website: www.dnrme.qld.gov.au.

Note: This is an approved form under the *Water Supply (Safety and Reliability) Act 2008* (the Act) to be used by a drinking water service provider, applying to the Regulator for approval to amend the approved drinking water quality management plan (DWQMP). Before submitting this approved form, please be fully aware of your rights and obligations under the Act.

1. Drinking water service provider details

Drinking water service provider	SPID
Boulia Shire Council	18
Drinking water scheme(s)	
Boulia and Urundangi	

2. Contact details

Principal Contact

Family name	Given names(s)	Position		
MOORE	Lynn	Chief Executive Officer		
Registered / business physical address		City / Town	State	Postcode
18 Herbert Street		Boulia	QLD	4829
Mailing address (if different from above)		City / Town	State	Postcode
Telephone number	Mobile number	Email address		
(07) 4746 3188	0429463188	ceo@boulia.qld.gov.au		

3. Proposed amendment

The amendment of the approved DWQMP is due to:

- The findings of the regular review of the approved DWQMP completed on ___/___/___; (S107)
- Service provider proposing to amend the approved DWQMP, other than under section 99A of the Act (S100)
- Regulator direction by notice issued on ___/___/___; (S101).

Please indicate the nature of the proposed amendment(s) to the approved DWQMP by ticking the appropriate box(s) and record the supporting documentation for each proposed amendment.

Select applicable box(s)	Proposed amendment	List the proposed amendment(s) to the DWQMP, supporting documentation for each amendment (for example, document name) and attach a copy to the application
<input type="checkbox"/>	Registered service details	
<input type="checkbox"/>	Details of infrastructure for providing the service	

<input checked="" type="checkbox"/>	Identify hazards and hazardous events	BSC DWQMP Amendment 2022
<input type="checkbox"/>	Information gathering – water quality and catchment characteristics	
<input checked="" type="checkbox"/>	Assessment of risks	BSC DWQMP Amendment 2022
<input checked="" type="checkbox"/>	Risk management measures	BSC DWQMP Amendment 2022
<input type="checkbox"/>	Operation and maintenance procedures	
<input type="checkbox"/>	Management of incidents and emergencies	
<input checked="" type="checkbox"/>	Risk management improvement program	BSC DWQMP Amendment 2022
<input type="checkbox"/>	Service wide support – information management	
<input type="checkbox"/>	Operational monitoring	
<input checked="" type="checkbox"/>	Verification monitoring	BSC DWQMP Amendment 2022.
<input type="checkbox"/>	Other (please detail)	

4. Attached proposed amendments to the approved DWQMP

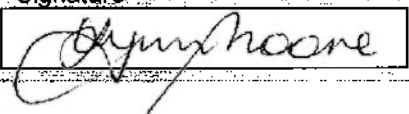
Important: The approved DWQMP must be attached with all proposed amendment(s) clearly highlighted.

Is a complete, approved DWQMP, with all proposed amendment(s), clearly highlighted and attached?

Yes No

5 Declaration

I declare and warrant that I have all the necessary and appropriate authority on behalf of the drinking water service provider to declare the information provided in this approved form, including any attachments or supporting information provided, are true and accurate to the best of my knowledge:

Family name MOORE	Given name(s) Lynn	Position Chief Executive Officer
Signature 	Date (dd/mm/yyyy) 11/2/2022	

9. Submission

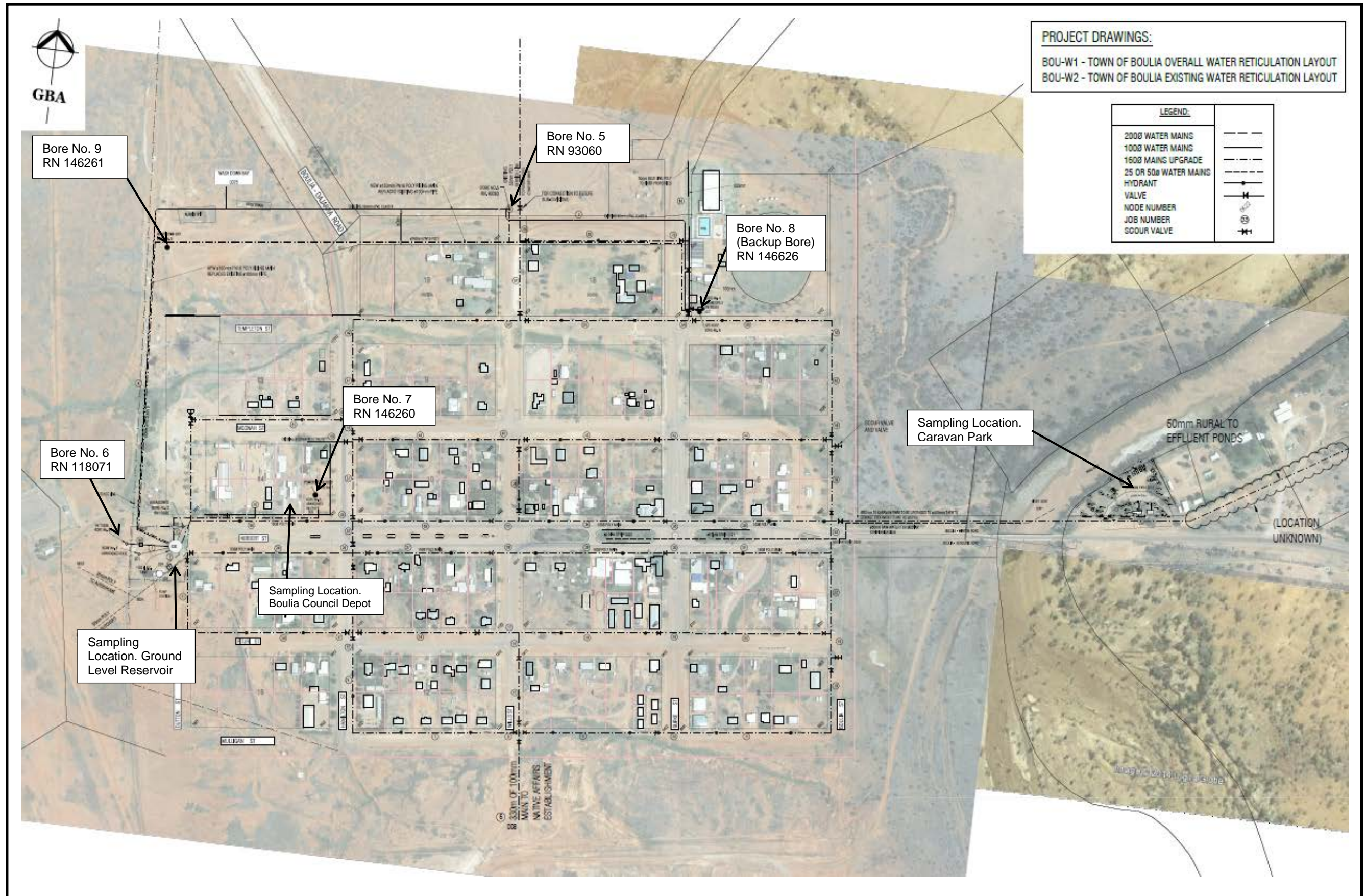
Please complete and sign the form and send to email address: DrinkingWater.Reporting@dnrme.qld.gov.au

APPENDIX B

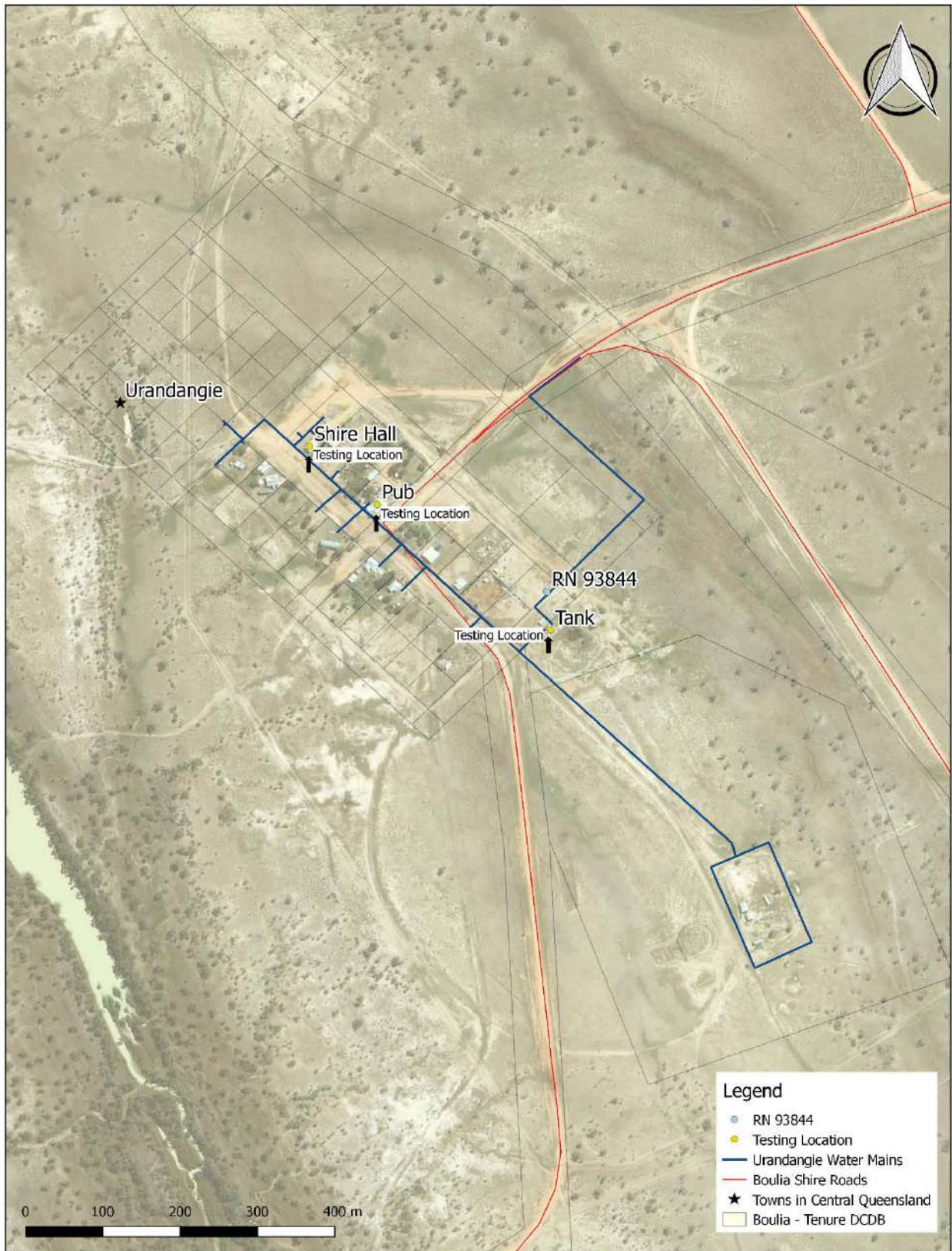
WATER SUPPLY LAYOUTS SUPERIMPOSED ON AERIAL PHOTOS

1. Boulia Water Supply Scheme
2. Urandangi Water Supply Scheme

1. Boulia Water Supply Scheme



2. Urandangi Water Supply Scheme



Boulia Shire Council
Urandangi Water Supply



APPENDIX C
BORE WATER REPORT CARDS

GROUNDWATER DATABASE

DATE 26/11/2007

BORE CARD REPORT

REG NUMBER 93060

REGISTRATION DETAILS

OFFICE Longreach	BASIN 0012	LATITUDE 22-54-26	MAP-SCALE
DATE LOG RECD	SUB-AREA	LONGITUDE 139-54-33	MAP-SERIES
D/O FILE NO. 028-405101-A	SHIRE 900-BOULIA	EASTING 388116	MAP-NO
R/O FILE NO. 028-405101-A	LOT 33	NORTHING 7466338	MAP NAME
H/O FILE NO.	PLAN SP158998	ZONE 54	PROG SECTION
	ORIGINAL DESCRIPTION PORTION 11	ACCURACY	PRES EQUIPMENT NE
		GPS ACC	
GIS LAT -22.9072065	PARISH NAME 639-BOULIA		ORIGINAL BORE NO NO 5
GIS LNG 139.9090384	COUNTY WILLS		BORE LINE -
CHECKED Y	PROPERTY NAME BOULIA SHIRE COUNCIL		
	FIELD LOCATION		POLYGON
FACILITY TYPE SF	DATE DRILLED 05/06/1995		RN OF BORE REPLACE
STATUS EX	DRILLERS NAME		DATA OWNER
ROLES	DRILL COMPANY		CONFIDENTIAL N
	METHOD OF CONST.		

CASING DETAILS

PIPE	DATE	RECORD NUMBER	MATERIAL DESCRIPTION	MAT SIZE (mm)	SIZE DESC	OUTSIDE DIAM (mm)	TOP (m)	BOTTOM (m)
A	05/06/1995	1	Steel Casing (unspecified)	6.400	WT	273	0.00	36.00
A	05/06/1995	2	Plastic Casing (unspecified)	13.000	WT	219	0.00	84.50
A	05/06/1995	3	Perforated or Slotted Casing				78.00	84.50

STRATA LOG DETAILS

RECORD NUMBER	STRATA TOP (m)	STRATA BOT (m)	STRATA DESCRIPTION
1	0.00	4.00	CLAY
2	4.00	11.00	RED CLAY
3	11.00	14.00	WHITE CLAY *
4	14.00	17.00	YELLOW CLAY
5	17.00	23.00	PINK CLAY
6	23.00	37.00	YELLOW CLAY

GROUNDWATER DATABASE

DATE 26/11/2007

BORE CARD REPORT

REG NUMBER 93060

RECORD NUMBER	STRATA TOP (m)	STRATA BOT (m)	STRATA DESCRIPTION
7	37.00	39.00	PINKY BROWN CLAY
8	39.00	42.00	BROWN CLAY
9	42.00	43.00	GREY MUDSTONE
10	43.00	44.00	GREEN SANDY MUDSTONE *?
11	44.00	57.00	GREY MUDSTONE
12	57.00	77.00	SANDY GREY MUDSTONE
13	77.00	83.50	SANDSTONE *
14	83.50	84.50	HARD ROCK
15	999.00		W BALKE LONGREACH WELL DRILLING
16	1000.00		CABLE TOOL 05-06-1995
17	1001.00		PUMP TEST 24HR SUBMERSIBLE

AQUIFER DETAILS

**** NO RECORDS FOUND ****

WATER LEVEL DETAILS

PIPE	DATE	MEASURE (m)	N/R	RMK	LOG	PIPE	DATE	MEASURE (m)	N/R	RMK	LOG	PIPE	DATE	MEASURE (m)	N/R	RMK	LOG
A	05/06/1995	-21.30		R													

GROUNDWATER DATABASE

DATE 26/11/2007

BORE CARD REPORT

REG NUMBER 118071

REGISTRATION DETAILS

OFFICE Longreach	BASIN 0012	LATITUDE 22-54-43	MAP-SCALE 254
DATE LOG RECD 16/JUN/03	SUB-AREA	LONGITUDE 139-54-15	MAP-SERIES M
D/O FILE NO. 140/017/0003	SHIRE 900-BOULIA	EASTING 387622	MAP-NO SF 54-10
R/O FILE NO.	LOT 33	NORTHING 7465801	MAP NAME
H/O FILE NO.	PLAN CP903938	ZONE 54	PROG SECTION
	ORIGINAL DESCRIPTION	ACCURACY SKET	PRES EQUIPMENT
		GPS ACC	
GIS LAT -22.91202393	PARISH NAME 639-BOULIA		ORIGINAL BORE NO TOWN BORE NO 6
GIS LNG 139.9041876	COUNTY WILLS		BORE LINE -
CHECKED Y	PROPERTY NAME BOULIA SHIRE COUNCIL		
	FIELD LOCATION POSITION DESCRIPTION MAY NOT BE ACCURATE		POLYGON
			RN OF BORE REPLACE 10928
FACILITY TYPE SF	DATE DRILLED 21/04/2003		DATA OWNER DNR
STATUS EX	DRILLERS NAME PHILLIPS, BARTON JOHN		CONFIDENTIAL N
ROLES WS	DRILL COMPANY		
	METHOD OF CONST. ROTARY MUD		

CASING DETAILS

PIPE	DATE	RECORD NUMBER	MATERIAL DESCRIPTION	MAT SIZE (mm)	SIZE DESC	OUTSIDE DIAM (mm)	TOP (m)	BOTTOM (m)
A	21/04/2003	2	Acrylonitrile Butadiene Styrene	17.200	WT	219	0.00	82.00
A	21/04/2003	4	Grout			311	0.00	50.00
A	21/04/2003	5	Perforated or Slotted Casing				64.00	76.00
A	21/04/2003	6	Gravel Pack	3.000	GR	311	50.00	82.00
X	21/04/2003	1	Steel Casing (unspecified)	6.400	WT	324	0.00	6.00
X	21/04/2003	3	Grout			381	0.00	6.00

STRATA LOG DETAILS

RECORD NUMBER	STRATA TOP (m)	STRATA BOT (m)	STRATA DESCRIPTION
1	0.00	12.00	LIMESTONE, WHITE, HARD
2	12.00	37.00	CLAY, WHITE, CHALKY
3	37.00	64.00	SHALE, GREY, FIRM

GROUNDWATER DATABASE

DATE 26/11/2007

BORE CARD REPORT

REG NUMBER 118071

RECORD NUMBER	STRATA TOP (m)	STRATA BOT (m)	STRATA DESCRIPTION
4	64.00	82.00	SANDSTONE, GREY, FINE, FIRM

AQUIFER DETAILS

REC	TOP BED(M)	BOTTOM BED(M)	BED LITHOLOGY	DATE	SWL (m)	FLOW	QUALITY	YIELD (l/s)	CTR	CONDIT	FORMATION NAME
1	67.00		SDST	21/04/2003	-31.10	N	"POTABLE"	5.00	Y	PS	

WATER LEVEL DETAILS

**** NO RECORDS FOUND ****

GROUNDWATER DATABASE
BORE CARD REPORT - PUBLISHABLE

REG NUMBER 146260

REGISTRATION DETAILS

OFFICE Longreach	BASIN 0012	LATITUDE 22-54-41	MAP-SCALE 254
DATE LOG RECD	SUB-AREA	LONGITUDE 139-54-24	MAP-SERIES
D/O FILE NO. 140/017/0003	SHIRE 900-BOULIA	EASTING 387866	MAP-NO SF 54-10
R/O FILE NO.	LOT 1	NORTHING 7465884	MAP NAME
H/O FILE NO.	PLAN SP107147	ZONE 54	PROG SECTION
	ORIGINAL DESCRIPTION	ACCURACY	PRES EQUIPMENT
		GPS ACC	
GIS LAT -22.91129	PARISH NAME 639-BOULIA		ORIGINAL BORE NO POWER HOUSE
GIS LNG 139.9065728	COUNTY WILLS		BORE LINE -
CHECKED Y	PROPERTY NAME		POLYGON
	FIELD LOCATION		RN OF BORE REPLACED
FACILITY TYPE SF	DATE DRILLED 11/02/2010		DATA OWNER DNR
STATUS EX	DRILLERS NAME HARGRAVE, TREVOR JOHN		CONFIDENTIAL N
ROLES	DRILL COMPANY Q.D.S.		
	METHOD OF CONST. ROTARY MUD - PDC		

CASING DETAILS

PIPE	DATE	RECORD NUMBER	MATERIAL DESCRIPTION	MAT SIZE (mm)	SIZE DESC	OUTSIDE DIAM	TOP (m)	BOTTOM (m)
A	11/02/2010	1	Polyvinyl Chloride	11.600	WT	226	0.00	82.00
A	11/02/2010	2	Centraliser				12.00	36.00
A	11/02/2010	3	Perforated or Slotted Casing				64.00	82.00
X	11/02/2010	4	Grout			270	0.00	35.00

STRATA LOG DETAILS

RECORD NUMBER	STRATA TOP (m)	STRATA BOT (m)	STRATA DESCRIPTION
1	0.00	1.00	TOP SOIL
2	1.00	5.00	ROCK, WHITE
3	5.00	8.00	CLAY, WHITE
4	8.00	23.00	CLAY, YELLOW
5	23.00	65.00	SHALE

BORE CARD REPORT - PUBLISHABLE

REG NUMBER 146260

RECORD NUMBER	STRATA TOP (m)	STRATA BOT (m)	STRATA DESCRIPTION
6	65.00	81.00	SANDSTONE
7	81.00	83.00	ROCK

STRATIGRAPHY DETAILS

**** NO RECORDS FOUND ****

AQUIFER DETAILS

REC	TOP BED(M)	BOTTOM BED(M)	BED LITHOLOGY	DATE	SWL (m)	FLOW	QUALITY	YIELD (l/s)	CTR	CONDIT	FORMATION NAME
1	65.00	81.00	SDST	11/02/2010	-39.00	N	POTABLE	2.00	Y	PS	HOORAY SANDSTONE

PUMP TEST DETAILS PART 1

**** NO RECORDS FOUND ****

PUMP TEST DETAILS PART 2

**** NO RECORDS FOUND ****

BORE CONDITION

**** NO RECORDS FOUND ****

ELEVATION DETAILS

**** NO RECORDS FOUND ****

WATER ANALYSIS PART1

**** NO RECORDS FOUND ****

WATER ANALYSIS PART 2

**** NO RECORDS FOUND ****

WATER LEVEL DETAILS

**** NO RECORDS FOUND ****

WIRE LINE LOG DETAILS

BORE CARD REPORT - PUBLISHABLE

REG NUMBER 146260

**** NO RECORDS FOUND ****

FIELD MEASUREMENTS

PIPE	DATE	DEPTH (m)	COND (uS/cm)	pH	TEMP (C)	NO3 (mg/L)	DO (mg/L)	Eh (mV)	ALK	METH	SOURCE
A	11/02/2010	83.00	1376	6.5						FU	GB

SPECIAL WATER ANALYSIS

**** NO RECORDS FOUND ****

VALIDATION LOG - PART 1

**** NO RECORDS FOUND ****

VALIDATION LOG - PART 2

**** NO RECORDS FOUND ****

GENERAL NOTES

**** NO RECORDS FOUND ****

GROUNDWATER DATABASE

DATE 06/09/2012

BORE CARD REPORT - PUBLISHABLE

REG NUMBER 146262

REGISTRATION DETAILS

OFFICE Longreach	BASIN 0012	LATITUDE 22-54-30	MAP-SCALE 254
DATE LOG RECD	SUB-AREA	LONGITUDE 139-54-43	MAP-SERIES
D/O FILE NO. 140/017/0003	SHIRE 900-BOULIA	EASTING 388402	MAP-NO SF 54-10
R/O FILE NO.	LOT 17	NORTHING 7466220	MAP NAME
H/O FILE NO.	PLAN B2674	ZONE 54	PROG SECTION
	ORIGINAL DESCRIPTION	ACCURACY	PRES EQUIPMENT
		GPS ACC	
GIS LAT -22.90829	PARISH NAME 639-BOULIA		ORIGINAL BORE NO SES BORE NO. 4
GIS LNG 139.91182	COUNTY WILLS		BORE LINE -
CHECKED Y	PROPERTY NAME		
	FIELD LOCATION		POLYGON
FACILITY TYPE SF	DATE DRILLED 16/02/2010		RN OF BORE REPLACED
STATUS EX	DRILLERS NAME HARGRAVE, TREVOR JOHN		DATA OWNER DNR
ROLES	DRILL COMPANY Q.D.S.		CONFIDENTIAL N
	METHOD OF CONST. ROTARY MUD - PDC		

CASING DETAILS

PIPE	DATE	RECORD NUMBER	MATERIAL DESCRIPTION	MAT SIZE (mm)	SIZE DESC	OUTSIDE DIAM	TOP (m)	BOTTOM (m)
A	16/02/2010	1	Polyvinyl Chloride	11.600	WT	266	0.00	83.00
A	16/02/2010	2	Centraliser				8.00	36.00
A	16/02/2010	3	Perforated or Slotted Casing				65.00	83.00
X	16/02/2010	4	Grout			271	0.00	35.00

STRATA LOG DETAILS

RECORD NUMBER	STRATA TOP (m)	STRATA BOT (m)	STRATA DESCRIPTION
1	0.00	8.00	TOPSOIL
2	8.00	21.00	ROCK
3	21.00	31.00	CLAY, YELLOW
4	31.00	75.00	SHALE, GREY
5	75.00	81.00	SHALE, SANDY

BORE CARD REPORT - PUBLISHABLE

REG NUMBER 146262

RECORD NUMBER	STRATA TOP (m)	STRATA BOT (m)	STRATA DESCRIPTION
6	81.00	88.00	LIMESTONE

STRATIGRAPHY DETAILS

**** NO RECORDS FOUND ****

AQUIFER DETAILS

REC	TOP BED(M)	BOTTOM BED(M)	BED LITHOLOGY	DATE	SWL (m)	FLOW	QUALITY	YIELD (l/s)	CTR	CONDIT	FORMATION NAME
1	75.00	81.00	SHLE SAND	16/02/2010	-25.00	N	POTABLE	3.00	Y	PS	HOORAY SANDSTONE

PUMP TEST DETAILS PART 1

**** NO RECORDS FOUND ****

PUMP TEST DETAILS PART 2

**** NO RECORDS FOUND ****

BORE CONDITION

**** NO RECORDS FOUND ****

ELEVATION DETAILS

**** NO RECORDS FOUND ****

WATER ANALYSIS PART1

**** NO RECORDS FOUND ****

WATER ANALYSIS PART 2

**** NO RECORDS FOUND ****

WATER LEVEL DETAILS

**** NO RECORDS FOUND ****

WIRE LINE LOG DETAILS

GROUNDWATER DATABASE
BORE CARD REPORT - PUBLISHABLE

REG NUMBER 146262

**** NO RECORDS FOUND ****

FIELD MEASUREMENTS

PIPE	DATE	DEPTH (m)	COND (uS/cm)	pH	TEMP (C)	NO3 (mg/L)	DO (mg/L)	Eh (mV)	ALK	METH	SOURCE
A	16/02/2010	88.00	1408	6.5						PU	GB

SPECIAL WATER ANALYSIS

**** NO RECORDS FOUND ****

VALIDATION LOG - PART 1

**** NO RECORDS FOUND ****

VALIDATION LOG - PART 2

**** NO RECORDS FOUND ****

GENERAL NOTES

**** NO RECORDS FOUND ****

BORE REPORT

REG NUMBER 146261

REGISTRATION DETAILS

OFFICE Longreach	BASIN 0012	LATITUDE 22-54-31	MAP-SCALE 254
DATE LOG RECD	SUB-AREA	LONGITUDE 139-54-15	MAP-SERIES
D/O FILE NO. 140/017/0003	SHIRE 900-BOULIA	EASTING 387607	MAP-NO SF 54-10
R/O FILE NO.	LOT D	NORTHING 7466193	MAP NAME
H/O FILE NO.	PLAN AP20052	ZONE 54	PROG SECTION
	ORIGINAL DESCRIPTION	ACCURACY	PRES EQUIPMENT
		GPS ACC	
GIS LAT -22.9084832	PARISH NAME 639-BOULIA		ORIGINAL BORE NO INDUST/AC AREA
GIS LNG 139.9040676	COUNTY WILLS		BORE LINE -
CHECKED Y			
			POLYGON
FACILITY TYPE Sub-Artesian Facility	DATE DRILLED 13/02/2010		RN OF BORE REPLACED
STATUS Existing	DRILLERS NAME HARGRAVE, TREVOR JOHN		DATA OWNER DNR
ROLES	DRILL COMPANY Q.D.S.		
	METHOD OF CONST. ROTARY MUD - PDC		

CASING DETAILS

PIPE	DATE	RECORD NUMBER	MATERIAL DESCRIPTION	MAT SIZE (mm)	SIZE DESC	OUTSIDE DIAM (mm)	TOP (m)	BOTTOM (m)
A	13/02/2010	1	Polyvinyl Chloride	11.600	WT	226	0.00	78.00
A	13/02/2010	2	Centraliser				12.00	36.00
A	13/02/2010	3	Perforated or Slotted Casing				60.00	78.00
X	13/02/2010	4	Grout			270	0.00	35.00

STRATA LOG DETAILS

RECORD NUMBER	STRATA TOP (m)	STRATA BOT (m)	STRATA DESCRIPTION
1	0.00	4.00	TOPSOIL
2	4.00	10.00	CLAY, YELLOW/WHITE
3	10.00	17.00	ROCK
4	17.00	29.00	CLAY, YELLOW
5	29.00	64.00	SHALE

BORE REPORT

REG NUMBER 146261

RECORD NUMBER	STRATA TOP (m)	STRATA BOT (m)	STRATA DESCRIPTION
6	64.00	78.00	LIMESTONE
7	78.00	84.00	GRANITE

STRATIGRAPHY DETAILS

**** NO RECORDS FOUND ****

AQUIFER DETAILS

REC	TOP BED(M)	BOTTOM BED(M)	BED LITHOLOGY	DATE	SWL (m)	FLOW	QUALITY	YIELD (l/s)	CTR	CONDIT	FORMATION NAME
1	64.00	78.00	LMST	13/02/2010	-27.00	N	POTAB;E	12.00	Y	PS	HOORAY SANDSTONE

PUMP TEST DETAILS PART 1

PIPE	DATE	REC NO.	RN OF PUMP-BORE	TOP (m)	BOTTOM (m)	DIST (m)	METH	TEST TYPES	PUMP TYPE	SUCTION SET (m)	Q PRIOR TO TEST (l/s)	DUR OF Q PR (min)	PRES ON ARRIV (m)	Q ON ARRIV (l/s)
A	13/02/2010	1	146261	64.00	78.00		PUM		AIR	54.00				

PUMP TEST DETAILS PART 2

PIPE	DATE	REC	TEST DUR (mins)	SWL (m)	RECOV. TIME (mins)	RESID. DD (m)	MAX DD or P RED (m)	Q at MAX DD (l/s)	TIME TO MAX DD (mins)	Max Q (l/s)	CALC STAT HD (m)	DESIGN YIELD (l/s)	DESIGN BP (m)	SUCT. SET (m)	TMSY (m2/DAY)	STOR
A	13/02/2010	1	390	-27.00				12.00						54.00		

BORE CONDITION

**** NO RECORDS FOUND ****

ELEVATION DETAILS

**** NO RECORDS FOUND ****

WATER ANALYSIS PART1

**** NO RECORDS FOUND ****

WATER ANALYSIS PART 2

BORE REPORT

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** End of Report. Produced: 06/07/2016 02:58:37 PM **

GROUNDWATER DATABASE

DATE 06/09/2012

BORE CARD REPORT - PUBLISHABLE

REG NUMBER 93844

REGISTRATION DETAILS

OFFICE Longreach	BASIN 0012	LATITUDE 21-36-38	MAP-SCALE 254
DATE LOG RECD	SUB-AREA	LONGITUDE 138-19-08	MAP-SERIES M
D/O FILE NO. 455/007(28)	SHIRE 900-BOULIA	EASTING 222435	MAP-NO 54-5
R/O FILE NO.	LOT 8	NORTHING 7607902	MAP NAME
H/O FILE NO.	PLAN CP684165	ZONE 54	PROG SECTION
	ORIGINAL DESCRIPTION	ACCURACY	PRES EQUIPMENT
		GPS ACC	
GIS LAT -21.610401715	PARISH NAME 4783-URANDANGI		ORIGINAL BORE NO URANGANGIE TOWN BORE
GIS LNG 138.318941087	COUNTY PITURIE		BORE LINE -
CHECKED Y	PROPERTY NAME		POLYGON
	FIELD LOCATION		RN OF BORE REPLACED 5337
FACILITY TYPE SF	DATE DRILLED 06/10/2001		DATA OWNER
STATUS EX	DRILLERS NAME BRETT NORRIE		CONFIDENTIAL
ROLES	DRILL COMPANY NORRIE DRILLING SERVICES		
	METHOD OF CONST. ROTARY AIR		

CASING DETAILS

PIPE	DATE	RECORD NUMBER	MATERIAL DESCRIPTION	MAT SIZE (mm)	SIZE DESC	OUTSIDE DIAM	TOP (m)	BOTTOM (m)
A	06/10/2001	1	Steel Casing (unspecified)	6.400	WT	319	0.00	6.00
A	06/10/2001	2	Polyvinyl Chloride			150	0.00	30.00
A	06/10/2001	3	Grout			319	0.00	6.00
A	06/10/2001	4	Perforated or Slotted Casing				24.00	30.00

STRATA LOG DETAILS

RECORD NUMBER	STRATA TOP (m)	STRATA BOT (m)	STRATA DESCRIPTION
1	0.00	1.00	BLACK SOIL
2	1.00	6.00	BROWN CLAY
3	6.00	10.00	GREY CLAY
4	10.00	12.00	WEATHERED QUARTZITE
5	12.00	13.00	GREY CLAY

BORE CARD REPORT - PUBLISHABLE

REG NUMBER 93844

RECORD NUMBER	STRATA TOP (m)	STRATA BOT (m)	STRATA DESCRIPTION
6	13.00	30.00	LIMESTONE*

STRATIGRAPHY DETAILS

**** NO RECORDS FOUND ****

AQUIFER DETAILS

REC	TOP BED(M)	BOTTOM BED(M)	BED LITHOLOGY	DATE	SWL (m)	FLOW	QUALITY	YIELD (l/s)	CTR	CONDIT	FORMATION NAME
1	24.00	30.00	LMST			N	POTABLE	3.40	Y	VS	AUSTRAL DOWNS LIMESTONE

PUMP TEST DETAILS PART 1

**** NO RECORDS FOUND ****

PUMP TEST DETAILS PART 2

**** NO RECORDS FOUND ****

BORE CONDITION

**** NO RECORDS FOUND ****

ELEVATION DETAILS

**** NO RECORDS FOUND ****

WATER ANALYSIS PART1

**** NO RECORDS FOUND ****

WATER ANALYSIS PART 2

**** NO RECORDS FOUND ****

WATER LEVEL DETAILS

**** NO RECORDS FOUND ****

WIRE LINE LOG DETAILS

**** NO RECORDS FOUND ****

DATE 06/09/2012

GROUNDWATER DATABASE
BORE CARD REPORT - PUBLISHABLE

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REG NUMBER 93844

FIELD MEASUREMENTS

**** NO RECORDS FOUND ****

SPECIAL WATER ANALYSIS

**** NO RECORDS FOUND ****

VALIDATION LOG - PART 1

**** NO RECORDS FOUND ****

VALIDATION LOG - PART 2

**** NO RECORDS FOUND ****

GENERAL NOTES

**** NO RECORDS FOUND ****

APPENDIX D
INFORMATION NOTICE DWQMP AMENDMENT APPROVAL



Department of
**Regional Development,
Manufacturing and Water**

20 October 2022

Chief Executive Officer
Boulia Shire Council
18 Herbert Street
BOULIA QLD 4829

Dear Ms Moore,

Drinking Water Quality Management Plan Amendment Application – Information Notice for the Decision

I refer to Boulia Shire Council's application to the Director-General of the Department of Regional Development, Manufacturing and Water (the regulator) for approval of its amended Drinking Water Quality Management Plan (DWQMP), which was received by Water Supply Regulation, Divisional Support on 14 February 2022, in the approved form.

I advise that the regulator has considered the application and has decided to approve Boulia Shire Council's amended DWQMP, dated 5 October 2022 with conditions. This version of the DWQMP is now deemed to be the approved DWQMP for Boulia Shire Council.

Enclosed is the *Information Notice for the decision* (this notice), given under subsection 99(1)(b), pursuant to subsection 107(4) of the *Water Supply (Safety and Reliability) Act 2008*, which gives effect to this approval.

The assessment of Boulia Shire Councils amended DWQMP has found that the following items are to be addressed in the next review of the plan and it is expected these will be included in the amended plan:

- Update water quality data (turbidity and radiological activity) for both schemes including analysis/trending of this data and the potential impact of surface water (rainfall and flooding) on groundwater sources to adequately determine the risks from these source water quality hazards.
- Review and update turbidity targets/critical limits in the plan once sufficient turbidity data has been collected and reconsider any improvements/changes that may affect the risk profile and the measures in place to manage these risks.
- Review and update the risk management improvement program (RMIP) once items are completed/actioned. Improvements used to reduce risk levels of identified hazards are to be re-evaluated and the new/additional measures included in the risk assessment.

Please note that Boulia Shire Council may apply for a review of the decision within 30 business days after the day you are given this notice (see section 12.0 of this notice).

If you have any related enquiries, please contact Mariel Forrester by telephone on (07) 3333 5444 or by email to: drinkingwater.reporting@rdmw.qld.gov.au.

Yours sincerely



Sue Larsen

Manager

**Water Supply Regulation, Water Operations and Systems
Department of Regional Development, Manufacturing and Water**

Delegate of the regulator

under the *Water Supply (Safety and Reliability) Act 2008*

Cc: Ajay Agwan, Director of Works and Operations
Isabeau Gavel, George Bourne and Associates

Water Operations and Systems

INFORMATION NOTICE

Water Supply (Safety and Reliability) Act 2008
(Section 99, subsection (1)(b))



Department of
**Regional Development,
Manufacturing and Water**

1.0 Citation

1.1 This notice, dated 20 October 2022, may be cited as the Information Notice for the Decision to approve an amendment of the Boulia Shire Council approved Drinking Water Quality Management Plan.

2.0 Power to give notice

2.1 This notice is given under subsection 99(1)(b), pursuant to subsection 107(4) of the *Water Supply (Safety and Reliability) Act 2008* (the Act).

3.0 Reference to service provider

3.1 A reference to service provider in this notice is a reference to the drinking water service provider specified in section 3.2 of this notice.

3.2 This notice is given to:

Boulia Shire Council
18 Herbert Street
BOULIA QLD 4829

who may be referred to in the remainder of this notice as 'you' and 'your', as applicable.

4.0 Reason for Notice

Pursuant to section 107 of the Act, a drinking water service provider must, within 30 business days of completing a review of their approved Drinking Water Quality Management Plan, referred to in the remainder of this notice as the DWQMP or the plan, which indicated changes needed to be made to the plan, amend the DWQMP to reflect the changes to the operation of the water service and apply to the regulator for the approval of that amended plan.

4.1 Subsection 107(4) provides that subsections 95(2) and (3) and sections 96 to 99 apply to the application and the proposed amended DWQMP, as if a reference in the sections to the DWQMP was a reference to the amended DWQMP.

4.2 Pursuant to section 98 of the Act, the Director-General of the Department of Regional Development, Manufacturing and Water (the regulator) must consider and decide to approve or refuse to approve an amendment of an approved DWQMP lodged by a service provider under section 107 of the Act.

4.3 Subsection 99(1)(b) provides that the regulator may approve a DWQMP with conditions.

4.4 If the regulator, under subsection 99(1)(b) of the Act, approves a DWQMP with conditions, the regulator must give the service provider an information notice for the decision.

5.0 Scheme details

5.1 This notice applies to the Boulia Shire Council drinking water service, which includes the following water supply scheme/s:

- Boulia Water Supply Scheme; and
- Urandangie Water Supply Scheme.

6.0 Decision made

6.1 On 12 October 2022, the delegate of the regulator decided under section 98 of the Act, to approve the amended DWQMP, as submitted by Boulia Shire Council, on 5 October 2022, with the conditions stated in this notice.

6.2 The decision was made having regard to the DWQMP detailed in your DWQMP amendment application form, received on 14 February 2022, including changes to the sections:

- Identify hazards and hazardous events;
- Assessment of risks;
- Risk management measures;
- Operation and maintenance procedures;
- Risk management improvement program;
- Verification monitoring;

6.3 The approved amended DWQMP includes all the documents and information submitted to the regulator under sections 95 and 96 of the Act, as a component of the amendment application made on 14 February 2022 including:

- Boulia Shire Council Drinking Water Quality Management Plan submitted on 5 October 2022.

7.0 Conditions of approval for the plan

7.1 The following definitions apply to conditions of your approved DWQMP:

‘water quality criteria’ means the water quality criteria for drinking water, as defined in Schedule 3 of the Act and a health guideline value provided in the most current version of the Australian Drinking Water Guidelines (ADWG).

‘an incident’ is the detection of *Escherichia coli* (E.coli), an ADWG parameter or radioactivity that does not comply with the water quality criteria or a pathogen, i.e. a disease-causing microorganism (e.g. bacteria, viruses and protozoa).

‘an event’ is anything that has happened or is likely to imminently happen in your drinking water service, which you cannot manage under your approved DWQMP and/or which may adversely impact public health. An event includes, but not limited to:

- the detection of a parameter that has an aesthetic guideline value, but used as an indicator or a surrogate of other hazards (for example, turbidity), or
- the detection of a parameter that has no guideline value in ADWG, which may adversely impact public health (for example, chlorate),
- failure to undertake the water quality testing described in the DWQMP or missing data, for example, laboratory errors, where rescheduling cannot demonstrate the required frequency,
- an operational situation, which requires a response to ensure safety and continuity of supply and which is not managed by an operational procedure and/or detailed in the DWQMP.

‘manage under your approved DWQMP’ means the hazard and/or a hazardous event is identified in the DWQMP and can be managed to an acceptable level of risk, i.e., the hazard and/or a hazardous event:

- is identified in the risk assessment and has existing preventive measures documented in the DWQMP to achieve an acceptable risk level; and
- has corrective actions documented in the DWQMP to comply with the water quality criteria, or below an ‘interim’ health guideline value, where applicable; or
- can be managed by an operational procedure or as described in the DWQMP.

‘immediately’ means without reasonable delay, but no later than on the same day you became aware of the incident or event.

‘as soon as practicable’ means -

- for the initial notification - within 24 hours after you immediately notified the regulator of the incident or event, but no later than the close of business the next business day; and
- for the investigation report - within five (5) business days after completing your investigation of the incident or event, which includes identifying the root cause and the actions proposed to prevent or minimise the likelihood of a recurrence of the incident or event.

‘circumstances’ means a description of the incident or event, which may include the possible cause of the incident or event, the assessed potential of the event to adversely impact public health, any relevant water quality sampling or testing conducted or proposed and any corrective action(s) taken or proposed.

7.2 If, due to your verification or other monitoring activity, which includes a research program or another entity’s monitoring activity, you become aware of an incident in your drinking water service, you must, unless you have a reasonable excuse, immediately notify the regulator of the circumstances and follow up that initial notification by giving the regulator written notice in the approved form, as soon as practicable.

7.3 When you become aware an event in your drinking water service, you must, unless you have a reasonable excuse, immediately notify the regulator of the circumstances and follow up that initial notification by giving written notice in the approved form, as soon as practicable.

7.4 You must give the regulator an investigation report, using the approved notice form, as soon as practicable. This notice must identify the cause of the incident or event and include the outcomes of your investigation, the actions taken to remedy the incident or event and any actions proposed to prevent or minimise the likelihood of a recurrence of the incident or event.

7.5 You may seek the regulator’s formal acknowledgement for your research activities, by submitting the Research Project Notification form to the regulator.

Where you are operating under a research activity that has been formally acknowledged by the regulator, detections of parameters arising from this research activity must be reported as detailed in the regulator’s formal acknowledgement.

7.6 The next regular review of your approved DWQMP, to ensure the DWQMP remains accurate and relevant to the drinking water service you provide, must be conducted by **31 January 2024 and at the intervals specified in section 8 of this notice.**

This review must be conducted in accordance with the regulatory guidelines made by the regulator for conducting a regular review of a DWQMP.

7.7 The next audit of your approved DWQMP must be conducted by **30 June 2026 and at the intervals specified in section 8 of this notice.**

This audit must be conducted in accordance with section 108 of the Act and the regulatory guidelines made by the regulator for undertaking an audit of a DWQMP and preparing audit reports.

- 7.8 The State of Queensland accepts no liability for any financial outlay you incur by implementing and complying with your approved DWQMP and the conditions of the plan.
- 7.9 You must provide quarterly progress reports to the regulator detailing the status of your DWQMP risk management improvement program as stipulated in the following table:

Quarter	Report due
1 October 2022 – 31 December 2022	1 February 2023
1 January 2023 – 31 March 2023	1 May 2023
1 April 2023 – 30 June 2023	1 August 2023
1 July 2023 – 30 September 2023	1 November 2023
1 October 2023 – 31 December 2023	1 February 2024

The reports must indicate the progress to date on each improvement item. If an item has not been completed by the due date, you must include the action(s) you will take to ensure its completion within a reasonable timeframe.

This condition is imposed to ensure that the risk management improvement program items are completed within the stated timeframes in the plan.

- 7.10 You must provide copies of the operation and maintenance procedures listed in Table 21 of your DWQMP to the regulator by 31 May 2023, or once the risk management improvement program action item B8 has been completed.

This condition is imposed to ensure that you have adequate preventive measures to address the risks identified in the risk assessment.

- 7.11 You must undertake monitoring of turbidity and radiological activity in Boulia and Urandangie and include all related water quality data and an analysis/trending of the data in the next review of your DWQMP.

This condition is imposed to ensure that you can reasonably determine the risks arising from turbidity and radiological quality.

8.0 Intervals for DWQMP reviews and audits under the Act

- 8.1 Regular reviews of your approved DWQMP must be conducted every two (2) years. The interval of two (2) years is considered reasonable to ensure your approved DWQMP remains relevant and appropriate to manage all likely hazards associated with your drinking water service.
- 8.2 Audits of your approved DWQMP must be conducted every four (4) years. The purpose of this audit is to verify data accuracy, assess compliance with the DWQMP and its relevance to your drinking water service. The interval of four (4) years is considered reasonable to demonstrate your implementation of and compliance with your approved DWQMP.

9.0 Evidential material on which findings of fact were based

9.1 The delegate of the regulator in making the decision mentioned in section 6.0 'Decision Made' above had regard to the following material:

- *Water Supply (Safety and Reliability) Act 2008*;
- Water Supply (Regulator) Delegation (No.1) 2022;
- Public Health Regulation 2018;
- Drinking Water Quality Management Plan Guidelines, November 2018;
- Australian Drinking Water Guidelines 2011, Version 3.8 Updated September 2022;
- Compliance notice issued to Boulia Shire Council on 10 November 2021
- Boulia Shire Council's DWQMP regular review 2020-2021 financial year, received on 31 December 2021
- Boulia Shire Council's DWQMP Amendment Application received on 14 February 2022;
- Boulia Shire Council's amended DWQMP received on 14 February 2022;
- Information Requirement Notice issued to Boulia Shire Council on 12 May 2022;
- Boulia Shire Council's amended DWQMP received on 15 July 2022 in response to an Information Requirement Notice issued on 12 May 2022;
- Boulia Shire Council's further amended DWQMP, received 5 October 2022 in response to email sent by the regulator on 29 September 2022;
- Correspondence between the department and the service provider about this application;
- Case number CPL-18-22-09434; and
- Boulia Shire Councils DWQMP audit report, dated 12 April 2022.

10.0 Findings on material questions of fact

10.1 The delegate of the regulator in making the decision mentioned in section 6.0 'Decision Made' above, made the following findings of fact:

- Boulia Shire Council has an approved DWQMP, in accordance with section 95 of the Act;
- Boulia Shire Council amended its approved DWQMP and applied for approval of this amended plan on 14 February 2022;
- Boulia Shire Council amended the sections of its approved DWQMP, as indicated in the amendment application form;
- Boulia Shire Council further amended the DWQMP to incorporate the findings and recommendations of an audit report dated 12 April 2022; and
- Boulia Shire Council gave the regulator further amended DWQMPs on 15 July 2022 and on 5 October 2022.

11.0 Reasons for the decision

11.1 The delegate of the regulator made the decision for the following reasons:

- Boulia Shire Council amended its approved DWQMP, following its review and submitted a bona-fide amendment application to the regulator on 14 February 2022;
- Boulia Shire Council's DWQMP, as received on 5 October 2022, meets the requirements of the Act and the relevant guidelines for the drinking water supply schemes addressed;
- Boulia Shire Council's DWQMP audit report findings, indicated improvements required in reporting, documented procedures and data collection/analysis.

12.0 Internal review of decision

12.1 Subsections 512(1) and 512(2)(b) of the Act provide that a person who has been given an information notice by the regulator may apply for an internal review of the decision in the notice.

12.2 An internal review application must be:

- in the approved form (WSR004 - Internal review of decision application) which can be obtained at www.rdmw.qld.gov.au/water or from our local departmental office;
- accompanied by a statement of the grounds, on which the applicant seeks review of the decision;
- supported by sufficient information to enable the reviewer to make a decision; and
- made to the regulator by email sent to: drinkingwater.reporting@rdmw.qld.gov.au or posted to the address below, within 30 business days after the day you are given this information notice.

Director, Water Supply Regulation
Water Operations and Systems
Department of Regional Development, Manufacturing and Water
GPO Box 2247
Brisbane Qld 4001

12.3 Making an internal review application does not delay the person's obligation to comply with the notice. A person who has been given an information notice by the regulator under the Act may apply to a court with jurisdiction for a stay of the decision.

12.4 The latest version of the Act is available at www.legislation.qld.gov.au and detailing the review and appeal rights in Chapter 7. This process may not be the only right of review and you are encouraged to seek legal advice.

This notice is given on Thursday, the 20th day of October, 2022.



Sue Larsen

**Delegate of the regulator
under the *Water Supply (Safety and Reliability) Act 2008*
Manager
Water Supply Regulation, Water Operations and Systems
Department of Regional Development, Manufacturing and Water**