DIAMANTINA SHIRE COUNCIL

SUSTAINABLY DEVELOPING THE OUTBACK

DIAMANTINA DRINKING WATER QUALITY MANAGEMENT PLAN

Service Provider ID 42

GBA CONSULTING ENGINEERS

Document Control

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Contact for enquiries and proposed changes.

If you have any questions regarding this document or if you have a suggestion for improvements, please contact GBA Consulting Engineers.

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1.0 INTRODUCTION

1.1 Drinking Water Quality Management Plan Overview

This document describes how Diamantina Shire Council provides safe and reliable drinking water services to the communities of Bedourie and Birdsville, in conjunction with the *Water Supply (Safety and Reliability) Act 2008* (*the Act*) which commenced on the 1st July 2008.

The purpose of *the Act* is to provide for the safety and reliability of water supply throughout Queensland and it includes provisions relating to the management of drinking water quality, aimed at protecting public health. This outcome is achieved primarily through a regulatory framework for drinking water quality which requires Drinking Water Service Providers to:

- Undertake monitoring and reporting on drinking water quality;
- Have an approved Drinking Water Quality Management Plan (DWQMP).

This DWQMP is prepared consistently with the DWQMP Guideline issued by the Department of Regional Development, Manufacturing and Water (RDMW).

The operation of a water service or a drinking water service is also covered under other State and Commonwealth Legislation. The requirements of the *Water Supply (Safety and Reliability) Act 2008* do not negate the requirements of other Legislation unless expressly stated. The Drinking Water Service Provider (DWSP) is responsible for obtaining any necessary approvals under other Acts to ensure the compliant operation of their services. Other State and Commonwealth Legislation relating to the operations of water services may include:

- *Public Health Act 2005*
- *Public Health Regulation 2018*
- *Plumbing and Drainage Act 2018*
- *Planning Act 2016*
- *Environmental Protection Act 1994*
- *Water Act 2000*
- *Trade Practices Act 1974*
- *Work Health and Safety Act 2011*
- *Food Act 2006*

1.2 Registered Service Details

This Drinking Water Quality Management Plan relates to the water supply services owned and operated by:

Diamantina Shire Council, Service Provider ID 42
17 Herbert Street
BEDOURIE 4829
P: (07) 4746 1600
E: admin@diamantina.qld.gov.au

The first point of contact in relation to this plan is:

Bob Stephen, Director of Infrastructure Services
P: (07) 4746 1600
M: 0455 431 962
E: Bob.Stephen@Diamantina.qld.gov.au

The declared service area maps for each scheme can be located here:
https://www.diamantina.qld.gov.au/about-council/council-publications

The Administration Centre and Main Works Depot for the Shire are located in Bedourie. There is also Customer Service available at the Information Centre in Birdsville

1.3 Chief Executive Office Endorsement

Diamantina Shire Council recognises the importance of this DWQMP in the management and provision of safe and reliable drinking water services to the reticulated parts of the Shire. DSC aims to maintain an integrated approach to ensuring that the requirements of this DWQMP are adhered to by all DSC staff and any contractors operating on behalf of DSC. In particular, DSC endorses all outcomes from the current Risk Assessment and all items outlined in the Risk Management Improvement Programme.

Date.....26 July 2024.....

Scott Mason

Interim Chief Executive Officer

1.4 Diamantina Shire Council

The Diamantina Shire is located in Queensland's central-west and covers an area of 95,000km^2 with a population of approximately 266 people (as per the 2021 census from the Australian Bureau of Statistics). The Shire consists of two towns; Bedourie and Birdsville. The administrative centre of the Shire is located in Bedourie, approximately 500km south-west of Longreach.

Council provides potable water to both Birdsville and Bedourie which is sourced from deep artesian bores. Birdsville also has a distribution system for non-potable river water sourced from the Diamantina River and supplied to the town for irrigation use. Birdsville's potable and non-potable mains are different colours to avoid confusion and potential cross-connections. The non-potable water is also pumped at a lower water pressure. All valves are correctly labelled in the junction box and subsequently, it is considered extremely unlikely for the non-potable water supply to be confused with the potable water supply.

Council's 2022- 27 Corporate Plan, developed to provide strategic direction for the Shire, includes the strategy: "*Guarantee quality, potable urban water supply.*" Table 1 below outlines the current population and connections (including 10-yr population projections) for the towns of Bedourie and Birdsville, Figure 1 below depicts Diamantina Shire Council's location in relation to the rest of Queensland.

Table 1: Bedourie and Birdsville population projections.

Scheme Name	Communities Serviced	Current			10-year Projection		
		Population	Connections	Demand	Population	Connections	Demand
Bedourie	Bedourie	122	70	281 KL/day	140	75	322 KL/day
Birdsville Bore Supply	Birdsville	110	70	394 KL/day	160	85	450 KL/day

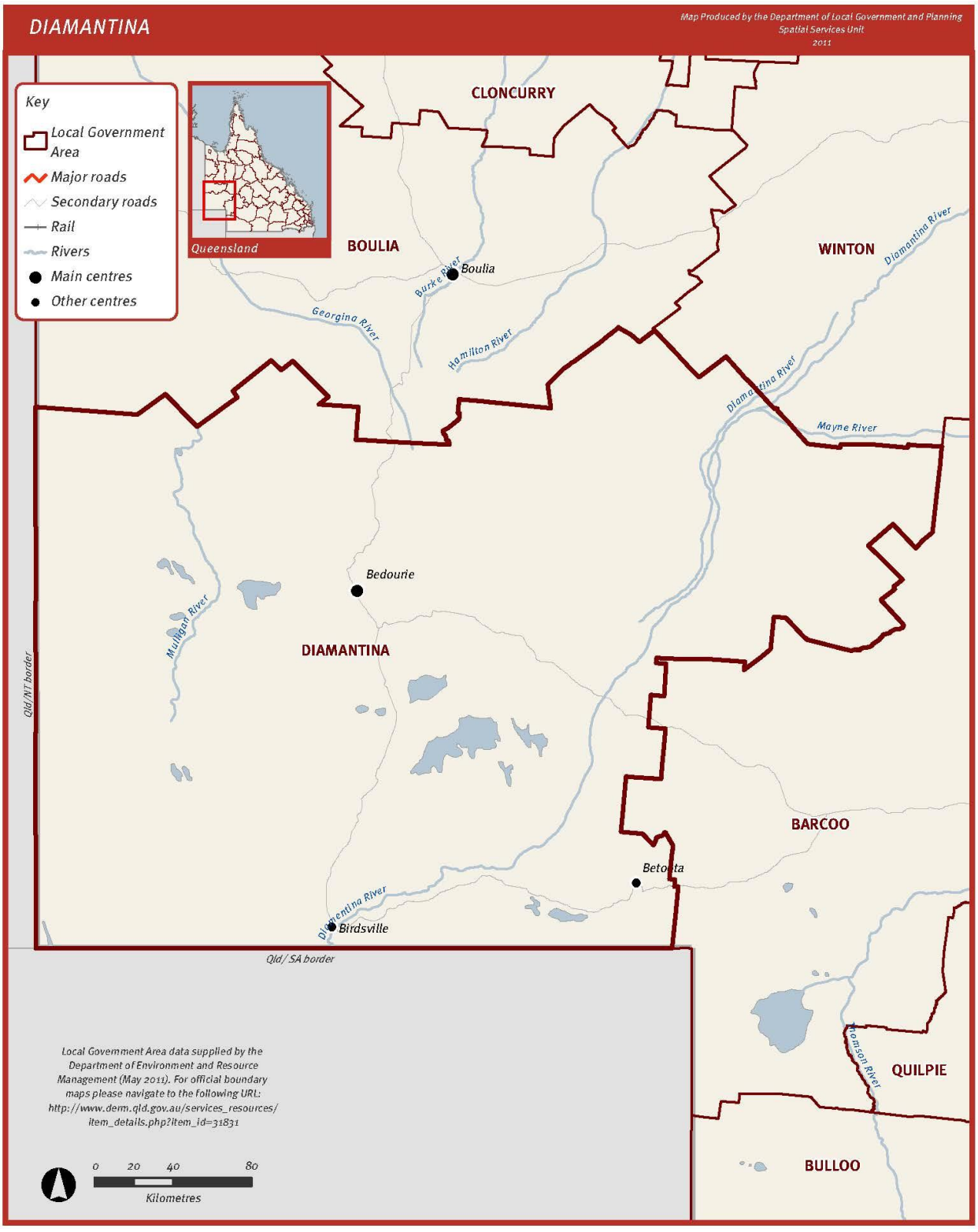

Figure 1: Diamantina Shire Council area and location relative to Queensland.

1.5 Diamantina Shire Council Stakeholders

Table 2: Diamantina Shire Council stakeholders.

Organisation	Contact Name and Details	DWQMP Relevance	How the stakeholder is engaged in the DWQMP
Diamantina Shire Council	Scott Mason Interim Chief Executive Officer P: (07) 4746 1600	Council CEO	Risk management participant and DWQMP oversight.
	Bob Stephen Director of Infrastructure Services P: (07) 4746 1600 M: 0455 431 962 E: Bob.Stephen@Diamantina.qld.gov.au	Overall Supervisor	Risk management participant and DWQMP implementation.
	Jodie Girdler Facilities and Town Services Manager P: (07) 4746 1600 E: Jodie.girdler@diamantina.qld.gov.au	Town Services Manager	Risk management participant and DWQMP implementation.
	Alarna Birdsville Town Services Foreman M: 0407 146 902	Birdsville Town Supervisor	Risk management participant and DWQMP implementation.
GBA Engineers	Stuart Bourne Senior Engineer P: (07) 4651 5177 E: GBourne@gbaenginners.com.au	Planning, design and construction of works	Risk management participant and engineering supervision.
	Isabeau Gavel Senior Environmental Officer P: (07) 4651 5177 M: 0418 411 920 E: igavel@gbaengineers.com.au	Consultancy services	Risk management participant and preparation of DWQMP.
Water Supply Regulator	P: 1300 596 709 (24-hour hotline) E:DrinkingWater.Reporting@rdmw.qld.gov.au	Water Supply Regulator	Approval of DWQMP documentation.
Queensland Health Public Health Unit	82-86 Bolsover Street, Rockhampton QLD 4700 PO Box 946, Rockhampton QLD 4700 P: (07) 4920 6989	Public Health Unit	Public Health.
SGS Melbourne EH&S	10/585 Blackburn Rd, Notting Hill VIC 3186 P: (03) 9574 3200 E: Au.SampleReceipt.Melbourse@sgs.com	Water Analysis Authority	Chemical Analysis/ Reporting Water Quality.
QLD Government Chief Information Office	P: (07) 3215 3951 E: qgisvrt@qld.gov.au	Cyber Security Hotline	Cyber Security Assistance.
Bedourie Clinic	Kepler St, Bedourie QLD 4829 P: (07) 4746 1226	Local health Service	Sensitive User.

Organisation	Contact Name and Details	DWQMP Relevance	How the stakeholder is engaged in the DWQMP
Birdsville Clinic	31 Adelaide St, Birdsville QLD 4482 P: (07) 4656 3245	Local health Service	Sensitive User.
Bedourie State School	Timor St, Bedourie QLD 4482 P: (07) 4746 1224	Sensitive User	Sensitive User.
Birdsville State School	54 Adelaide St, Birdsville QLD 4829 P: (07) 4656 3233	Sensitive User	Sensitive User.

2.0 CATCHMENT CHARACTERISTICS

2.1 The Great Artesian Basin

The potable water supply for both towns is sourced from the Great Artesian Basin (GAB), which extends over the blue shaded area on Figure 2 below.

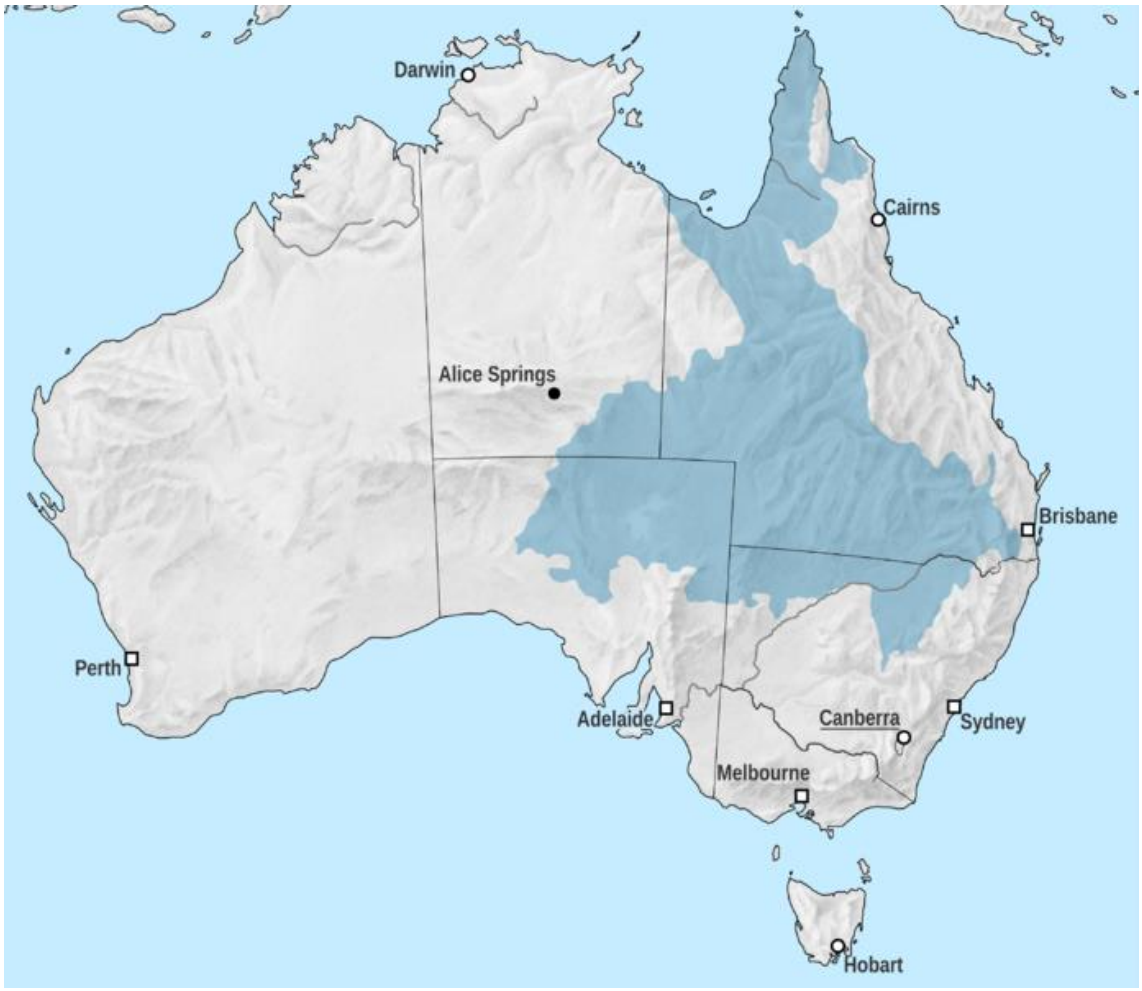

Figure 2: Great Artesian Basin area and location relative to Queensland.

The water of the GAB is held in sandstone layers laid down by continental erosion of higher ground during the Triassic, Jurassic, and early Cretaceous periods, during a time when much of what is now inland Australia was below sea level. The sandstone was then covered by a layer of marine sedimentary rock shortly afterwards, which formed a confining layer - thus trapping water in the sandstone aquifer. The eastern edge of the basin was uplifted when the Great Dividing Range formed. The other side was created from the landforms of the Central Eastern Lowlands and the Great Western Plateau to the west.

Most recharge water enters the rock formations from relatively high ground near the eastern edge of the basin (in Queensland and New South Wales) and very gradually flows towards the south and west. A much smaller amount enters along the western margin in arid central Australia, flowing to the south and east. Because the sandstones are permeable, water gradually makes its way through the pores between the sand grains, flowing at a rate of one to five metres per year.

The age of the groundwater determined by carbon-14 and chlorine-36 measurements combined with hydraulic modelling ranges from several thousand years for the recharge areas in the north to nearly 2 million years in the south-western discharge zones. At this age the water would be expected to display consistent quality.

3.0 BEDOURIE DRINKING WATER SCHEME

The Bedourie Drinking Water Scheme consists of two deep Artesian bores; Old Bedourie Bore (RN 316) and New Bedourie Bore (RN184306). The Bedourie distribution system was constructed in 1996 and was extended to the industrial area in 2000. The Old Bedourie Bore is located in a fenced compound on the southern side of Nappa Street and the New Bedourie Bore is located in a fenced compound on the northern side of Nappa Street. The town is fed by the New Bedourie Bore and the Old Bedourie Bore remains connected as a back-up supply. Neither bore is at significant risk from bushfires, flooding or damage by vehicles or machinery.

The Bedourie scheme also has cooling pond and two reservoirs; a Ground Level and an Elevated reservoir located next to the Old bore in the fenced compound on the northern side of Nappa Street. Both reservoirs were isolated from the distribution system by removing the pipework from the reservoirs to the distribution system. Thus, there is no potential for drinking water to be accidentally reticulated to the town through the reservoirs. There are no plans to recommission the reservoirs.

3.1 Infrastructure

Table 3: Bedourie Drinking Water Scheme infrastructure details.

Component		Details	
Source	Name	Old Bedourie Bore	New Bedourie Bore
	Details	Artesian RN: 316 Depth: 400m Drill Date: 1905 Aquifer: Longsight Sandstone Details: Sealed	Artesian RN: 184306 Depth: 420m Drill Date: 2019 Aquifer: Longsight Sandstone Details: Sealed
		Allocation: 150 ML/a (shared water licence for the two bores) Closed head pressure: 529 kPa Unrestricted flow: 42 L/s See Appendix A for Department of Resources Bore Cards	
	% of Supply	0%	100%
	Reliability	100%	100%
	Catchment Categorisation	Fully protected groundwater	
	Contamination Sources	None.	
	Water Quality Issues	High Temperature, water comes out of the ground at 44^0C	
Source Infrastructure	Type	Cooling pond	
	Description	Bore flows under artesian pressure through the cooling pond and direct into reticulation via pressure control valves.	
Treatment		Cooling.	

Component		Details
Disinfection		Not provided.
Distribution and Reticulation System	**Pipe material**	**MDPE**
	Age range	25 years @ 2023
	Approx. % of total length	48% (4,165m)
	Age range	23 years @ 2023
	Approx. % of total length	4% (347m)
	Age range	21 years @ 2023
	Approx. % of total length	48% (4,111m)
	Areas where potential long detention periods could be expected?	Industrial subdivision and Bedourie racecourse.
	Areas where low water pressure (e.g. < 12 m) could be expected during peak or other demand periods?	Not applicable.
Reservoirs	**Ground Level Reservoir**	**Bedourie GLR –** no longer in use
	Capacity	400 kL
	Roofed (Y/N)	Yes.
	Vermin-proof (Y/N)	Yes.
	Runoff directed off roof (Y/N)	Yes.
	Elevated Reservoir	**Bedourie Elevated Reservoir –** no longer in use
	Capacity	200 kL
	Roofed (Y/N)	Yes.
	Vermin-proof (Y/N)	Yes.
	Runoff directed off roof (Y/N)	Yes.

Figure 3: QLD Globe screenshot of the Bedourie Drinking Water Scheme infrastructure.

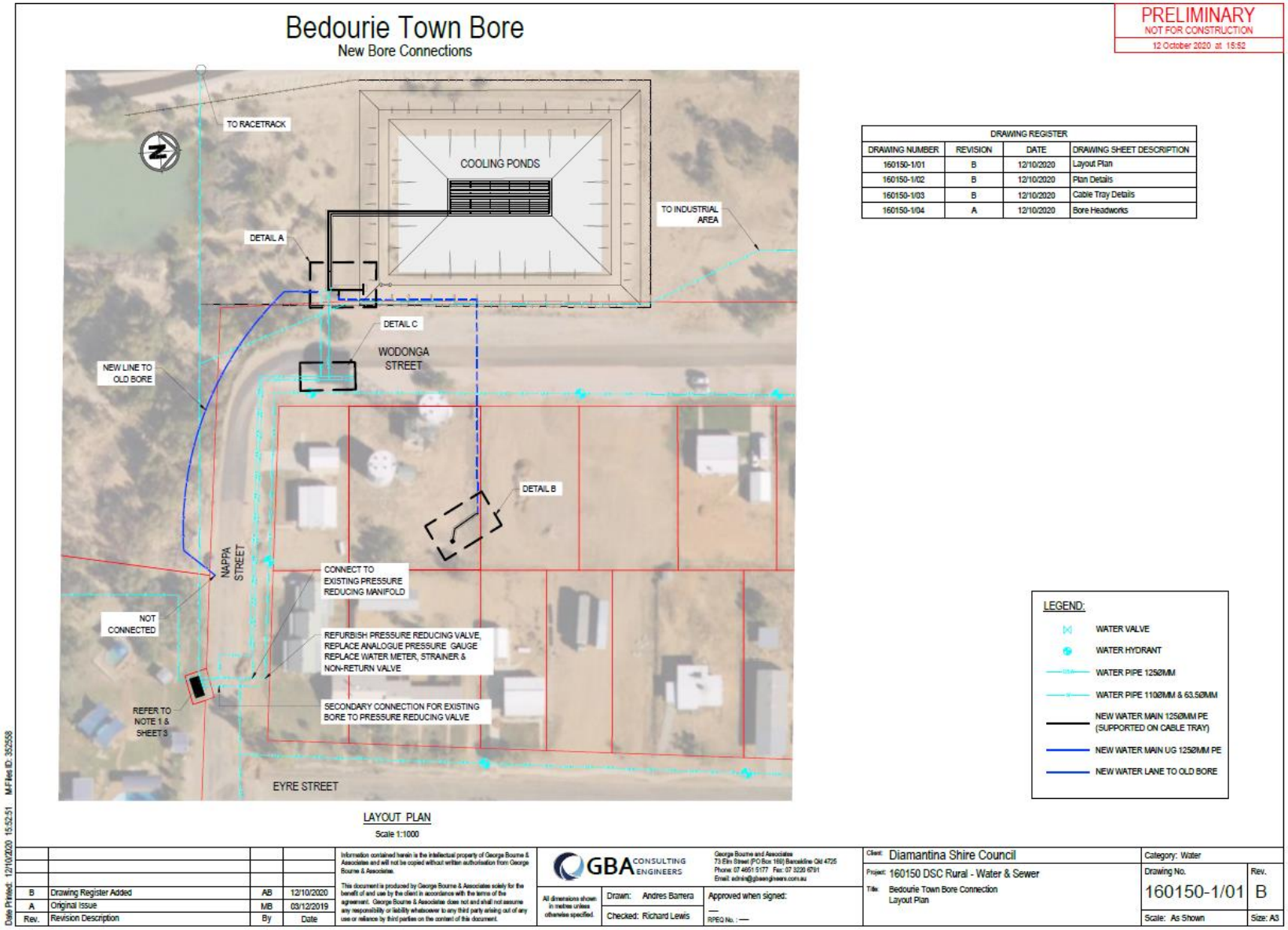

Figure 4: Bedourie drinking water supply schematics.

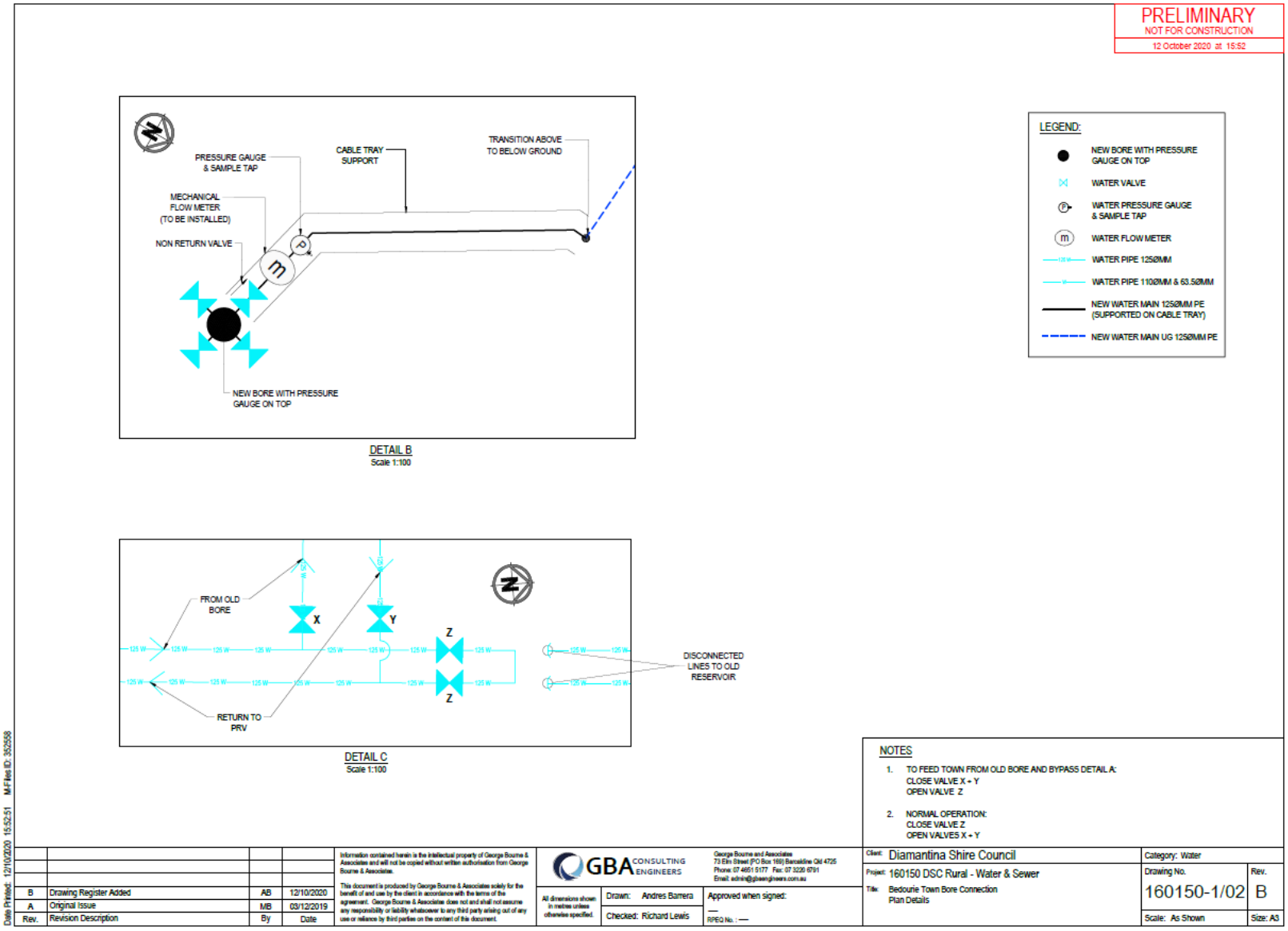

Figure 5: Bedourie drinking water supply schematics.

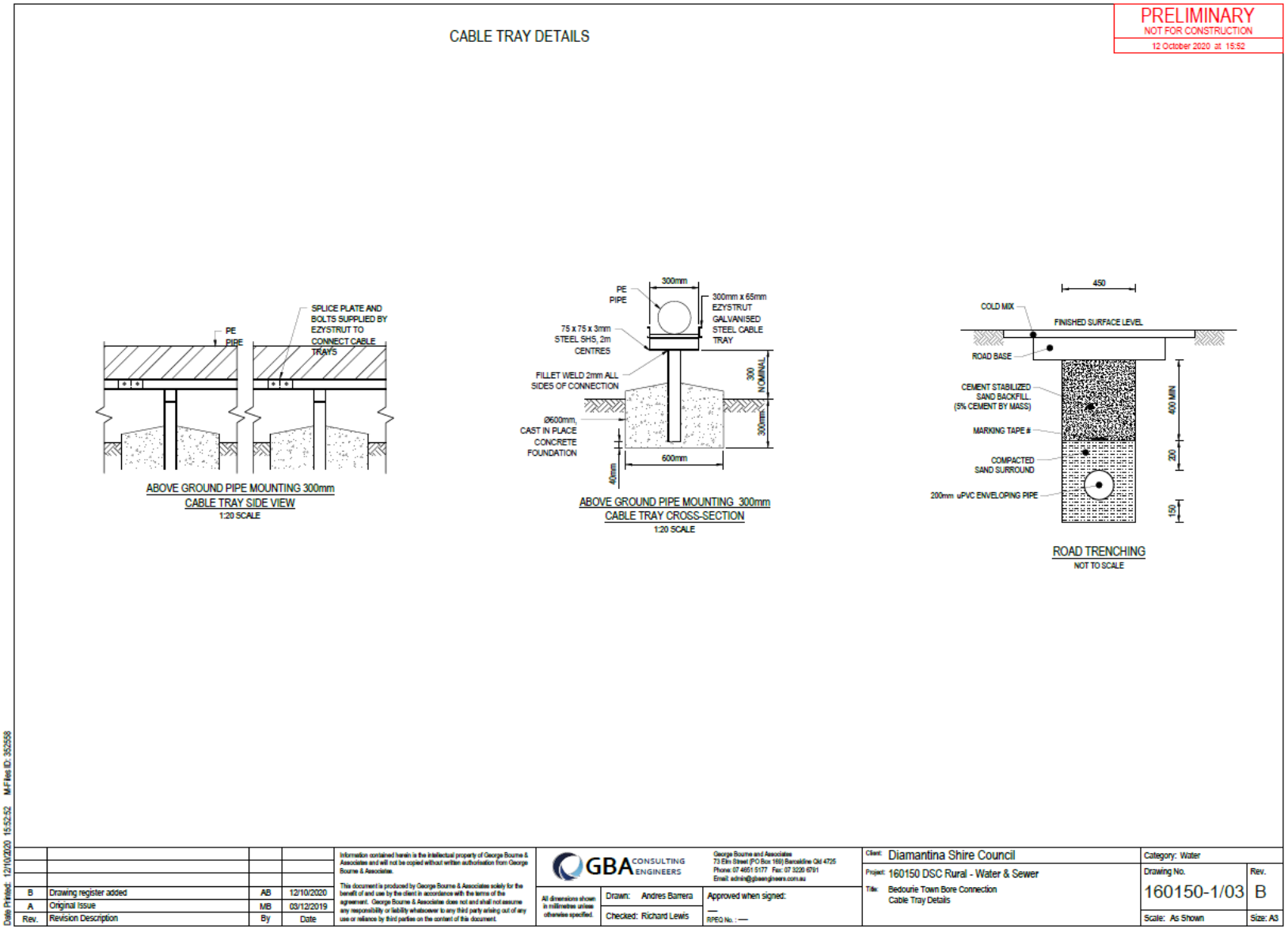

Figure 6: Bedourie drinking water supply schematics.

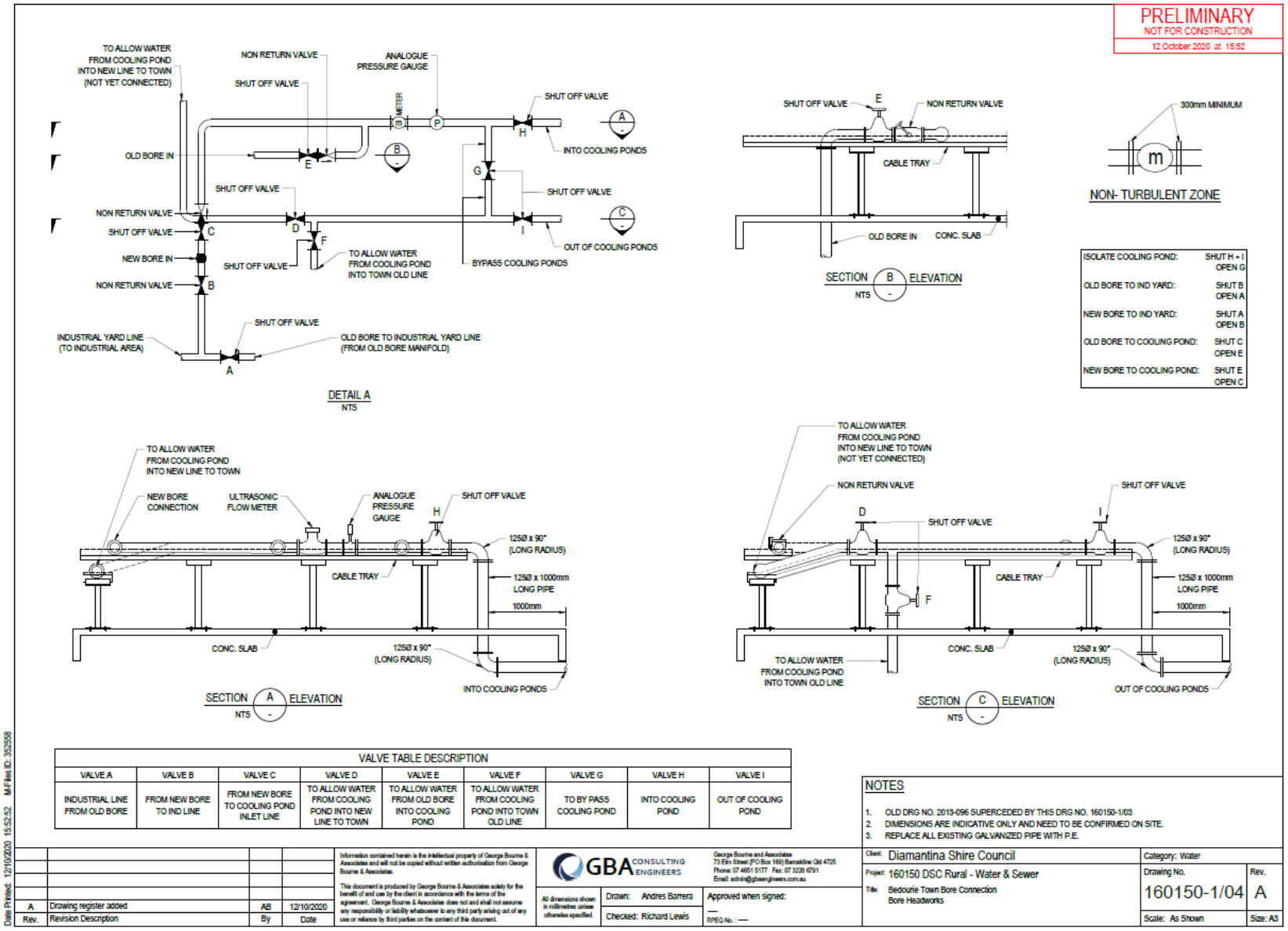

Figure 7: Bedourie drinking water supply schematics.

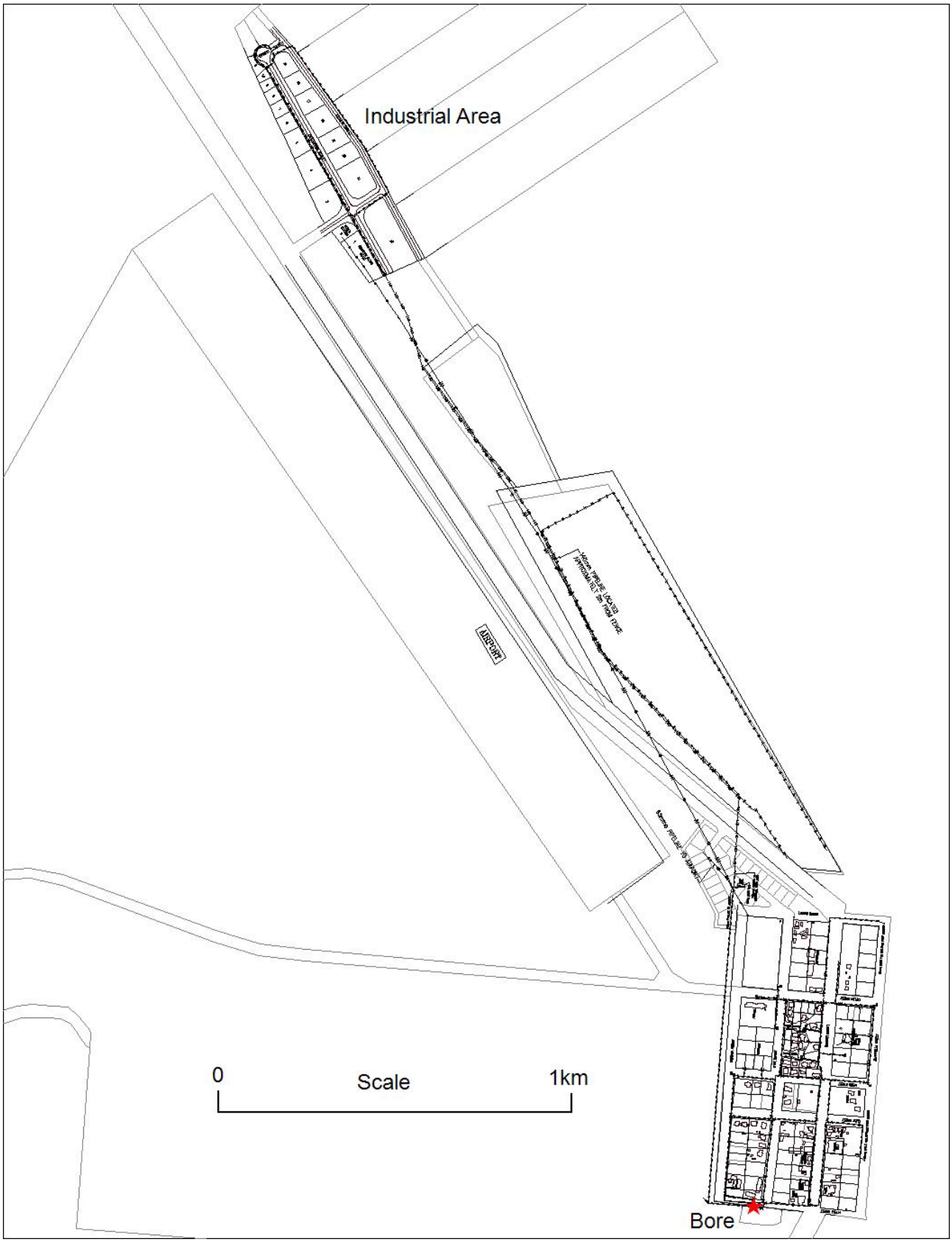

Figure 8: Bedourie drinking water supply schematics.

3.2 Bedourie Drinking Water Treatment

The Bedourie Bore water is of a quality that does not require chemical treatment as the raw water quality generally complies with the health and aesthetic Australian Drinking Water Guideline values. The, only water treatment that occurs is cooling. Water is pumped under pressure from a deep artesian aquifer directly into the distribution system, where it passes through a single cooling pond which cools the water via. a manifold from 44°C to approximately 25°C. The Ground Level and Elevated reservoirs were isolated from the distribution system when the cooling pond was commissioned to keep the distribution system as a closed system, reducing the risk of contamination to the water supply. Being deep Artesian ground water, the water is sterile at its source and due to the positive pressure throughout the distribution system, there is no opportunity for contamination to occur under normal operating conditions.

Council's decision to not chlorinate the water also reduces the complexity of the scheme so that it is more manageable for the water operators. Chlorination is also not a viable option for Council to pursue due to the cost required to install a disinfection system and the ongoing maintenance that would be required. If a section of the reticulation is depressurised for repairs, then flushing of the affected section with a chlorine solution is undertaken to disinfect the system.

Council also implements the following management measures to ensure public safety in regards to pathogenic ingress, while providing a water service with no disinfection:

- Mains flushing occurs at quarterly intervals;
- Weekly visual inspections occur of all drinking water infrastructure including pumps and cooling pond.

4.0 BIRDSVILLE DRINKING WATER SCHEME

The Birdsville Drinking Water Scheme consists of one deep Artesian bore; Birdsville Bore (RN 14645). Birdsville has a dual reticulation system, with untreated river water being reticulated throughout the town for irrigation use in addition to the potable bore water supply. The Birdsville distribution system was constructed in 1984, supplied from the town bore which was constructed in 1961. Birdsville's bore is located within a fenced compound in the town area, just off the Eyre Developmental Road. It is not at significant risk from bushfires, flooding or damage by vehicles or machinery.

The Birdsville scheme also has two reservoirs; a Ground Level and an Elevated reservoir and two cooling ponds. All infrastructure is utilised in the normal operation of the scheme. The reservoirs and cooling ponds are located in the same fenced compound as the bore.

4.1 Infrastructure

Table 4: Birdsville Drinking Water Scheme infrastructure details.

Component		Details
Source	Name	Birdsville Town Bore
	Details	Artesian RN: 14645 Depth: 1,220m Allocation: 343 ML/a Drill Date: 1961 Aquifer: Hooray Sandstone Details: Sealed
		Allocation: 343 ML Closed head pressure: 1,200 kPa Unrestricted flow: 40 L/s See Appendix A for Department of Resources Bore Cards
	% of supply	100%
	Reliability	100%
	Catchment Categorisation	Fully protected groundwater
	Contamination Sources	None.
	Water Quality Issues	High temperature, water comes out of the ground at approximately 99^0C.
Source Infrastructure	**Type**	Cooling pond
	Description	Bore flows under artesian pressure via. the geothermal power station (when operating) and the cooling ponds to the ground level reservoir, water is then pumped through parallel plate heat exchanger to the elevated reservoir. The cooling pond cools the water to approximately 40°C and the heat exchange system to approximately 31°C.

Component		Details
Treatment		Cooling is the only treatment provided.
Disinfection		Not applicable.
Distribution System	**Pipe Material**	**Galvanised steel**
	Age range	39 years @2023
	Approx. % of total length	3% (105m)
	Pipe Material	**uPVC**
	Age range	37 years @2023
	Approx. % of total length	30% (1,256m)
	Pipe Material	**MDPE**
	Age range	8 years @2023
	Approx. % of total length	67% (2,783m)
	Areas where potential long detention periods could be expected	Industrial subdivision and Bedourie racecourse.
	Areas where low water pressure (e.g. < 12 m) could be expected during peak or other demand pds)	Not applicable.
Reservoirs	**Name**	**Birdsville Ground Level Reservoir**
	Capacity	400 kL
	Roofed (Y/N)	Yes.
	Vermin-proof (Y/N)	Yes, with frog flap installed on the overflow.
	Runoff directed off roof (Y/N)	Yes.
	Name	**Birdsville Elevated Reservoir**
	Capacity	200 kL
	Roofed (Y/N)	Yes.
	Vermin-proof (Y/N)	Yes, with frog flap installed on the overflow.
	Runoff directed off roof (Y/N)	Yes.

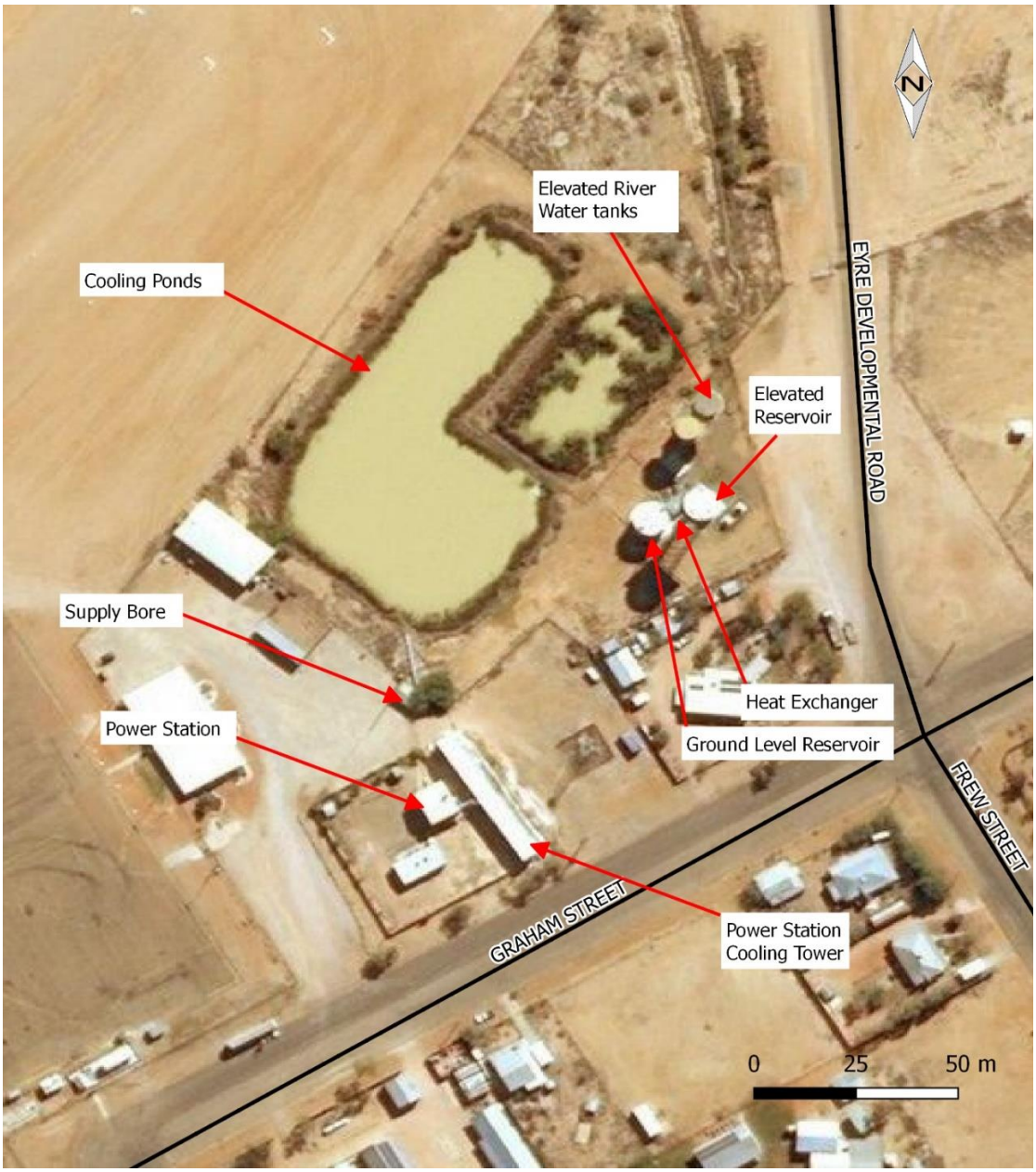

Figure 9: QLD Globe screenshot of the Birdsville Drinking Water Scheme infrastructure.

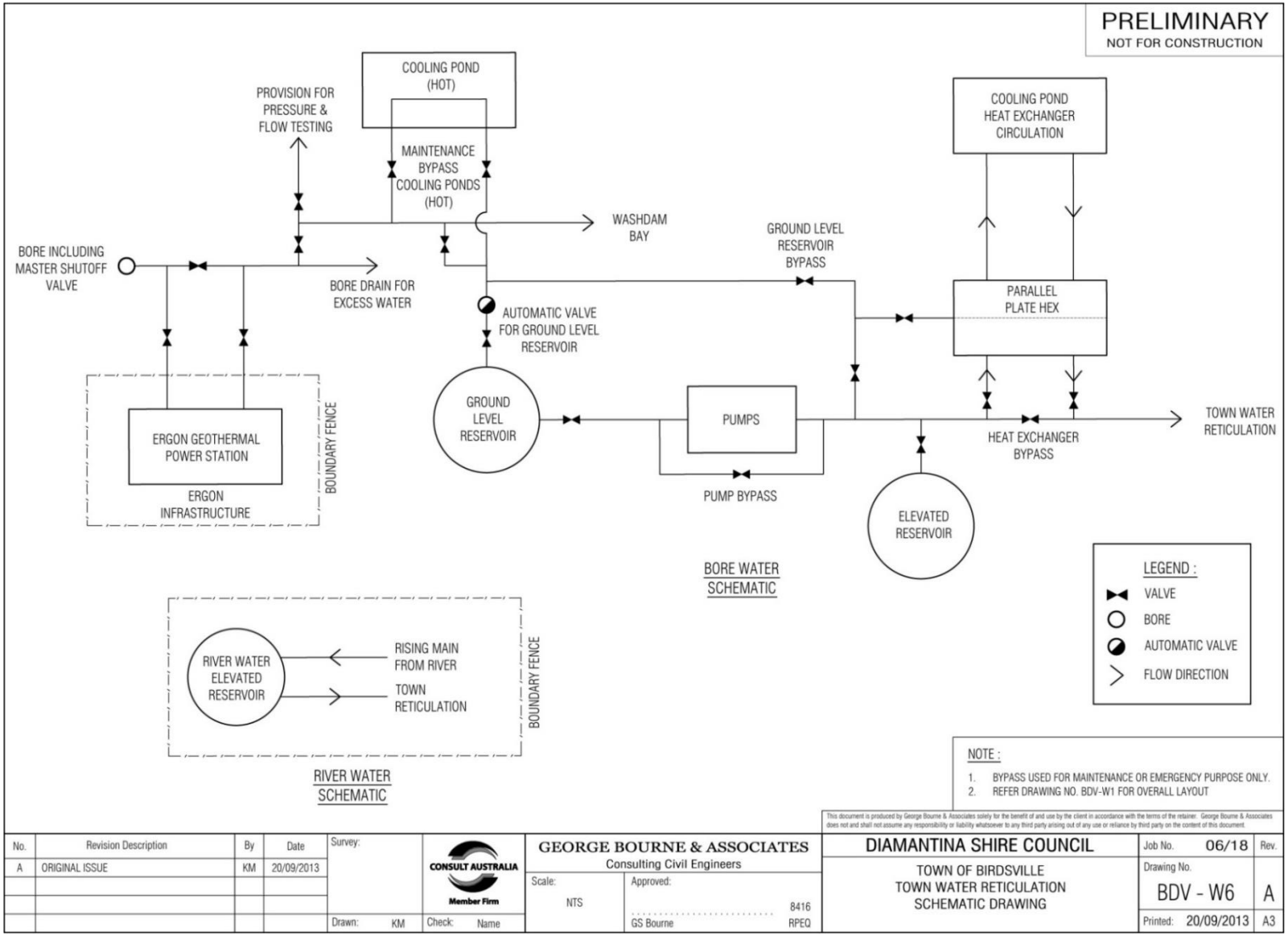

Figure 10: Birdsville drinking water supply schematics.

Figure 11: Birdsville drinking water supply schematics.

4.2 Birdsville Drinking Water Treatment

The only water treatment that Birdsville's drinking water undergoes is cooling. Water is pumped under pressure from a deep Artesian aquifer into the Ground Level reservoir via. the cooling pond. It then passes through a parallel heat exchanger and into the Elevated reservoir. Reservoir levels are maintained by a float system with a solenoid at the bottom to activate the pumps between reservoirs. Lift pumps simultaneously push the water through the elevated reservoir and to town. Drinking water is then distributed to the customer's taps and does not undergo any other treatment processes. Being deep Artesian ground water, the water is sterile at its source. Furthermore, the two reservoirs are sealed against contamination and due to the positive pressure throughout the distribution system, under normal operating conditions there is no opportunity for contamination to occur.

The Birdsville bore water is of a quality that does not require chemical treatment as the raw water quality generally complies with the ADWG. Council's decision to not chlorinate the water also reduces the complexity of the scheme so that it is more manageable for the water operators. Chlorination is also not a viable option for Council to pursue due to the cost of installing a disinfection system and the ongoing maintenance that would be required. If a section of the reticulation is depressurised for repairs, then flushing of the affected section with a chlorine solution is undertaken to disinfect the system.

Council also implements the following management measures to ensure public safety in regards to pathogenic ingress, while providing a water service with no disinfection:

- Mains flushing occurs at quarterly intervals and air scouring every 3- 4 years, organised through the RAPAD group;
- Reservoir cleaning (implemented in 2024), organised through the RAPADWSA group. Moving forward, this will occur every 3 years. To date, council have engaged an external Contractor (Southern Commercial Divers) and cleaning is currently scheduled for completion by August 2024.
- Documented reservoir inspections occur at 6-monthly intervals, and drone inspections occur annually;
- Weekly visual inspections occur of all drinking water infrastructure, including the pumps, cooling pond and heat exchanger.

During a power outage, water restrictions can be implemented to curb the town's water usage and assist in preventing hot water straight from the bore being reticulated to the town. For a long-term power outage Council would issue a Public Notice warning residents of the elevated water temperature.

4.3 Geothermal Power Station Operation

There is an Ergon geothermal power station located next to the Birdsville Bore compound. As of 2022, this power station has been decommissioned. Previously, when the power station was in operation the water passed through the power station prior to entering the town cooling and storage systems. Supply to the power station is controlled by manual valves at the borehead which are currently switched off, bypassing the station. The borehead valves to the power station are in the Council's fenced area and are under Council control, thus this system adds no risk to the Birdsville Drinking Water Scheme as there is no contact of bore water with the power station. In situations where the water supply to the power station is required, Ergon must advise DSC to activate the valves.

4.4 Birdsville Races and Big Red Bash

Each year, Birdsville hosts horse races in September and the Big Red Bash in July. During these two weekends, the population for the town increases from around 150 people to approximately 6,000 (Birdsville races) and 10,000 (Big Red Bash). While the Big Red Bash is held remotely (out of town on a

cattle station), Birdsville being the nearest town sees all individuals attending the event pass through the town on their way to the festival. To date, these events have not significantly impacted upon the town's water supply and quality. As Council does not monitor the daily water usage for the town, they currently do not have an estimate of the town's drinking water consumption during these events.

In the lead up to these events, Council implements the following management measures to ensure a safe drinking water service is provided:

- Flushing of the town's distribution system to remove any stagnant water that may be present in the mains;
- Operational monitoring for *E.coli* and Turbidity, the week leading up to these events to ensure that the drinking water being distributed throughout the town is safe.

Council have also removed all river water reticulation points within the town to prevent event attendees from accidentally filling their drinking water bottles with river water.

If the town's water supply were to exceed the flow-rate of the heat exchange system and hot water were to be reticulated to the town, Council would issue a Public Notice via. the usual communication methods (Facebook, Council website etc.) warning individuals of the elevated water temperatures. Water restrictions would also be implemented to help curb unnecessary water use. Note that a level of cooling would still be provided by the cooling pond system and the reservoirs. Similarly, if a power outage were to occur, a public notice would be issued and water restrictions implemented.

5.0 BEDOURIE AND BIRDSVILLE DRINKING WATER QUALITY

Diamantina Shire Council maintains copies of water quality data from 2009 onwards, all of which is trended in a master spreadsheet that is regularly updated by their consulting engineers. Colilert testing provided to Council are initially entered into a spreadsheet on the Council server in Bedourie and sent to Council's engineering consultants who maintain all the water sampling data in a master spreadsheet which are available to Council. The data provided in Sections 5.1 and 5.2 below confirms that the drinking water supplied by the Bedourie and Birdsville bores generally is within the ADWG with only a few occasional health and aesthetic exceedances (which are discussed below). Heavy metal sampling has been previously undertaken within both schemes between 2012- 2018. A review undertaken in 2017 recommended heavy metal monitoring be removed from the verification monitoring programme as data showed these parameters to be consistently well below the ADWG health values. Historic verification monitoring values are provided in Appendix B.

5.1 Bedourie Drinking Water Quality 2009- 2023 Summary

Table 5: Bedourie drinking water verification and operational monitoring.

Analyte	Units	Monitoring	Summary of Results						Guideline Values			
			Samples Tested	Maximum Value	Mean Value	Minimum Values	Std Dev	95th %	Health	Exceedances	Aesthetic	Exceedances
E. coli	CFU/100ml	Operational/ Verification	320	1	0.006	0	0.079	0	1	2		
Total Coliforms	CFU/100mL	Operational/ Verification	263	40	0.171	0	2.48	0				
Turbidity	NTU	Operational	88	3	0.25	0.02	0.379	0.607			5	0
Turbidity	NTU	Verification	32	3	0.44	0.025	0.527	1.1			5	0
Dissolved Organic Carbon	mg/L	Verification	10	4.6	1.65	0.2	1.553	4.375				
Dissolved Oxygen	Hazen	Verification	11	10	7.518	3.9	1.84	9.7				
pH	pH Units	Verification	41	8.9	8.22	6.9	0.283	8.5			≥6.5 & ≤8.5	1
Conductivity	µS/cm	Verification	40	1200	911.3	7	157.28	1005				
Total Dissolved Solids	mg/L	Verification	19	770	535.79	450	63.11	581			600	1
Chloride	mg/L	Verification	20	100	87.95	81	5.044	100			250	0
Fluoride	mg/L	Verification	41	0.9	0.735	0.1	0.135	0.9	1.5	0		
Selenium	mg/L	Verification	20	0.009	0.003	0.001	0.0021	0.0052	0.01	0		
Sodium	mg/L	Verification	20	220	194.5	140	17.741	220			180	17
Aluminium	mg/L	Verification	41	0.18	0.0178	0.001	0.0315	0.075			0.2	0
Total Iron	mg/L	Verification	41	0.21	0.068	0.017	0.043	0.14			0.3	0
Soluble Iron	mg/L	Verification	17	0.7	0.09	0.02	0.158	0.292				
Total Manganese	mg/L	Verification	41	0.046	0.014	0.003	0.006	0.018	0.5	0	0.1	0
Soluble Manganese	mg/L	Verification	20	0.026	0.0128	0.005	0.0038	0.0175				
Uranium	mg/L	Verification	14	0.003	0.001	0.001	0.0005	0.0017	0.017	0		
Gross Alpha	Bq/L	Verification	2	0.138±0.043	0.11±0.039	0.081±0.034	0.029	0.135±0.04			0.5	0

Analyte	Units	Monitoring	Summary of Results						Guideline Values			
			Samples Tested	Maximum Value	Mean Value	Minimum Values	Std Dev	95th %	Health	Exceedances	Aesthetic	Exceedances
Gross Beta	Bq/L	Verification	2	0.061±0.043	0.047±0.04	0.033±0.039	0.014	0.06±0.043			0.5	0
Aesthetic Guideline Exceedance												
Health Guideline Exceedance												

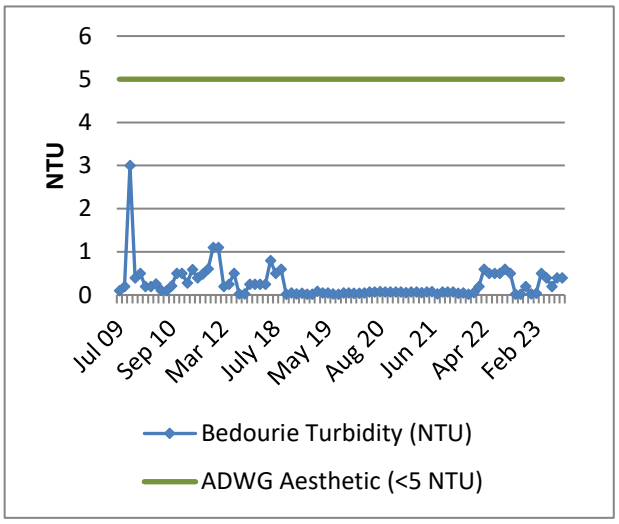

Figure 12: Bedourie operational monitoring trends for Turbidity (2009- 23).

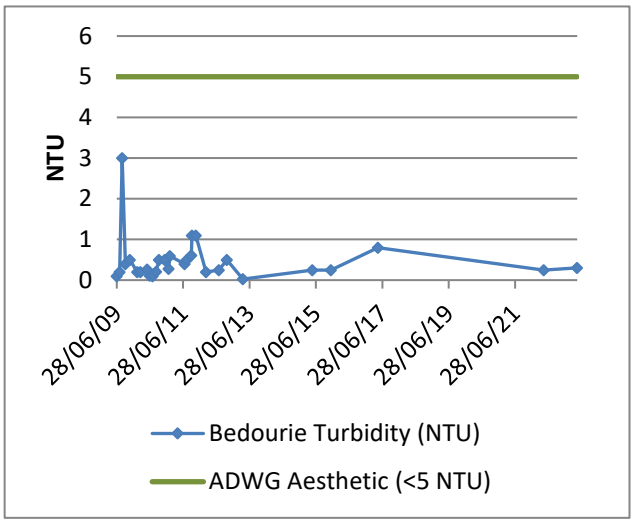

Figure 13: Bedourie verification monitoring trends for Turbidity (2009- 23).

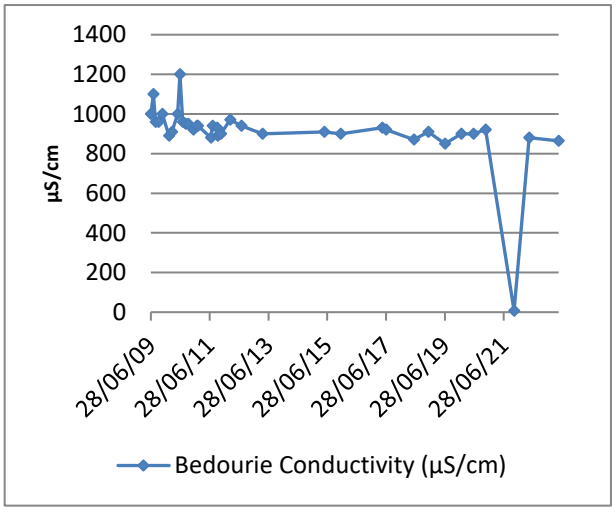

Figure 14: Bedourie verification monitoring trends for Conductivity (2009- 2023).

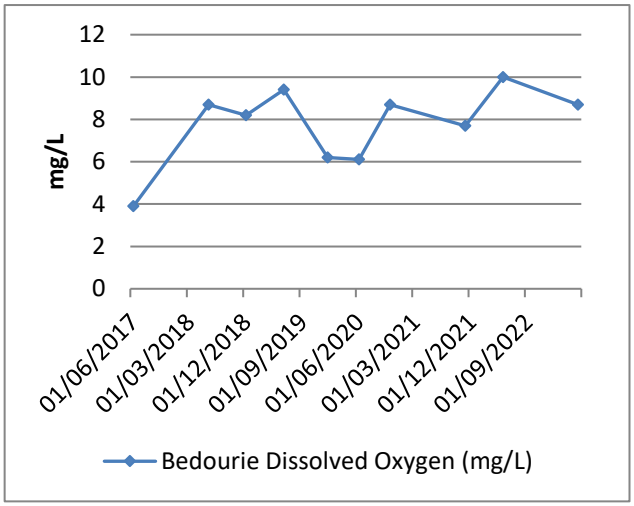

Figure 15: Bedourie verification monitoring trends for Dissolved Oxygen (2017- 2023).

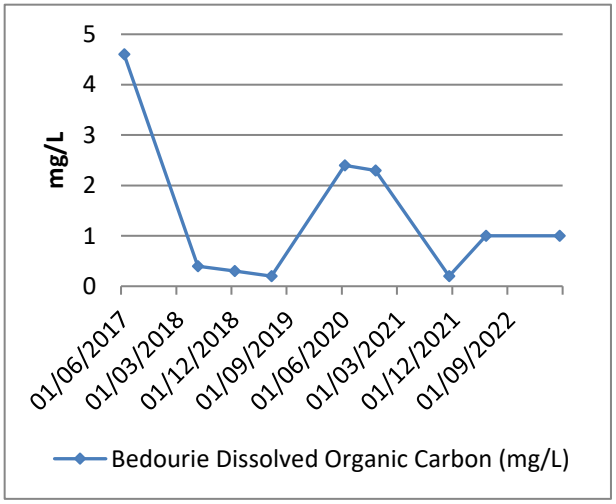

Figure 16: Bedourie verification monitoring trends for Dissolved Organic Carbon (2017- 2023).

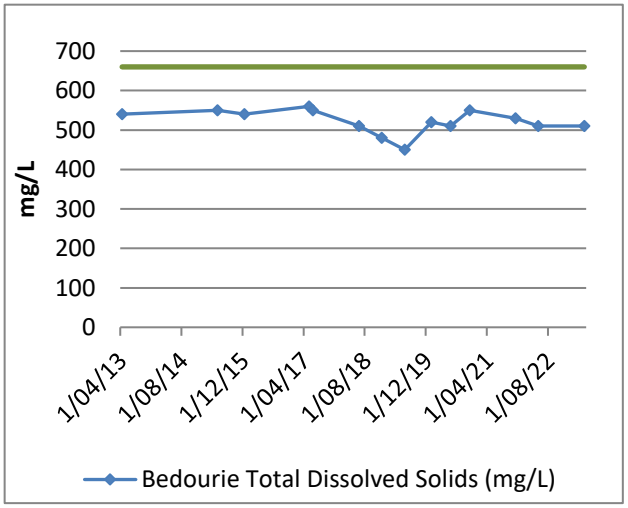

Figure 17: Bedourie verification monitoring trends for Total Dissolved Solids (2013- 2023).

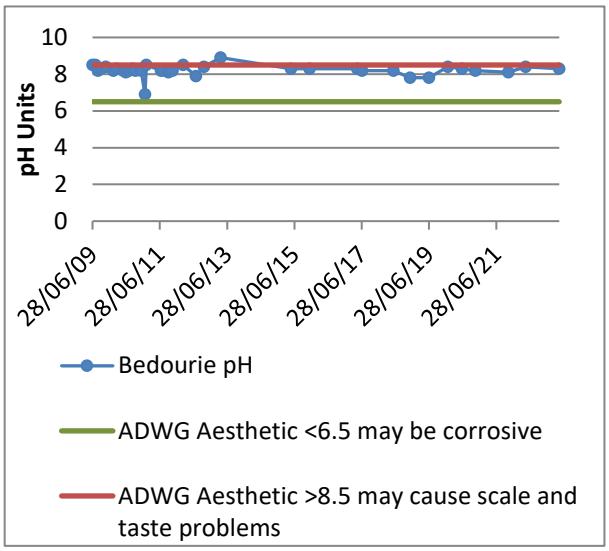

Figure 18: Bedourie verification monitoring trends for pH (2009- 2023).

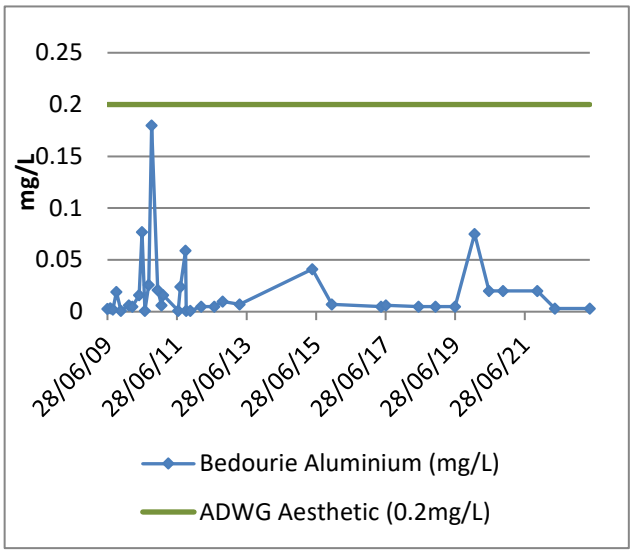

Figure 19: Bedourie verification monitoring trends for Aluminium (2009- 2023).

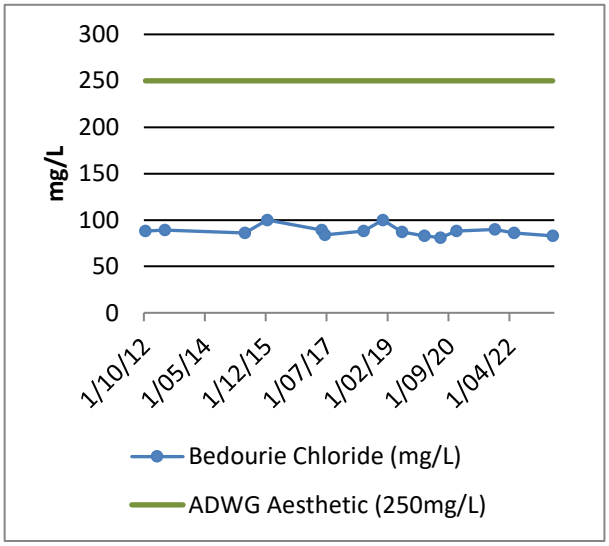

Figure 20: Bedourie verification monitoring trends for Chloride (2012- 2023).

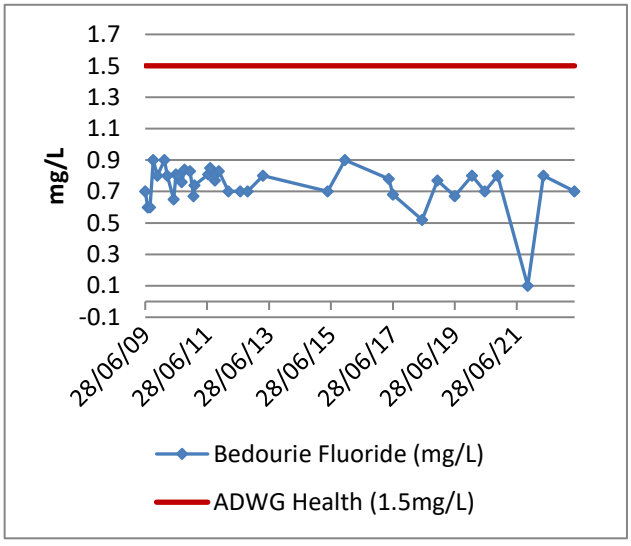

Figure 21: Bedourie verification monitoring trends for Fluoride (2009- 2023).

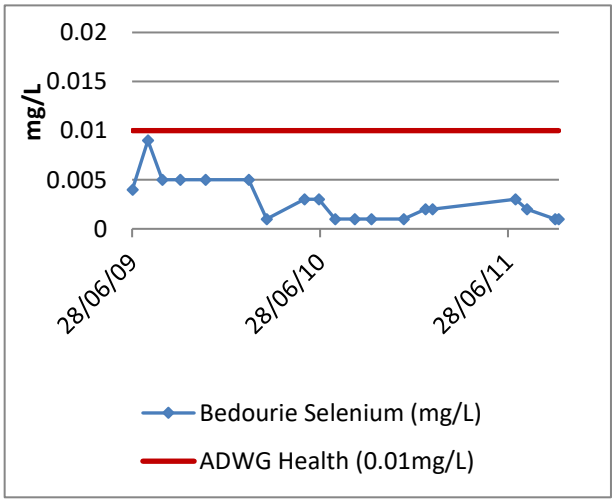

Figure 22: Bedourie verification monitoring trends for Selenium (2009- 2023).

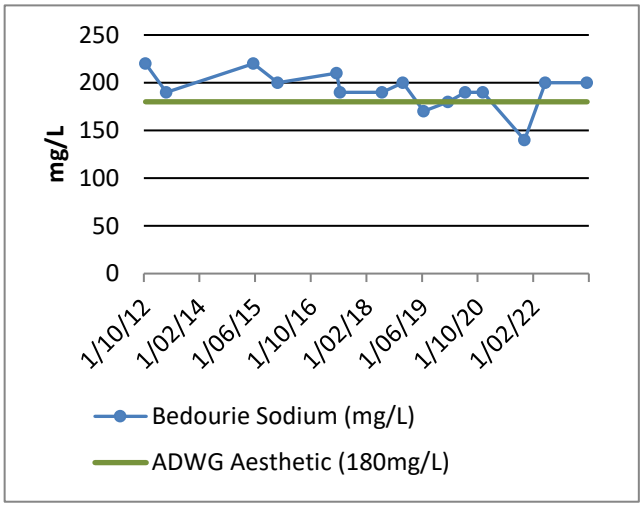

Figure 23: Bedourie verification monitoring trends for Sodium (2012- 2023).

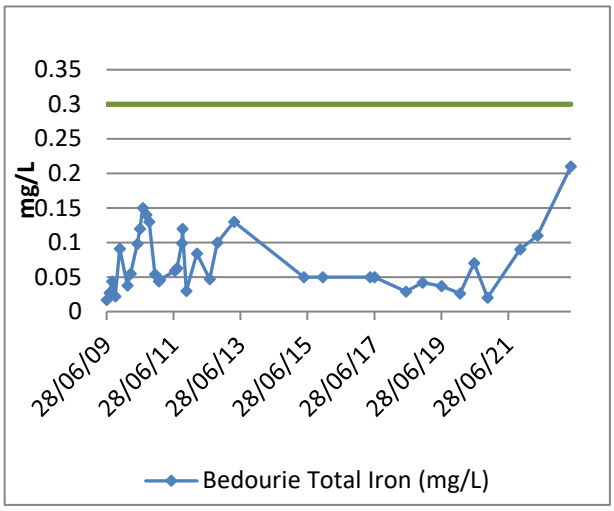

Figure 24: Bedourie verification monitoring trends for Total Iron (2009- 2023).

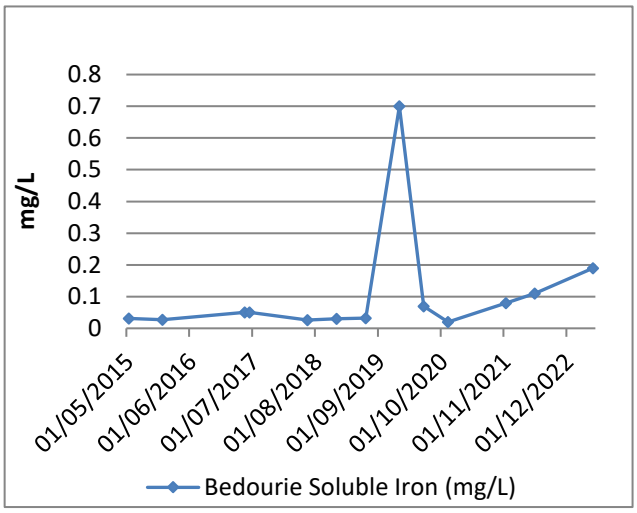

Figure 25: Bedourie verification monitoring trends for Soluble Iron (2015- 2023).

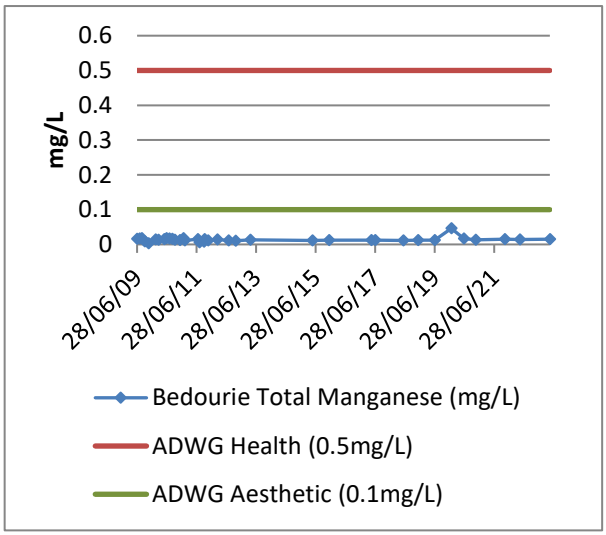

Figure 26: Bedourie verification monitoring tends for Total Manganese (2009- 2023).

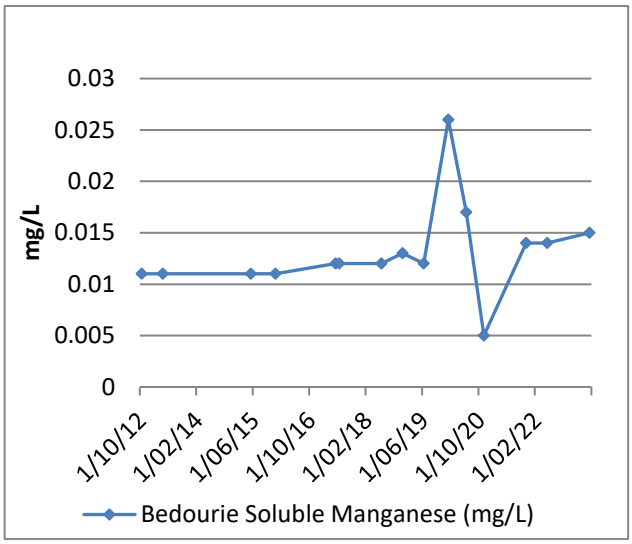

Figure 27: Bedourie verification monitoring trends for Soluble Manganese (2012- 2023).

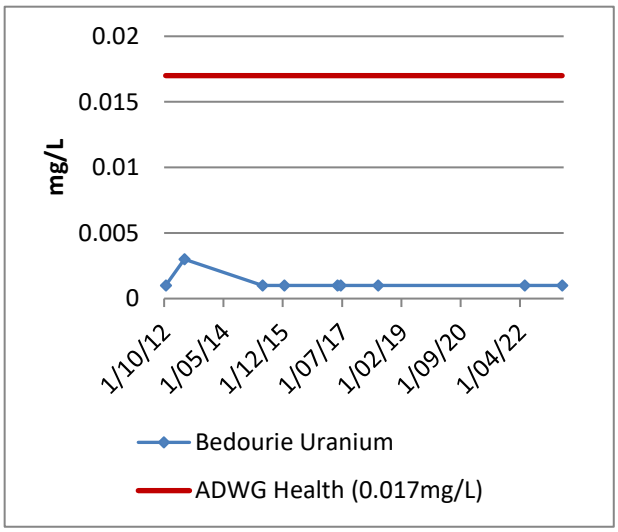

Figure 28: Bedourie verification monitoring trends for Uranium (2012- 2023).

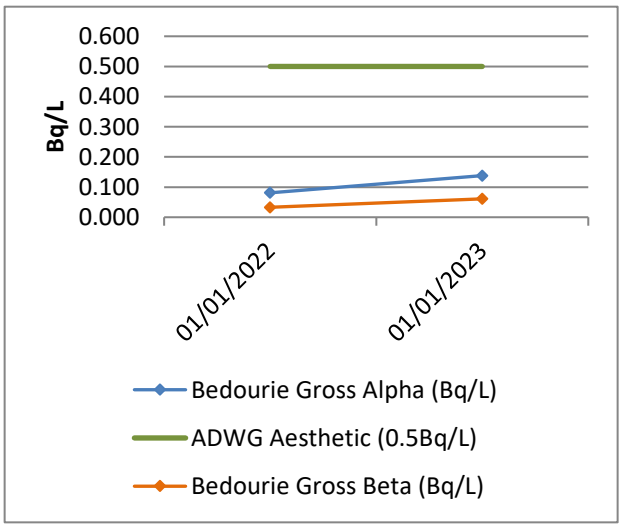

Figure 29: Bedourie verification monitoring trends for Gross Alpha and Gross Beta.

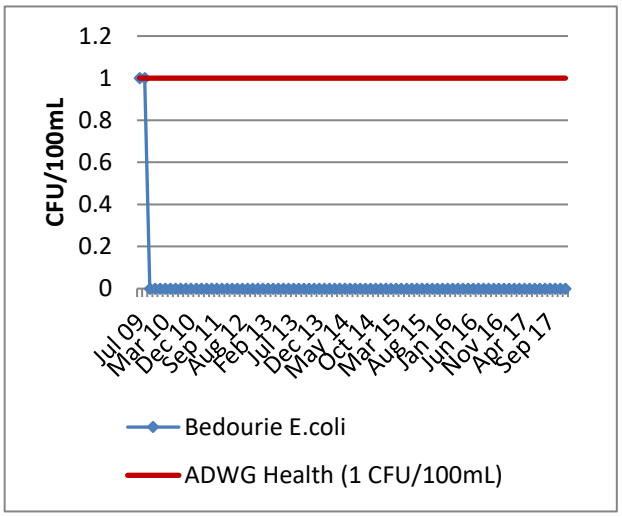

Figure 30: Bedourie operational and verification monitoring trends for *E.coli* (2009- 2017).

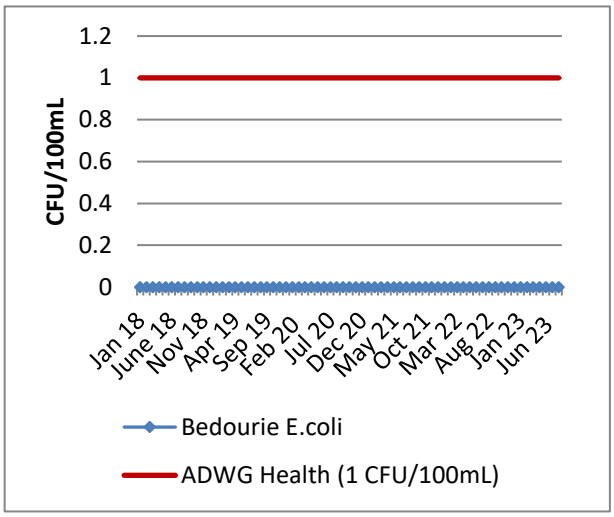

Figure 31: Bedourie operational and verification monitoring trends for *E.coli* (2018- 2023).

5.1.1 Bedourie Water Quality ADWG Value Exceedances

There have been two *E.coli* detections within the Bedourie scheme, occurring in July and August of 2009. The source was determined to be from pathogenic ingress during repairs to a reticulation main. Since these two occurrences, Council have prioritised good hygiene practices when repairing, maintaining, or commissioning new mains and subsequently there have been no more *E.coli* detections within the scheme since. In mid-2012, *E.coli* sampling was increased from one sample per month from the distribution system to three samples per month to further improve the reliability and validity of the operational monitoring programme.

Generally, Bedourie's drinking water is within the ADWG aesthetic range for pH, with only one outlier of 8.9 (reported in 2013) which exceeded the upper ADWG aesthetic limit of 8.5 pH units. Water outside the aesthetic guidelines for pH is not unsafe to drink and elevated pH levels in groundwater are common, however, elevated pH may result in a bitter aftertaste.

Similarly, there has been one ADWG aesthetic exceedance recorded for Total Dissolved Solids; 770mg/L, reported in 2009. There are no health effects directly attributed to elevated Total Dissolved Solids in drinking water, however, water that exceeds the aesthetic value of 600mg/L may have palatability issues. It is likely that this exceedance is an outlier, as the average Total Dissolved Solids recorded for the scheme sits under the aesthetic guideline at 536 mg/L from 19 samples.

Finally, Bedourie's drinking water regularly exceeds the ADWG aesthetic value for Sodium, with 17 exceedances from 20 samples. The ADWG value for Sodium is 180mg/L, with the average for Bedourie sitting at 194.5mg/L. Drinking water that exceeds the ADWG aesthetic value may cause taste issues but is not necessarily unsafe. No ADWG health value has been set for Sodium.

5.2 Birdsville Drinking Water Quality Summary 2009- 2023

Table 6: Birdsville drinking water verification and operational monitoring.

Analyte	Units	Monitoring	Summary of Results						Guideline Values			
			Samples Tested	Maximum Value	Mean Value	Minimum Values	Std Dev	95th %	Health	Exceedances	Aesthetic	Exceedances
E. coli	CFU/100ml	Operational/ Verification	354	1	0.0057	0	0.075	0	1	2		
Total Coliforms	CFU/100mL	Operational/ Verification	266	15	0.0602	0	0.92	0				
Turbidity	NTU	Operational	89	3	0.273	0.025	0.408	0.769			5	0
Turbidity	NTU	Verification	36	3	0.353	0.025	0.494	0.733			5	0
Dissolved Organic Carbon	mg/L	Verification	12	4.9	1.79	0.1	1.719	4.735				
Dissolved Oxygen	Hazen	Verification	12	11	6.97	2.6	2.456	9.9				
pH	pH Units	Verification	45	8.7	8.84	7.7	0.255	8.58			≥6.5 & ≤8.5	3
Conductivity	µS/cm	Verification	46	1000	836.89	710	48.973	937				
Total Dissolved Solids	mg/L	Verification	18	660	526.01	480	43.98	583.5			660	1
Chloride	mg/L	Verification	19	65	55.89	49	3.754	62.3			250	0
Fluoride	mg/L	Verification	46	2.5	1.7	0.6	0.376	2.2	1.5	33		
Selenium	mg/L	Verification	19	0.005	0.0025	0.001	0.00176	0.005	0.01	0		
Sodium	mg/L	Verification	19	220	182.11	150	17.344	211			180	8
Aluminium	mg/L	Verification	45	0.21	0.0476	0.018	0.029	0.076			0.2	1
Total Iron	mg/L	Verification	46	0.23	0.0438	0.005	0.0353	0.0828			0.3	0
Soluble Iron	mg/L	Verification	17	0.05	0.02	0.008	0.0144	0.05				
Total Manganese	mg/L	Verification	46	0.036	0.0163	0.0006	0.007	0.025	0.5	0	0.1	0
Soluble Manganese	mg/L	Verification	19	0.019	0.0112	0.0005	0.0065	0.019				
Uranium	mg/L	Verification	12	0.003	0.00117	0.001	0.0006	0.0019	0.017	0		
Gross Alpha	Bq/L	Verification	2	0.1±0.038	0.09±0.036	0.079±0.033	0.0105	0.1±0.04			0.5	0

Analyte	Units	Monitoring	Summary of Results						Guideline Values			
			Samples Tested	Maximum Value	Mean Value	Minimum Values	Std Dev	95th %	Health	Exceedances	Aesthetic	Exceedances
Gross Beta	Bq/L	Verification	2	0.07±0.041	0.068±0.04	0.065±0.04	0.0025	0.07±0.04			0.5	0
Aesthetic Guideline Exceedance												
Health Guideline Exceedance												

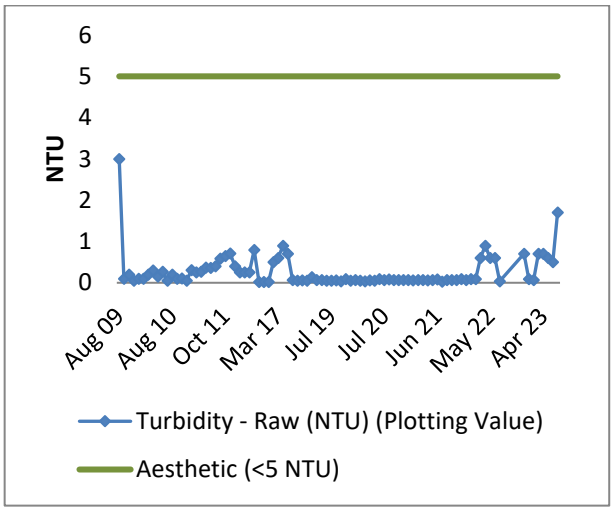

Figure 32: Birdsville operational monitoring trends for Turbidity (2009- 2023).

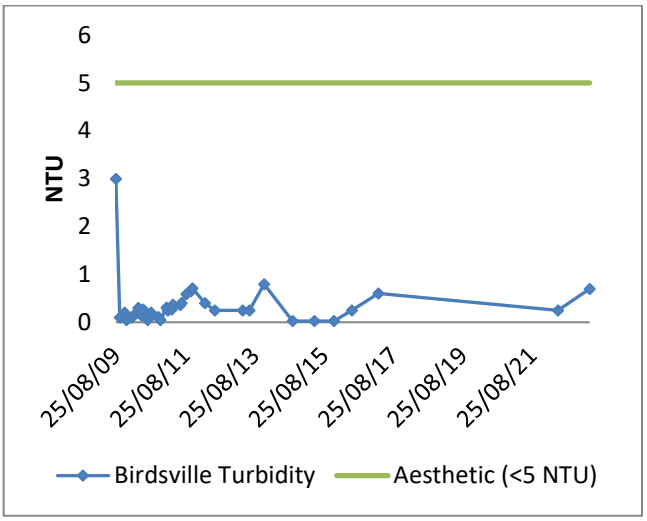

Figure 33: Birdsville verification monitoring trends for Turbidity (2009- 2023).

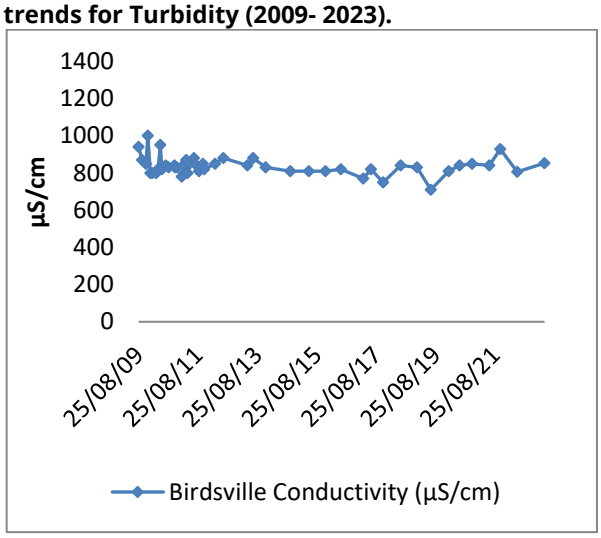

Figure 34: Birdsville verification monitoring trends for Conductivity (2009- 2023).

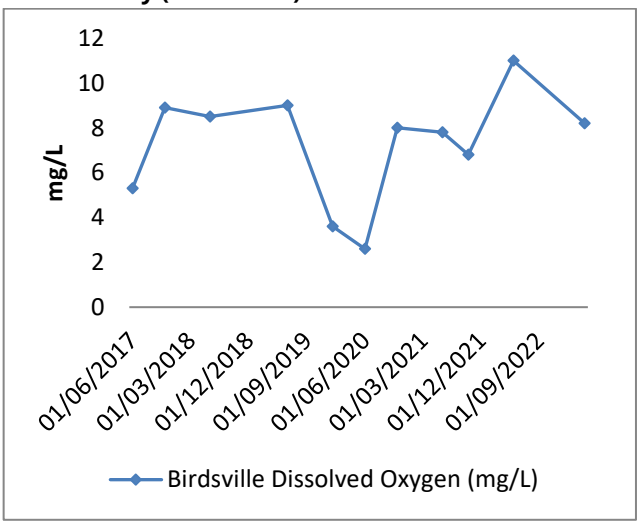

Figure 35: Birdsville verification monitoring trends for Dissolved Oxygen (2017- 2023).

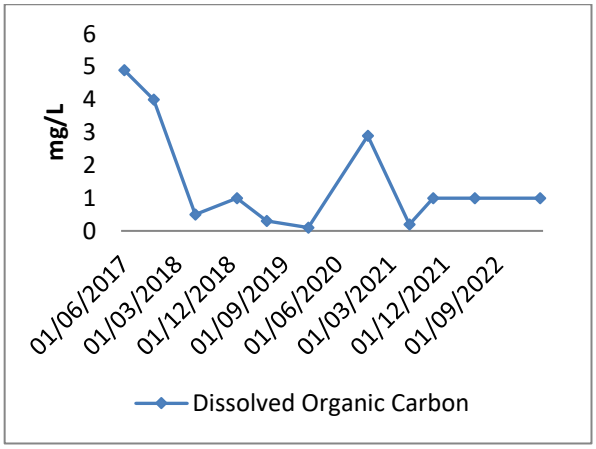

Figure 36: Birdsville verification monitoring trends for Dissolved Organic Carbon (2017- 2023).

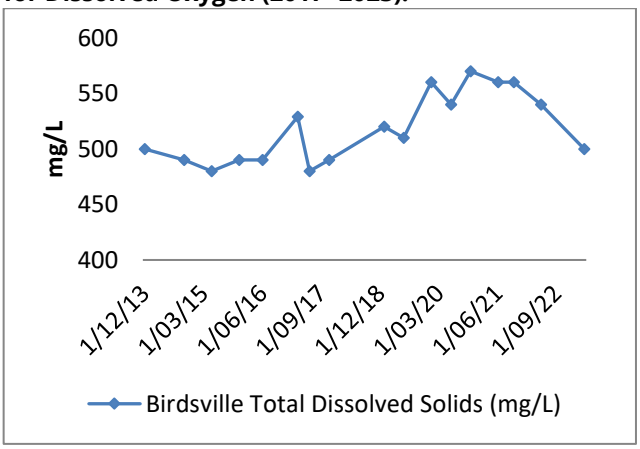

Figure 37: Birdsville verification monitoring trends for Total Dissolved Solids (2013- 2023).

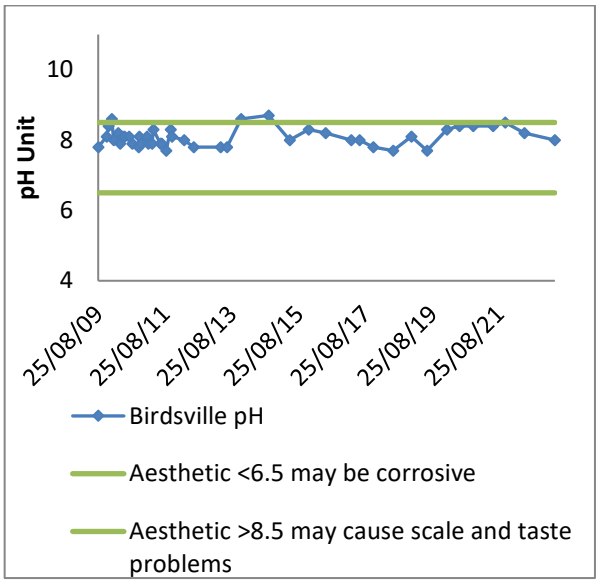

Figure 38: Birdsville verification monitoring trends for pH (2009- 2021).

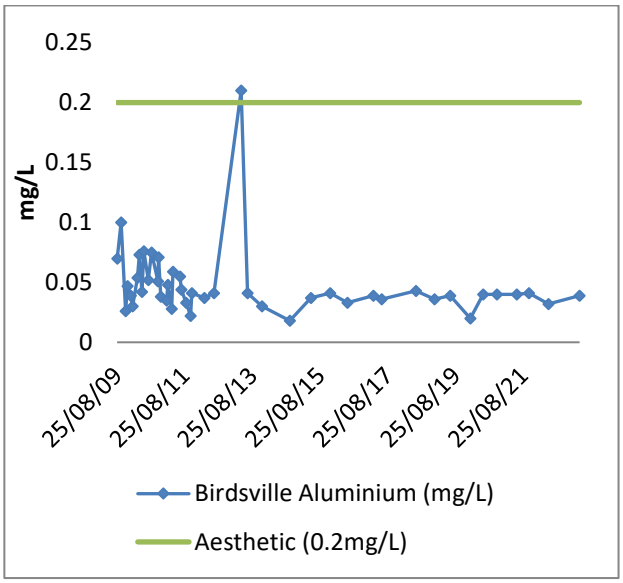

Figure 39: Birdsville verification monitoring trends for Aluminium (2009- 2023).

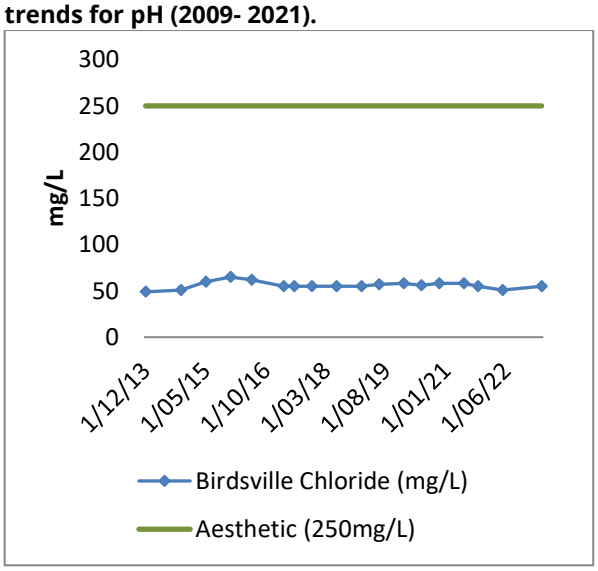

Figure 40: Birdsville verification monitoring trends for Chloride (2013- 2023).

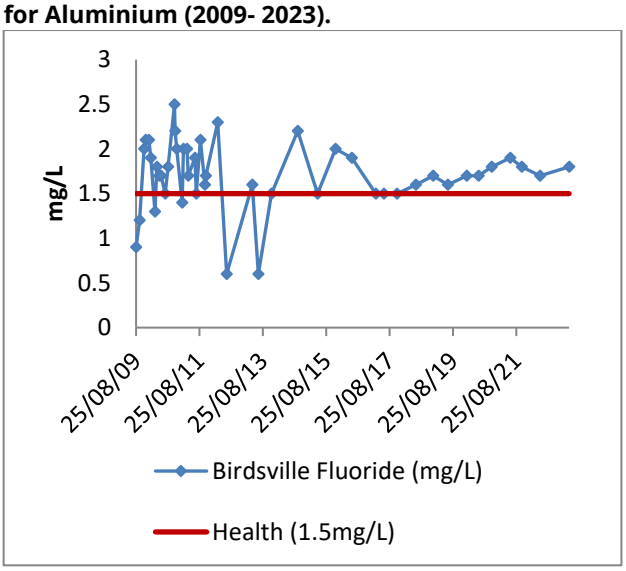

Figure 41: Birdsville verification monitoring trends for Fluoride (2009- 2022).

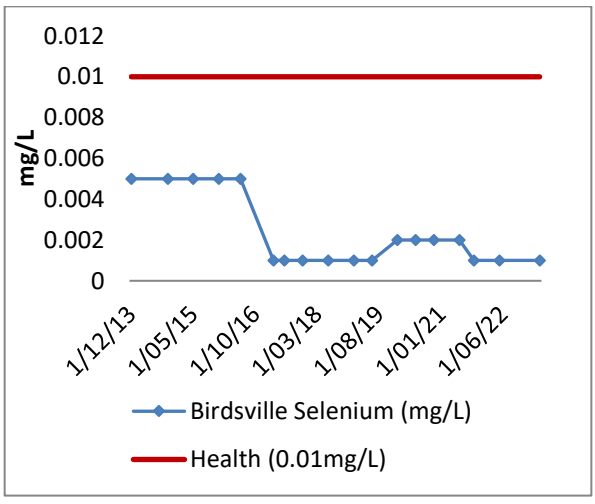

Figure 42: Birdsville verification monitoring trends for Selenium (2013- 2023).

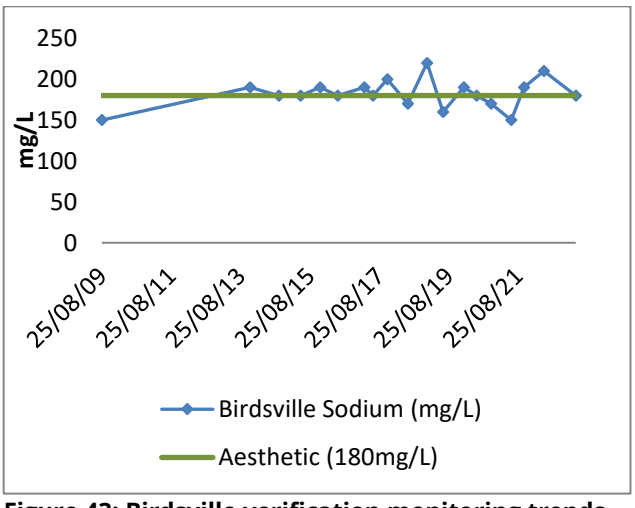

Figure 43: Birdsville verification monitoring trends for Sodium (2009- 2023).

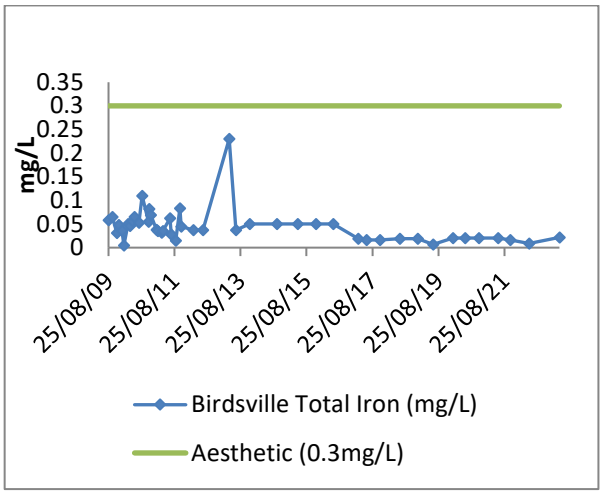

Figure 44: Birdsville verification monitoring trends for Total Iron (2009- 2023).

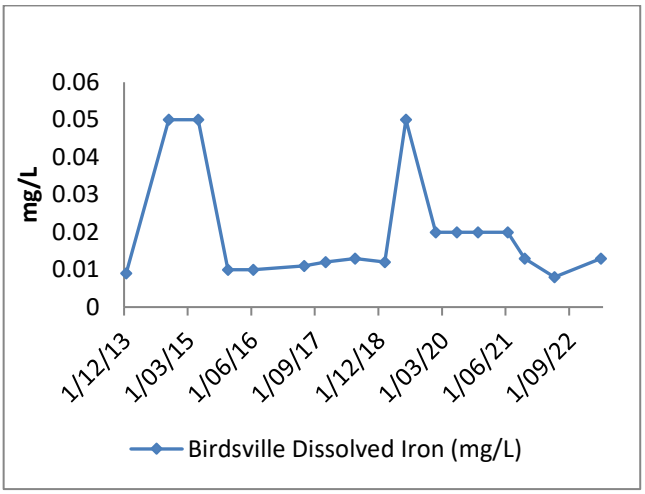

Figure 45: Birdsville verification monitoring trends for Dissolved Iron (2013- 2023).

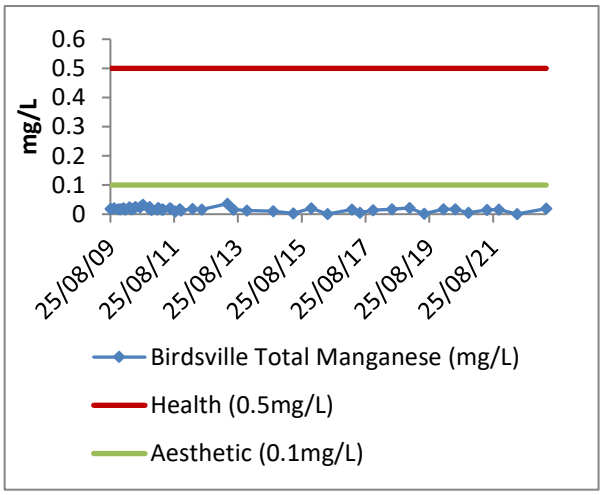

Figure 46: Birdsville verification monitoring trends for Total Manganese (2009- 2023).

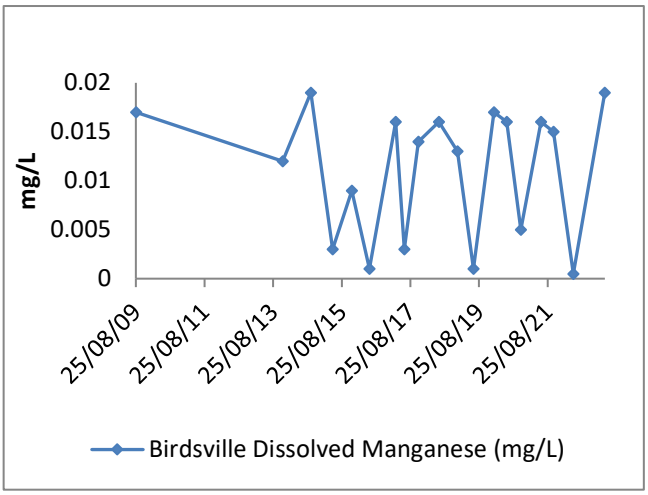

Figure 47: Birdsville verification monitoring trends for Dissolved Manganese (2009- 2023).

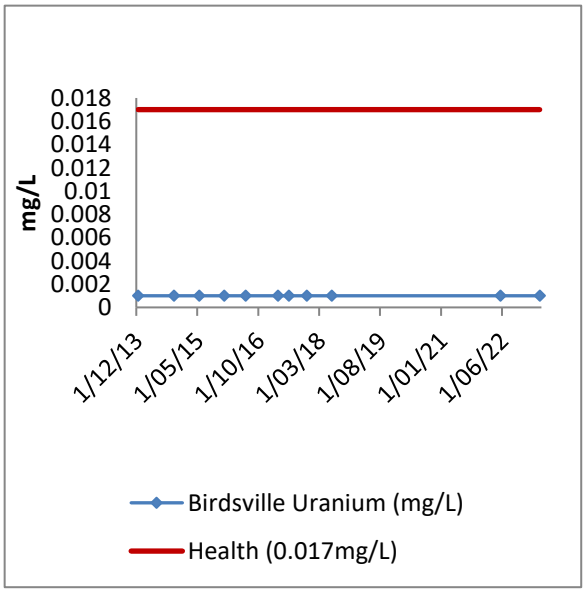

Figure 48: Birdsville verification monitoring trends for Uranium (2013- 2023).

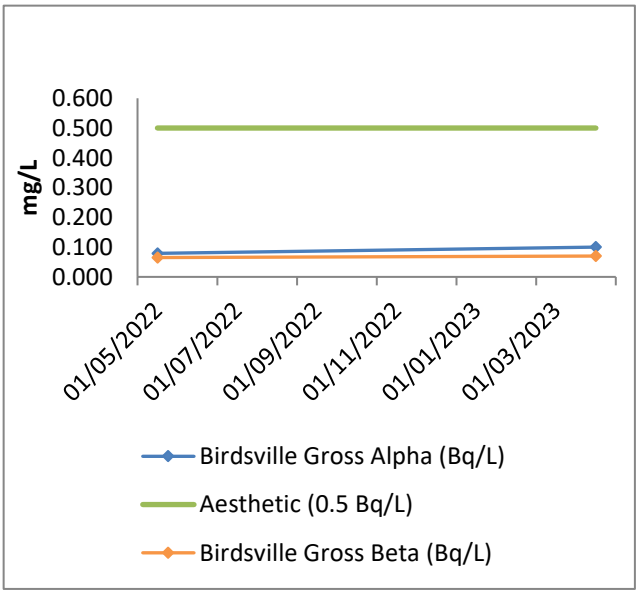

Figure 49: Birdsville verification monitoring trends for Gross Alpha and Gross Beta (2022- 2023).

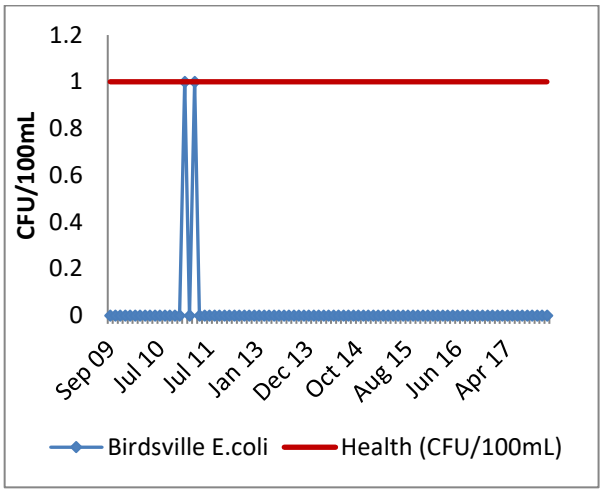

Figure 50: Birdsville operational and verification monitoring trends for *E.coli* (2009- 2017).

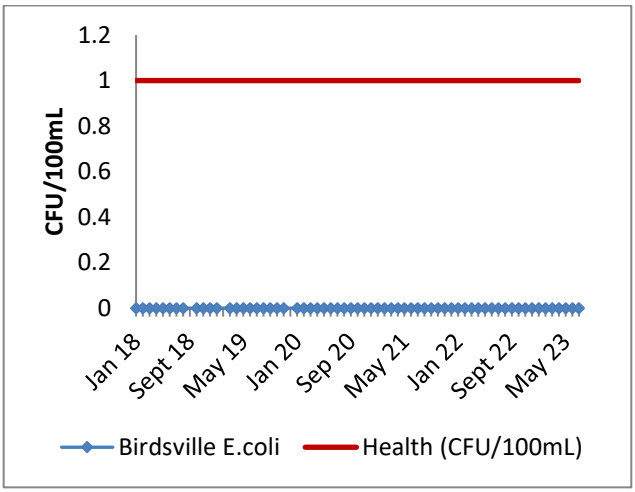

Figure 51: Birdsville operational and verification monitoring trends for E.coli (2018- 2023).

5.2.1 Birdsville Water Quality ADWG Value Exceedances

There have been two *E.coli* detections within the Birdsville scheme, occurring in February and April of 2011. The *E.coli* detections were associated with a failure of the reservoir roof which had rusted badly and was allowing access for birds and possibly even small vertebrates to access the drinking water supply. The roof was replaced in 2013 and is now properly vermin-proof. There have been no more *E.coli* detections within the scheme since. In mid-2012*, E.coli* sampling was increased from one sample per month from the distribution system to three samples per month to further improve the reliability and validity of the operational monitoring programme.

Birdsville's drinking water is consistently above the ADWG health value for Fluoride. The ADWG value is 1.5 mg/L, with Birdsville averaging approximately 1.7 mg/L. Elevated Fluoride levels in Birdsville's drinking water are discussed in Section 5.2.3 below.

Generally, Birdsville's drinking water is within the ADWG aesthetic range for pH, with only three exceedances, reported in 2009, 2013 and 2014, all of which exceeded the upper ADWG aesthetic limit of 8.5 pH units. Water outside the aesthetic guidelines for pH is not unsafe to drink and elevated pH levels in groundwater are common, however, elevated pH may result in a bitter aftertaste.

Birdsville's Aluminium values are generally well within the aesthetic guideline value of 0.2mg/L. An outlying value of 0.21mg/L was identified in April 2013. This outlier was attributed to maintenance works occurring on the reservoir at the time, including roof replacement and reservoir cleaning.

There has been one exceedance for Total Dissolved Solids; 660 mg/L, reported in the Birdsville scheme back in 2009. AS mentioned above, there are no health effects directly attributed to elevated Total Dissolved Solids in drinking water, however, water that exceeds the aesthetic value of 600mg/L may have palatability issues. It is likely that this exceedance is an outlier, as the average Total Dissolved Solids recorded for the scheme sits at 526 mg/L from 18 samples.

Finally, it is not uncommon for Birdsville's drinking water to exceed the ADWG aesthetic value of 180mg/L for Sodium. The average value for Birdsville is 182 mg/L, only slightly above the aesthetic value. Drinking water that exceeds the ADWG aesthetic value may cause taste issues but is not necessarily unsafe. No ADWG health value has been set for Sodium.

5.2.2 Birdsville High Water Temperature

Birdsville's high water temperature is a characteristic of deep Artesian water. In Birdsville, water comes out of the aquifer at approximately 98°C. As mentioned above, Council uses a cooling pond and heat exchange system to reduce the temperature of the water being reticulated to the town.

Visual inspections of the cooling pond ensures that there are no leaks in the copper piping that runs through the pond. Bubbles on the pond's surface, a reduction in water pressure and the pond over-flowing would indicate a leak and the need for maintenance. Similarly, the heat Exchanger is cleaned approximately every 6-months but temperature fluctuations observed during visual inspections can indicate a need for cleaning or other operational issues.

If the cooling pond or heat exchanger were to fail or were required to be taken off-line for repairs, Council would issue a public notice to the town, warning residents of higher water temperatures, as well as water restrictions, to assist in reducing the town's water usage. Public notices are uploaded to the Council Facebook page and the Council website. If it were just the heat exchanger that went off-line, there would still be some level of water cooling provided by the cooling pond and the storage of water in the reservoirs.

As required, a plumber can be flown in from Boulia for unplanned maintenance issues.

5.2.3 Birdsville Elevated Fluoride

Elevated Fluoride levels are associate with the natural geology of the area and averages around 1.7 mg/L. This is only 12% above the ADWG value of 1.5 mg/L.

Treatment to reduce Fluoride levels is not financially feasible.

DSC has one ongoing incident for the naturally elevated levels of fluoride within Birdsville's drinking water. The elevated fluoride levels are associated with the natural geology of the area and averages around 1.7mg/L. Treatment to reduce fluoride levels in the drinking water is not financially feasible, considering that the concentration is only 12% above the ADWG health value of 1.5mg/L. The main issues associated with elevated Fluoride levels in Birdsville is dental fluorosis primarily affecting children under the age of 6. Despite the frequent exceedance of Fluoride levels, biannual verification monitoring has been deemed suitable for the scheme as historical data has identified Fluoride concentrations to remain within a consistent range. At this stage, Council's primary management strategy is to provide public notification to Birdsville residents in the form of a Fluoride factsheet to help the community understand the potential impacts of elevated fluoride in the drinking water. Refer to Appendix C for a copy of the Fluoride factsheet.

5.3 Drinking Water Complaints

Diamantina Shire Council has several ways that complaints can be made, all of which are outlined on the Council website: https://www.diamantina.qld.gov.au/about-council/complaints.

Complaints can be made via. the following methods:

- In person at Council's Administration Centre in Bedourie or by calling (07) 4746 1600.
- By filling in the Administrative Action Complaint Form, available online from the Council website.
- In writing, by letter, fax or email, addressed to the Chief Executive Officer.

Postal Address: 17 Herbert Street, BEDOURIE QLD 4829

Fax: (07) 4746 1272

Email: admin@diamantina.qld.gov.au

The following details must be included when a complaint is lodged:

- The nature of the complaint with as much detail as possible;
- Details of any loss or detriment suffered;
- If the incident has been reported to any other agency or authority;
- The remedy being sought;
- Any supporting information or documentation, including names and contact details of anyone else who is able to support the complaint;
- Details of the complainant.

Council aims to investigate all complaints as quickly and efficiently as possible. The officer handling each complaint will contact the complainant within 7 days of the complaint being made to provide an update on any rectification methods and their expected timeframes. Where necessary, Council can assist complainants in lodging their complaints.

All drinking water complaints that are lodged with Council are sent directly to the Facilities and Town Services Manager who actions the complaints. It should be noted that it is not uncommon for informal complaints to made to Council. Due to the small populations within the two towns, most individuals

know they can talk directly to the plumber or town foreman responsible if there is a leak of any other drinking water related issues.

All complaints, once received are filed in Council's database and kept for a minimum of five years.

5.3.1 Bedourie Drinking Water Quality Complaints

To date, there is no record of any formal water quality complaints within the Bedourie drinking water scheme.

5.3.2 Birdsville Drinking Water Quality Complaints

In 2012, Council had two written complaints from Birdsville regarding water aesthetics, stating that the water was foul smelling. At this time Council had been repainting both drinking water reservoirs and water was being run directly to town. Under normal operating conditions, the bore water would have sat in the reservoirs, aerating the Sulphur and removing the foul smell. However, due to the required maintenance, there was no opportunity to get rid of the smell. Nonetheless, Council issued a public notice regarding the water and additional testing was done to confirm that the water supply was still with the ADWG and was safe for consumption.

In 2017, Council had two written complaints from Birdsville regarding water Turbidity. The complaints were that the tap water looked dirty. The investigation found that during the Birdsville races, fire trucks were removing large quantities of water from the reticulation at high flow rates, which resulted in sediment being stirred up in the distribution system, causing the water supply to become turbid. As the water was already in reticulation, there was no opportunity to rectify the issue.

No other formal complaints have been made for the Birdsville scheme.

6.0 HAZARD IDENTIFICATION AND RISK ASSESSMENT

The hazard identification and risk assessment for Diamantina Shire Council's DWQMP was undertaken using the risk methodology detailed in the Departmental guideline. The Risk Assessment outlined below, below includes a mitigated and unmitigated hazard assessment for each scheme which includes:

- Identified hazards or hazardous events
- Hazard or hazardous event sources
- An assessment of the unmitigated maximum risk level likelihood of each hazard being present or each hazardous event occurring
- Existing preventative measures implemented to counteract each hazard or hazardous event, or reduce the maximum risk level
- A re-assessed residual risk level which details the final risk level of a hazard or hazardous event that is applicable when the appropriate mitigation measures have been implemented. The residual risk is determined using the same methodology as the initial maximum risk assessment; however, changes to the assessed likelihood (or consequence) should result in an overall lower risk level.

As the Bedourie and Birdsville Drinking Water Schemes are very similar and generally operated by the same people, a combined risk assessment was conducted simultaneously for the two schemes. The final Risk Assessment notes where differences between the schemes were identified. The Risk Assessment was reviewed in August 2023 and Amended as necessary. Moving forward, Council intends to Review the Risk Assessment every 2 years, to coincide with the DWQMP Regular Reviews. All amendments will be referred to the Director of Infrastructure Services for input, review and acceptance of the new Risk Assessment.

Finally, where there was insufficient data or information to complete a reliable risk assessment, this was highlighted as an uncertainty to be discussed further in the Risk Management Improvement Program (Section 7).

6.1 Risk Assessment Methodology

In assessing the risk score of each hazard or hazardous event, the first step is to determine the consequence. Consequence categories used are outlined in Table 7 below.

Table 7: Consequence Descriptors.

Consequence	Descriptors
Insignificant	Negligible injury or health effects, isolated complaints related to aesthetic parameters. Little to no disruption to the normal operation of the scheme.
Minor	Negligible injury or health effects, widespread complaints related to aesthetic parameters.
Moderate	Potential acute health impact or potential chronic health impact.
Major	Acute health impact, no declared outbreak expected.
Catastrophic	Declared outbreak expected with an acute health impact. One or more fatalities or large number of hospitalisations.

Once the consequences were identified, the likelihood of each consequence occurring was determined using the Likelihood categories outlined in Table 8 below.

Table 8: Likelihood Descriptors.

Likelihood	Descriptors
Almost Certain	Hazard is considered to be present on a daily to weekly basis.
Likely	Occurs more often than once per month and up to once per week.
Possible	Occurs more often than once per year and up to once a month.
Unlikely	Unlikely but may occur once every 1- 5 years.
Rare	Hazard is expected to arise in exceptional circumstances; <1 occurrence every 5 years.

The risk scores were then assessed using the likelihood and consequence matrix provided in Table 9 below. The risk score was calculated by the intercept of likelihood and consequence.

Table 9: Risk Matrix used for the Bedourie and Birdsville Risk Assessments.

	Consequence				
Likelihood	**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

Finally, uncertainty was assessed using the definitions outlined in Table 10 below. Assessing uncertainty provides an indication of the need to undertake further work or gather more data to ensure that the risk assessment is accurate and reliable.

Table 10: Uncertainty Definitions used for the Hazard and Hazardous Events Assessment.

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 monitoring 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, and the processes are based on best estimates.

Lastly, to review and update the pre-existing Risk Assessment, the following steps were undertaken:

- Discussion with the key stakeholders on each system's schematics, risk methodology, recent water quality performance and the findings from the 2022 external DWQMP audit;
- Review of the hazards and hazardous events identified for the schemes and identification of any new hazards or hazardous events;
- Review of the maximum risk level and revaluation of the previous risk scores;
- Review of the preventative measures and identification of any new preventative measures that may be required;
- Reassessment of the residual risk and risk scoring
- Identification of any new Risk Management Improvement Items to address unacceptable risks.

The acceptable risk level in relation to public health depends very much on the Likelihood and Consequence descriptors used for the assessment. For the criteria used by DSC, a reasonable rule of thumb for an acceptable risk level is considered "medium" or less.

However, the decision on taking action to reduce a risk depends on two factors:

- the magnitude of the risk, and
- the cost and difficulty of actions required to reduce the risk.

Thus, there will be cases when it is sensible to reduce a "Low" risk and others where it may not be practical to reduce a "Medium" or "High" risk. It should be noted that all unacceptable residual risks identified in the Risk Assessment form part of the Risk Management Improvement Plan outlined in Section 7 below.

6.2 Bedourie and Birdsville Drinking Water Risk Assessment

Hazard/ Hazardous Event	Hazard Source	Location	Unmitigated			Primary Preventative Measure	Other Preventative Measures	Mitigated			Uncertainty	Documented Procedures	Comments	RMIP Item
			Likelihood	Consequence	Risk Level			Likelihood	Consequence	Risk Level				
Source Water														
Pathogenic ingress	Contamination of the Artesian aquifer or pathogenic ingress through the borehead	Bedourie/ Birdsville	Rare	Catastrophic	Medium – 6	All bores are deep flowing and always under positive pressure at the surface. Source water is pasteurised due to the heat.	Working day visual inspections of bores including checks for pressure, temperature and borehead integrity. Regular CCTV borehead inspections every 5 years.	Rare	Catastrophic	Medium – 6	Confident	CCP3 Borehead Inspection Procedure (refer to RMIP).	ALARP – extremely rare.	**S4:** Operation and Maintenance Procedure Update.
Pathogenic ingress	Water goes through Geothermal Power Station before being distributed to town as drinking water.	Birdsville	Rare	Catastrophic	Medium – 6	As of 2022, the Geothermal Power Station has been decommissioned.	Sealed system under pressure, water temperature remains above 80^{0}C, pasteurising the water as it passes through the Power Station.	Rare	Catastrophic	Medium – 6	Estimate	CCP3	When the plant was running a Risk Assessment Workshop was held with Ergon Energy and DSC to identify risks and associated hazards.	Not applicable.
Chemical ingress			Rare	Moderate	Low – 3		Isolation valves prior to Power Station. Sealed system, reticulated under pressure. Plant can be shut down if Isopentane leaks occur.	Rare	Moderate	Low - 3	Estimate			
Pathogenic ingress	Contamination of source water through incorrect hygiene practices during maintenance, repair or commissioning of source water infrastructure and heat exchanger	Bedourie/ Birdsville	Possible	Catastrophic	High – 15	Maintenance always undertaken by one plumber contractor, familiar with system requirements.	Staff and contractors to check for vermin prior to pump, pipe and fittings assembly. Staff trained to exercise correct hygiene practices.	Rare	Catastrophic	Medium – 6	Confident	CCP3 Water Mains Repair, Maintenance and Commissioning Procedures and Heat Exchanger Cleaning Procedure (refer to RMIP).	None.	**S4:** Operation and Maintenance Procedure Update.
Loss of water supply	Long term power supply failure	Bedourie	Unlikely	Minor	Low – 4	Bedourie scheme does not require power. Water is reticulated under via. Artesian pressure.	None.	Rare	Minor	Low – 2	Confident	None.	None.	Not applicable
Loss of water supply	Long-term power supply failure	Birdsville	Unlikely	Minor	Low – 4	Reservoirs can hold 1 days' supply of drinking water but this can be lengthened with water restrictions.	Back-up generator available.	Rare	Minor	Low – 2	Estimate	None.	None.	Not applicable.

Hazard/ Hazardous Event	Hazard Source	Location	Unmitigated			Primary Preventative Measure	Other Preventative Measures	Mitigated			Uncertainty	Documented Procedures	Comments	RMIP Item
			Likelihood	Consequence	Risk Level			Likelihood	Consequence	Risk Level				
Loss of water supply	Bore failure	Bedourie/ Birdsville	Unlikely	Moderate	Medium – 6	Periodic (every 5 years) CCTV borehead inspections	Bedourie back-up bore. Investigation into alternative drinking water sources.	Rare	Moderate	Low – 3	Reliable	None.	New Bedourie Bore drilled in 2019, Old Bore now operates as a back-up. No back-up bore for Birdsville. Birdsville can utilise non-potable water in an emergency. Water can also be trucked into each town, the main impact is financial.	Not applicable.
Reticulation of hot water	Supply of water above safe temperature.	Birdsville	Almost Certain	Moderate	High -15	Cooling ponds, heat exchanger, and dual reservoir storage.	Bypass valves can only be operated by Council water officers.	Rare	Moderate	Low – 3	Reliable	None.	Water temperature is distributed as low as is reasonably practical. Bedourie water, at 45^0C is not dangerous.	Not applicable.
Reticulation of hot water	Poor quality cooling pond water entering the heat exchange system, causing it to malfunction.	Birdsville	Possible	Minor	Medium – 6	Coarse filter installed at intake from pond and in-line filter at inlet to heat exchanger.	Water is passed through the cooling ponds and reservoirs to aid in cooling.	Rare	Minor	Low – 2	Reliable	None.	Cooling pond was cleaned in 2020, vegetation growth was found to be minimal. Lining of the cooling pond to eliminate vegetation growth is impractical due to the structure of the piping.	Not applicable.
Reticulation of hot water	Heating of water in exposed pipe, causing hot water to enter heat exchange system, causing it to malfunction.	Birdsville	Possible	Minor	Medium – 6	Working day visual inspections to ensure infrastructure is operating as normal.	Water restrictions would assist in preventing hot water being reticulated to town.	Unlikely	Minor	Low – 4	Confident	None.	Plumber can be flown in from Boulia for urgent maintenance issues.	**S1:** Cooling pond upgrades.
Reticulation of hot water	Failure of the heat exchange system	Birdsville	Possible	Minor	Medium – 6	Working day visual inspections to ensure infrastructure is operating as normal.	Water would still be reticulated to town, just at an elevated temperature. Some level of cooling would still be provided by cooling pond and reservoirs. Water restrictions would assist in preventing hot water being reticulated to town.	Unlikely	Minor	Low – 4	Confident	None.	Plumber can be flown in from Boulia for urgent maintenance issues. Residents would receive notice of expected elevated temperatures.	**S4:** Operation and Maintenance Procedure Update.
Elevated Fluoride	Naturally elevated levels of Fluoride present in the	Birdsville	Almost Certain	Moderate	High - 15	Annual notification to residents informing	Ongoing Monitoring of fluoride levels.	Almost Certain	Moderate	High - 15	Confident	CCP1	On-going drinking water incident with the WSR for	**S2:** Annual notification to residents informing about the elevated Fluoride levels.

Hazard/ Hazardous Event	Hazard Source	Location	Unmitigated			Primary Preventative Measure	Other Preventative Measures	Mitigated			Uncertainty	Documented Procedures	Comments	RMIP Item
			Likelihood	Consequence	Risk Level			Likelihood	Consequence	Risk Level				
	source water above the ADWG health guideline value.					them of the elevated Fluoride. Distribution of a Fluoride Fact-sheet which identifies health risks of Fluoride and how to avoid dental fluorosis.							the elevated Fluoride levels. Potential chronic effect would not impact visitors. Treatment to reduce fluoride level is not financially feasible. Elevated Fluoride levels are discussed further in Section 5.2.3.	
Damage to infrastructure - malicious or accidental	Damage to Bores	Bedourie/ Birdsville	Unlikely	Moderate	Medium – 6	Bores are located in a fenced compound with locked gates.	Working day visual inspections of bores, including ensuring compound fence is intact and gate locked.	Rare	Moderate	Low – 3	Confident	Borehead Inspection Procedure (refer to RMIP).	To date, damage to water infrastructure has not been an issue for Council.	**S4:** Operation and Maintenance Procedure Update.
Damage to infrastructure	Pipe breakage in cooling pond	Bedourie/ Birdsville	Unlikely	Minor	Low- 3	New copper pipe cooling system installed.	O&M Procedures developed identifying correct maintenance procedures.	Rare	Minor	Low – 2	Estimate	Water Mains Repair, Maintenance and Commissioning Procedures (refer to RMIP).	None.	**S4:** Operation and Maintenance Procedure Update.
Elevated Radiological Activity	Gross Alpha , Gross Beta, Uranium naturally occurring in the source water.	Bedourie/ Birdsville	Unlikely	Major	Medium – 8	Biannual verification monitoring.	None.	Rare	Major	Medium – 5	Reliable	CCP1/2	Verification monitoring programme was updated in 2022 to include these parameters.	Not applicable.
Reservoirs														
Pathogenic ingress	Contamination from pathogenic ingress into the reservoirs.	Birdsville	Unlikely	Catastrophic	High- 10	Water temperature in reservoirs is approximately 45°C, providing some form of pasteurisation of drinking water.	Working day visual inspections of reservoirs. Reservoirs are vermin proof.	Rare	Catastrophic	Medium- 6	Confident	CCP3 Reservoir Inspection Procedure (refer to RMIP).	New roof installed on GLR. Reservoir cleaning to commence in 2024. Moving forward this will occur every 3 years (currently scheduled for completion by August 2024).	**S3:** Operational monitoring of location downstream of reservoirs for *E.coli* and Total Coliforms. **S4:** Operation and Maintenance Procedure Update.
Pathogenic ingress	Contamination from pathogenic ingress from the reticulation (mains break/back flow) into the reservoirs.	Birdsville	Possible	Catastrophic	High- 15	Water temperature in reservoirs is approximately 45°C, providing some form of pasteurisation of drinking water.	Staff trained to exercise correct hygiene practices.	Rare	Catastrophic	Medium- 6	Confident	CCP3 Water Mains Repair, Maintenance and Commissioning Procedures (refer to RMIP).	None.	**S3:** Operational monitoring of location downstream of reservoirs for *E.coli* and Total Coliforms. **S4:** Operation and Maintenance Procedure Update.
Pathogenic or chemical ingress or damage to infrastructure	Contamination or damage from illegal access to reservoirs	Birdsville	Unlikely	Catastrophic	High- 10	Reservoirs are located in a fenced compound with locked gates.	Working day visual inspections of reservoirs, including ensuring compound fence is intact and gate locked.	Rare	Catastrophic	Medium- 6	Estimate	CCP3 Reservoir Inspection Procedure (refer to RMIP).	Both schemes are located in small towns where break-ins would be noticed.	**S3:** Operational monitoring of location downstream of reservoirs for *E.coli* and Total Coliforms.

Hazard/ Hazardous Event	Hazard Source	Location	Unmitigated			Primary Preventative Measure	Other Preventative Measures	Mitigated			Uncertainty	Documented Procedures	Comments	RMIP Item
			Likelihood	Consequence	Risk Level			Likelihood	Consequence	Risk Level				
														S4: Operation and Maintenance Procedure Update.
Loss of water supply	Failure of the fill solenoid for the GLR	Birdsville	Unlikely	Major	Medium – 8	Working day visual inspections to ensure infrastructure is operating as normal.	Plumber can be flown in from Boulia for urgent maintenance issues.	Rare	Major	Medium – 5	Reliable	None.	None.	Not applicable.
Loss of water supply	Failure of the level probe in the GLR	Birdsville	Unlikely	Major	Medium – 8	Working day visual inspections to ensure infrastructure is operating as normal.	Plumber can be flown in from Boulia for urgent maintenance issues.	Rare	Major	Medium – 5	Reliable	None.	None.	Not applicable.
Loss of water supply	Failure of both lift pumps	Birdsville	Unlikely	Major	Medium – 8	Working day visual inspections to ensure infrastructure is operating as normal.	Plumber can be flown in from Boulia for urgent maintenance issues.	Rare	Major	Medium – 5	Reliable	None.	None.	Not applicable.
Loss of water supply	Failure of the level probe in the ER	Birdsville	Unlikely	Major	Medium – 8	Working day visual inspections to ensure infrastructure is operating as normal.	Plumber can be flown in from Boulia for urgent maintenance issues.	Rare	Major	Medium – 5	Reliable	None.	None.	Not applicable.
Repair, Maintenance and Commissioning of Mains														
Pathogenic Ingress	Contamination from pathogenic ingress occurring during repair, maintenance or commissioning of water mains.	Bedourie/ Birdsville	Possible	Catastrophic	High – 15	Maintenance always undertaken by one plumber contractor, familiar with requirements.	Staff trained to exercise correct hygiene practices.	Rare	Catastrophic	Medium – 6	Confident	CCP2/3 Water Mains Repair, Maintenance and Commissioning Procedures (refer to RMIP).	None.	**S4:** Operation and Maintenance Procedure Update
Turbidity			Possible	Minor	Medium – 6			Rare	Minor	Low – 2				
Pathogenic ingress	Contamination from pathogenic ingress caused by backflow occurring during repair, maintenance or commissioning of water mains.	Bedourie/ Birdsville	Possible	Catastrophic	High – 15	Water services have non-return valves fitted.	Maintenance always undertaken by one plumber contractor, familiar with requirements. Staff trained to exercise correct hygiene practices.	Rare	Catastrophic	Medium- 6	Confident	CCP3 Water Mains Repair, Maintenance and Commissioning Procedures (refer to RMIP).	None.	**S4:** Operation and Maintenance Procedure Update
Hydrocarbons	Contamination from major spill near water mains during repair, maintenance or commissioning activities.	Bedourie/ Birdsville	Unlikely	Moderate	Medium – 6	Staff adequately trained so that they can respond well to these types of situations.		Rare	Moderate	Low – 3	Estimate	Water Mains Repair, Maintenance and Commissioning Procedures (refer to RMIP).	None.	**S4:** Operation and Maintenance Procedure Update

Hazard/ Hazardous Event	Hazard Source	Location	Unmitigated			Primary Preventative Measure	Other Preventative Measures	Mitigated			Uncertainty	Documented Procedures	Comments	RMIP Item
			Likelihood	Consequence	Risk Level			Likelihood	Consequence	Risk Level				
Distribution System														
Pathogenic ingress	Contamination from drinking water that has a long detention time in the main.	Bedourie/ Birdsville	Possible	Catastrophic	High – 15	Flushing water mains that have a long detention time based on bacteriological results.	Compact distribution systems for both schemes.	Rare	Catastrophic	Medium- 6	Reliable	CCP3 Water Mains Repair, Maintenance and Commissioning Procedures (refer to RMIP).	Long main to mains to racecourses to be flushed prior to any events,	**S4:** Operation and Maintenance Procedure Update
Pathogenic ingress	Contamination from a lack of or failure of backflow prevention devices in the distribution system.	Bedourie/ Birdsville	Possible	Catastrophic	High – 15	Positive pressure in reticulation system. New, small systems - shut-downs are rare.	Water services have non-return valves fitted.	Rare	Catastrophic	Medium- 6	Reliable	CCP3	None.	Not applicable.
Pathogenic ingress	Contamination of potable water through illegal access to mains water supply.	Bedourie/ Birdsville	Unlikely	Catastrophic	High – 10	Both schemes are small, illegal activities would be noticed by Council.	None.	Rare	Catastrophic	Medium- 6	Estimate	CCP3	Mitigated risk level is as low as reasonably practical.	Not applicable.
Pathogenic ingress	Contamination from the accidental cross-connection of untreated river water mains with the potable water mains.	Birdsville	Unlikely	Catastrophic	High – 10	River water pipes are colour coded purple and operate at a lower pressure to assist in accidental cross-connections.	Both mains systems are clearly marked and include non-return valves at each property service point. River water has high Turbidity, Turbidity is monitored monthly to ensure no cross-connecting has occurred. Maintenance always undertaken by one plumber contractor, familiar with requirements.	Rare	Catastrophic	Medium- 6	Reliable	CCP3 Water Mains Repair, Maintenance and Commissioning Procedures (refer to RMIP).	Monthly operational and biannual verification monitoring to date has not identified cross-contamination to be an issue for the scheme.	**S4:** Operation and Maintenance Procedure Update
Heavy Metals	Heavy Metal contamination of potable water supply from leaching of metals from MDPE/galvanised steel distribution systems.	Birdsville	Possible	Moderate	Medium – 9	Distribution system is now 95% polyethylene piping.	Previous verification monitoring for heavy metals.	Major	Moderate	Low- 3	Reliable	CCP1	Heavy metal monitoring was undertaken between 2013- 2017 with no ADWG exceedances detected.	Not applicable.
Whole of System														
Dependence on single	Employment of a Contract plumber with limited	Bedourie/ Birdsville	Possible	Minor	Medium – 6	Council engineer has good knowledge of the	Distribution system drawings updated in 2023 with regular updates now	Rare	Moderate	Low – 3	Reliable	Bedourie/Birdsville Drinking Water Scheme	As of 2022, Council now employ an internal	**S4:** Operation and Maintenance Procedure Update

Hazard/ Hazardous Event	Hazard Source	Location	Unmitigated			Primary Preventative Measure	Other Preventative Measures	Mitigated			Uncertainty	Documented Procedures	Comments	RMIP Item
			Likelihood	Consequence	Risk Level			Likelihood	Consequence	Risk Level				
Contract plumber	knowledge of the schemes, including risks and controls.					schemes and associated risks.	occurring in response to distribution system upgrades/changes.					Operating Plans (refer to RMIP).	plumber in addition to any Contractors required.	
Lack of skilled/trained staff.	Inability for staff to respond to drinking water events or changes in drinking water quality due to lack of formal training/skills.	Bedourie/ Birdsville	Unlikely	Catastrophic	High – 10	Maintenance undertaken by plumber/water operators who are familiar with the schemes. Alternative Contract plumbers available if required.	Documented operation and maintenance procedures.	Rare	Catastrophic	Medium – 6	Estimate	Bedourie/Birdsville Drinking Water Scheme Operating Plans (refer to RMIP).		**S4:** Operation and Maintenance Procedure Update
Cyber Security breach.	Breach of Council's internal system causing access to restricted information.	Bedourie/ Birdsville	Possible	Major	High – 12	Restricted administrative privileges	Multi-factor authentication for all users. Back-up systems in place.	Rare	Major	Medium – 5	Estimate	None.	Diamantina does not rely on computerised technologies within their water supply schemes. If a breach were to occur they would only obtain remote access to records and not infrastructure.	Not applicable.
Prolonged mains repair time	Outdated water network drawings.	Bedourie/ Birdsville	Possible	Minor	Medium – 6	Contract plumber familiar with the system.	Distribution system drawings updated in 2023 with regular updates now occurring in response to distribution system upgrades/changes.	Rare	Minor	Low – 2	Confident	Water Mains Repair, Maintenance and Commissioning Procedures (refer to RMIP).	"As constructed" drawings in place with updates occurring as required	**S4:** Operation and Maintenance Procedure Update
Loss of water supply	Fire, causing damage to drinking water infrastructure	Bedourie/ Birdsville	Unlikely	Major	Medium – 8	Both schemes infrastructure free from flammable debris.		Rare	Major	Medium – 5	Confident	Disaster Management Plan	To date, has not been an issue for either scheme.	Not applicable.
Loss of water supply	Flood, causing damage to drinking water infrastructure	Bedourie/ Birdsville	Unlikely	Major	Medium – 8	Both schemes infrastructure located above the historic flood levels.		Rare	Major	Medium – 5	Confident	Disaster Management Plan	To date, has not been an issue for either scheme.	Not applicable.
Loss of water supply	Natural disaster, causing damage to drinking water infrastructure	Bedourie/ Birdsville	Unlikely	Major	Medium – 8	Flood and Fire (assessed above are the most likely natural disasters to damage infrastructure).		Rare	Major	Medium – 5	Confident	Disaster Management Plan	To date, has not been an issue for either scheme. Bore water provides level of water security during periods of drought.	Not applicable.

7.0 RISK MANAGEMENT IMPROVEMENT PROGRAMME

DSC's Risk Management Improvement Programme for both the Bedourie and Birdsville schemes is provided in Table 11 below. The RMIP was reviewed and amended in August 2023 via. consultation with the DSC Director of Infrastructure Services. Moving forward, Council intends to review all completion target dates at 6-monthly intervals to ensure that the processes are in place for items to be completed within their forecast timeframes. The target dates for all RMIP items were determined via. consultation with Council staff responsible for the respective items.

Table 11: Bedourie and Birdsville Risk Management Improvement Programme.

Code	Hazard/Hazardous Event	Scheme	Improvement Item	Priority	Target Date/s	Comments	Responsibility
S1	Heating of water in exposed cooling pond pipe.	Birdsville	DSC are planning to upgrade the Birdsville cooling ponds which includes the design and construction of new cooling ponds. The piping in these ponds will be adequately insulated.	High	Dec 2024	Target date set to coincide with completion of cooling pond upgrades.	Director of Infrastructure Services.
S2	Elevated Fluoride levels in the source water.	Birdsville	Annual notification to Birdsville residents informing them of the potential health impacts of elevated Fluoride levels in the drinking water.	High	Ongoing (annual notification sent to residents in April 2023, to be re-sent in early 2024).	Fluoride factsheet was updated in 2024.	Director of Infrastructure Services.
S3	Pathogenic ingress into the Birdsville Reservoirs.	Birdsville	*E.coli* and Total Coliform operational testing to be conducted from the new sampling point downstream of the two reservoirs. Data will be used to help indicate when reservoir cleaning may be required.	High	Dec 2024	Target date set to enable Council to obtain approximately 1 year of viable data that can be used to assess trends.	Director of Infrastructure Services.
S4	Lack of Operation and Maintenance Procedures.	Bedourie and Birdsville	Review of all Operation and Maintenance Procedures to update any that are out of date and to identify new or missing procedures that need to be written and implemented.	High	Dec 2024	A review has already been conducted to identify the missing procedures. All that is required now is to draft and implement these missing procedures.	Director of Infrastructure Services.

8.0 OPERATION AND MAINTENANCE PROCEDURES

Council have developed a series of Operation and Maintenance Procedures and Critical Control Points (CCPs) for the operation of the Bedourie and Birdsville schemes. Table 12 below outlines the current status of all Operation and Maintenance Procedures. Moving forward, Council will undertake reviews of all CCPs and O&M Procedures on the following triggers:

- Following significant changes in processes;
- At the time of the scheduled DWQMP Review.

Table 12: Bedourie and Birdsville Operation and Maintenance Procedures.

Scheme Component / Sub-component	Preventive Measure Managed	Documented Procedure	Version Date	Status
Whole of System	Bedourie/Birdsville Drinking Water Scheme	Bedourie/Birdsville Drinking Water Scheme Operating Plans	N/A	Procedures to be drafted and implemented.
	Birdsville Drinking Water Scheme	Birdsville Fluoride Factsheet	April 2024	Reviewed 2024.
Sourcing Infrastructure & Distribution System	Repair, Maintenance and Commissioning of Mains	Disinfection and Sanitisation of Material, Tools, and Equipment	March 2024	Drafted 2024, being reviewed by Council.
		Replacement and Repair of Water Mains		
		Commissioning of Water Mains		
		Super-chlorination		
		Mains Flushing		
	Boreheads	Borehead Inspection Procedure	March 2024	Implemented 2024.
		Procedure for managing bore failure	September 2015	Procedure outdated.
	Geothermal Power Station	Operational procedures of geothermal power plant & drinking water supply	April 2015	Procedures currently not required.
Reservoirs	Infrastructure	Reservoir Inspection Procedure	March 2024	Implemented 2024.
Water Sampling	Verification and Operational Monitoring	Water Sampling Procedure	N/A	Procedure to be drafted and implemented.

8.1 Critical Control Points

The following Critical Control Points have been implemented within the Bedourie and Birdsville schemes:

- **CCP 1:** ADWG Health Exceedance (Source or Distribution)
- **CCP 2:** ADWG Aesthetic Exceedance (Source or Distribution)
- **CCP 3:** *E.coli* Detection (Source or Distribution)

CCP1: ADWG Health Exceedance (Source or Distribution)			
What is measured?	**Where /how is it measured?**	**What is the Control Point?**	**What are the Hazards?**
Drinking Water Quality	In-house operational monitoring and external verification monitoring	ADWG Health Parameters	Pathogenic ingress Public Health Risks
Target Value: Drinking water monitoring identifies tested parameters to sit within ADWG health values.			
Alert Level: Potential exceedance of an ADWG health value **Responsibility: Water Operator**		**Critical Limit: Confirmed exceedance of an ADWG health value OR *E.coli* detection** **Responsibility: Water Operator**	
1. Immediately re-take grab sample to verify result. 2. Inform Director of Infrastructure Services. 3. Notify the Drinking Water Supply Regulator. 4. If follow-up grab sample does not identify any exceedances then re-commence the scheme's operation as normal, via. consultation with the Regulator. 5. If follow-up sample confirms exceedance then escalate to Critical Limit response. **Note that *E.coli* detections do not need to be verified and are to be escalated to the Critical Limit response immediately.** **Reporting:** Alert Supervisor and Drinking Water Supply Regulator.		1. Inform Director of Infrastructure Services and Regulator of confirmed result. 2. Refer to CCP 3 for procedure to follow for *E.coli* detections. 3. Isolate effected area if possible. 4. Review the need for a Boil Water Alert or an alternative water supply. 5. Conduct investigation into exceedance. 6. Re-sample. 7. Continue operation as normal if testing shows exceeded parameter has been corrected via. consultation with the Regulator. 8. Complete incident reporting forms. **Note that Boil Water Alerts can only be lifted via. consultation with QLD Health and the Water Regulator.**	

CCP2: ADWG Aesthetic Exceedance (Source or Distribution)			
What is measured?	**Where /how is it measured?**	**What is the Control Point?**	**What are the Hazards?**
Drinking Water Quality	In-house operational monitoring and external verification monitoring	ADWG Aesthetic Parameters	Pathogenic ingress Public Health Risk
Target Value: Drinking water monitoring identifies tested parameters to sit within ADWG aesthetic values.			
Alert Level: Potential exceedance of an ADWG aesthetic value **Responsibility: Water Operator**		**Critical Limit: Confirmed exceedance of an ADWG aesthetic value that cannot be managed under the DWQMP (e.g. elevated radiological activity)** **Responsibility: Water Operator**	
1. Immediately re-take grab sample to verify result. 2. Inform Director of Infrastructure Services. 3. If follow-up grab sample does not identify any exceedances, then re-commence the scheme's operation as normal. 4. If follow-up sample confirms exceedance and it cannot be safely managed under the DWQMP, then escalate to Critical Limit response. **Note that some aesthetic parameters (Sodium) are naturally elevated in Bedourie/Birdsville's drinking water supply and therefore, exceedances are not required to be investigated.** **Reporting:** Alert Supervisor.		1. Inform Director of Infrastructure Services of confirmed results. 2. Refer to CCP 3 for procedures to follow for Turbidity and Total Coliform exceedances. 3. Notify the Regulator. 4. Isolate effected area if possible. 5. Review the need for a Boil Water Alert or an alternative water supply. 6. Conduct investigation into exceedance. 7. Re-sample. 8. Continue operation as normal if testing shows exceeded parameter has been corrected. 9. Complete incident reporting forms. **Note that Boil Water Alerts can only be lifted via. consultation with QLD Health and the Water Regulator.** **Reporting:** Alert Supervisor and Drinking Water Supply Regulator.	

CCP3: *E.coli* Detections (Source or Distribution)			
What is measured?	**Where /how is it measured?**	**What is the Control Point?**	**What are the Hazards?**
E.coli Total Coliforms Turbidity	In-house operational monitoring and external verification monitoring	*E.coli* detections	Pathogenic ingress Public Health Risk
Target Value: No *E.coli* detections in source water or distribution system			
Alert Level: Turbidity >5 NTU & Elevated Total Coliforms **Responsibility: Water Operator**		**Critical Limit: *E.coli* detection** **Responsibility: Water Operator**	
1. Notify Director of Infrastructure Services. 2. Where exceedance is reported (e.g. source water or distribution), commence *E.coli* sampling. 3. Flush Mains. 4. Re-sample for Turbidity and Total Coliforms. 5. If exceedances are still being detected, re-commence flushing. 6. If *E.coli* is detected, escalate to Critical Limit response. 7. If *E.coli* is not being detected and Turbidity and Total Coliforms are no longer elevated after mains flushing, then re-commence the normal operation of the scheme. **Reporting:** Alert Supervisor.		1. Inform Director of Infrastructure Services and issue Boil Water Alert. 2. Notify Drinking Water Regulator. 3. Isolate the affected area if possible and commence investigation into exceedance. 4. Re-test for *E.coli* to ensure it was not a sampling error. 5. Flush mains, then re-test for *E.coli* , Total Coliforms and Turbidity. 6. If *E.coli* is still being detected, re-flush the mains. 7. The Boil Water Alert is to remain in place until operational and verification monitoring detects no *E.coli*. 8. Complete incident reporting forms. **Note that Boil Water Alerts can only be lifted via. consultation with QLD Health and the Water Regulator.** **Reporting:** Alert Supervisor and Drinking Water Supply Regulator.	

9.0 OPERATIONAL AND VERIFICATION MONITORING

9.1 Bedourie and Birdsville Operational Monitoring

In the Bedourie and Birdsville drinking water supply schemes, water is delivered from the bores and distributed throughout the towns, providing customers with a stable drinking water supply. Council's operational efforts are directed to ensuring that the drinking water supplied within each scheme meets the ADWG values and is free from contamination. While Council prioritises and adheres to the operational testing regime outlined in the DWQMP, there have been unavoidable/unforeseen circumstances in the past where staff have been unavailable, or road closures have caused for some water testing to be missed.

Table 13 below identifies the operational monitoring programme for both the Bedourie and Birdsville supply schemes. Refer to Appendix D for operational monitoring water sampling locations for each town.

Table 13: Bedourie and Birdsville Operational Monitoring Programme.

Site	Location	Monitoring Frequency	Parameter	Target value	ADWG Health Guideline	Positions Responsible
Bedourie						**Overall Responsibility:** Chief Executive Officer **Implementation and Review:** Director of Infrastructure Services. **Operations:** Water Operator
Raw Water	Bedourie Town Bore (New) and Bedourie Town Bore (Old)	Weekly Visual Inspections	Bore Pressure	529 kPa	N/A	
			Bore-head Integrity	Sealed	N/A	
Distribution System	3 samples tested from the following: • Council Depot • Sports Oval • Industrial Area Workshop Tap	Monthly Grab Sample	*E. coli*	0	1	
			Total Coliforms	0	N/A	
			Turbidity	<1	>5	
	Inlet and outlet of cooling pond	Weekly Visual Inspections	Temperature	<45°	N/A	
	Cooling pond	Weekly Visual Inspections	Integrity	No bubbles or leaks coming from the cooling pond	N/A	
Birdsville						
Raw Water	Birdsville Town Bore	Weekly Visual Inspections	Bore Pressure	1,200 kPa	N/A	
			Bore-head Integrity	Sealed	N/A	
Distribution System	4 samples tested from the following: • Council Depot • Caravan Park • Jardine St Park • Tap located downstream of the ground level and elevated reservoirs	Monthly Grab Sample	*E. coli*	0	1	
			Total Coliforms	0	N/A	
			Turbidity	<1	<5	

Site	Location	Monitoring Frequency	Parameter	Target value	ADWG Health Guideline	Positions Responsible
	Outlet of cooling ponds and outlet of heat exchanger		Temperature	50°C from cooling ponds 45°C from heat exchanger	N/A	
	Reservoir pumps and heat exchanger	Weekly Visual Inspections	Integrity	No maintenance/operational issues or leaking	N/A	
	Cooling pond	Weekly Visual Inspections	Integrity	No bubbles or leaks coming from the cooling pond	N/A	
	Reservoirs	Weekly Visual Inspections	Integrity	Sealed	N/A	

9.2 Bedourie and Birdsville Verification Monitoring

Diamantina Shire Council undertake one round of verification monitoring every six months within each of the schemes. Samples are sent to an external NATA accredited laboratory to verify the chemical quality of the water. Due to the remoteness of the shire, the main issue for Diamantina's verification monitoring programme is getting the *E.coli* verification monitoring samples to the external laboratory within the 24-hour holding period. More often than not by the time samples are collected from each town and flown to Brisbane, more than 24-hrs has passed, voiding the validity of the *E.coli* tests. Other issues that have arisen in the past, include unavailability of staff and seasonal flooding, resulting in road closures.

Table 14 below identifies the verification monitoring programme for both the Bedourie and Birdsville supply schemes. Refer to Appendix D for verification monitoring water sampling locations for each town.

Table 14: Bedourie and Birdsville 6-monthly Verification Monitoring Programme.

Characteristic	Parameter	ADWG &/or Regulation Value	Associated Hazard	Sampling Locations		Positions Responsible
				Bedourie	Birdsville	
Microbial Quality	*E.coli*	Nil Detected – Health	Bacteria	**3x Locations:** Bedourie Old Bore (mandatory) Bedourie New Bore (mandatory) Council Depot or Sports Oval	**2x Locations:** Birdsville Bore (mandatory) Council Depot or Caravan Park	**Overall Responsibility:** Chief Executive Officer **Implementation, and Review:** Manager of Engineering Services **Operations:** Water Operator
	Total Coliforms	Nil Detected				
Physical	Conductivity	N/A	Hazards that arise from the Natural Geological Processes in the aquifer			
	Dissolved Organic Carbon	N/A				
	Dissolved Oxygen	N/A				
	pH	pH 6.5 – 8.5 – Aesthetic				
	Total Dissolved Solids	600 mg/L – Aesthetic				
	Turbidity	5 NTU – Aesthetic				
Inorganics	Aluminium	0.2mg/L – Aesthetic				
	Chloride	250mg/L – Aesthetic				
	Fluoride	1.5mg/L – Health				
	Selenium	0.010mg/L – Health				
	Sodium	180mg/L – Aesthetic				
	Total Iron	0.3mg/L -Aesthetic				
	Soluble Iron	N/A				
	Total Manganese	0.5mg/L – Health				

Characteristic	Parameter	ADWG &/or Regulation Value	Associated Hazard	Sampling Locations		Positions Responsible
				Bedourie	Birdsville	
	Soluble Manganese	N/A				
	Uranium	0.017mg/L – Health				
	Gross Alpha	0.5 Bq/L – Aesthetic				
	Gross Beta	0.5 Bq/L – Aesthetic				
	Heavy Metals* (As, Cd, Cr, Cu, Hg, Pb, Ni, Zn)					

***Note: Heavy Metal testing to be conducted every four years to maintain appropriate long-term monitoring of the risk level (last testing undertaken April 2024).**

10.0 INCIDENTS AND EMERGENCIES

Diamantina Shire Council operates on a 3-level incident and emergency framework in the management of their drinking water incidents and emergencies, starting at Level 1 (least severe) through to Level 3 (most severe); these are outlined in Table 15 below. It should be noted that during a full-scale emergency response and recovery scenario (e.g. a natural disaster), the Local Disaster Management Group is activated in accordance with DSC's Local Disaster Management Plan. The Diamantina Local Disaster Management Plan can be accessed here: https://www.diamantina.qld.gov.au/downloads/file/925/local-disaster-management-plan-2022-23.

The drinking water incident and emergency action plan for the Bedourie and Birdsville schemes is provided in Section 10.1 below.

Table 15: DSC 3-level incident and emergency framework.

Alert Level	Description	Key Management Responses	Positions Responsible
Level 1 Low-Risk Operational Actions	Operational issues that could escalate if not responded to. These types of incidents are managed immediately and effectively by DSC staff, without any public health impact to the community. For example: • Exceedance of an Operational Control Point • Exceedance of an ADWG Aesthetic value that can be managed under the DWQMP. • Short-term drinking water infrastructure fail.	1. Notify Water Operator and/or Director of Infrastructure Services. 2. Check and act upon operation and maintenance procedures. 3. Take appropriate actions to rectify the situation.	Water Operator, Director of Infrastructure Services
Level 2 Medium-Risk Incidents and Emergencies	All ADWG health exceedances and incidents where normal actions under the DWQMP do not effectively manage the issue and there is a concern that public health may be impacted. For example: • Detection of a parameter with no water quality criteria that may have an adverse impact upon public health. • Detection of an ADWG aesthetic value exceedance that may have an adverse impact upon public health (e.g. radiological activity). • Minor exceedance of an ADWG health value. • Short-term loss of drinking water supply (<24 hours). • Cyber security breach	1. Report incident/event to the Water Supply Regulator (OWSR). 2. Inform Director of Infrastructure Services and implement short-term management measures. 3. Undertake incident investigation.	Water Operator, Director of Infrastructure Services, Water Supply Regulator

Alert Level	Description	Key Management Responses	Positions Responsible
Level 3 High-Risk Declared Disaster	For example: • Widespread outbreak of a waterborne disease. • Major loss of drinking water supply, e.g. >24 hours over wide area. • Gross exceedance of an ADWG health guideline value for a chemical parameter (e.g. more than five times the ADWG health guideline limit). • Declared disaster. • Long-term drinking water infrastructure fail. • Detection of *E.coli* in the treated water.	1. Report incident/event to the Water Supply Regulator (OWSR). 2. Notify Director of Infrastructure Services who will inform the Chief Executive Officer 3. CEO makes the call to activate the Local Disaster Management Plan (as required) 4. Implement short-term management measures. 1. Undertake incident investigation.	Water Operator, Director of Infrastructure Services, Water Supply Regulator, Chief Executive Officer

10.1 DSC Incident and Emergency Action Plan

Table 16: DSC drinking water Incident and emergency action plan.

Level	Incident Or Emergency	Summary Of Actions to be Undertaken	Positions Responsible for Actions
1	**Exceedance of OCP or exceedance of an ADWG aesthetic value that can be managed under the DWQMP**	1. Water Operator to notify supervisor. 2. If simple adjustment is required, make adjustment and record details. 3. If a more substantial system change is required (e.g. maintenance to overcome a recurring problem), advise the Director of Infrastructure Services so that budget can be made available for the project. 4. Organise system change or list for capital works as appropriate.	Water Operator
	Short-term drinking water infrastructure fail	1. Water Operator to notify supervisor. 2. Determine the potentially affected area and isolate. 3. Inform concerned customers of the details of the incident and anticipated progress (if required). 4. Rectify the problem. 5. Investigate options to avoid any reoccurrence. 6. If a more substantial system change is required (e.g. maintenance to overcome a recurring problem), advise the Director of Infrastructure Services so that budget can be made available for the project.	Water Operator & Director of Infrastructure Services
2	**Detection of a parameter with no water quality criteria that may have an adverse impact upon Public Health OR detection of an ADWG aesthetic value exceedance that may have an adverse impact upon public health**	1. Water Operator to notify Director of Infrastructure Services. 2. Check with the testing laboratory to confirm the exceedance OR re-commence operational monitoring to confirm aesthetic exceedance or adverse water quality criteria. 3. Report details of the exceedance to the Water Supply Regulator within 3 hours via. the Drinking Water Hotline (P: 1300 596 709) and the online notification form within 24 hours (E: DrinkingWater.Reporting@rdmw.qld.gov.au). 4. Determine the potentially affected area and advise the affected consumers (via. the usual communication channels) if required. 5. Commence investigation into water quality criteria or aesthetic exceedance. Some aesthetic exceedances or adverse water quality (e.g. Turbidity) may be able to be to be fixed with mains flushing. 6. Once investigation is complete and the issue fixed, re-test the drinking water supply and send samples to the	Water Operator, Director of Infrastructure Services, Water Supply Regulator

Level	Incident Or Emergency	Summary Of Actions to be Undertaken	Positions Responsible for Actions
		external laboratory (if required) for confirmation that there are no issues. 7. Investigate options to avoid any reoccurrences. 1. Upon resolution, provide a written report to the OWSR (Part 2 of Incident Reporting Form).	
	Minor exceedance of an ADWG health value	1. Water Operator to notify Director of Infrastructure Services. 2. Where an exceedance has been observed check with the testing laboratory to confirm the exceedance. 3. Report details of exceedance to the Water Supply Regulator within 3 hours via. the Drinking Water Hotline (P: 1300 596 709) and the online notification form within 24 hours (E: DrinkingWater.Reporting@rdmw.qld.gov.au) 4. Determine if water quality can be corrected and the time/resources required. 5. Advise consumers and make temporary water supply arrangements including bottled potable water if warranted. 6. Rectify the problem or inform consumers of ongoing water quality limitation. 7. Once rectified, re-test and send the water samples to an external lab for verification monitoring to confirm the issue has been resolved (if required). 7. Provide a written report to the OWSR (Part 2 of Incident Reporting Form).	Water Operator, Director of Infrastructure Services, Water Supply Regulator
	Short-term loss of drinking water (<24 hours)	1. Water Operator to notify Director of Infrastructure Services. 2. Details of the supply loss or infrastructure fail are to be reported to the Water Supply Regulator within 3 hours via. the Drinking Water Hotline (P: 1300 596 709) and the online notification form within 24 hours (E: DrinkingWater.Reporting@rdmw.qld.gov.au). 3. Determine the potentially affected area and advise the affected consumers (via. the usual communication channels) and implement temporary water restrictions if applicable. 4. Rectify the problem. 5. Investigate options to avoid any reoccurrence. 1. Upon resolution, provide a written report to the OWSR (Part 2 of Incident Reporting Form).	Water Operator, Director of Infrastructure Services, Water Supply Regulator
	Cyber Security Breach	1. Water Operator to notify Director of Infrastructure Services.	Water Operator, Director of

Level	Incident Or Emergency	Summary Of Actions to be Undertaken	Positions Responsible for Actions
		2. Determine the potentially affected area (i.e. access to Council files). 3. Alert Australian Government Cyber Security Hotline (P: (07) 3215 3951) 4. If water infrastructure has been compromised, report details to the Water Supply Regulator within 3 hours via. the Drinking Water Hotline (P: 1300 596 709) and the online notification form within 24 hours (E: DrinkingWater.Reporting@rdmw.qld.gov.au) 5. Rectify the problem. 6. Investigate options to avoid any recurrence. 7. Upon resolution, provide a written report to the OWSR (Part 2 of Incident Reporting Form), if required.	Infrastructure Services, Water Supply Regulator, Chief Executive Officer
3	**Widespread outbreak of a waterborne disease**	1. Water Operator to notify Director of Infrastructure Services. 2. Director of Infrastructure Services to alert CEO. 3. Details of the outbreak are to be reported to the Water Supply Regulator within 3 hours via. the Drinking Water Hotline (P: 1300 596 709) and the online notification form within 24 hours (E:DrinkingWater.Reporting@rdmw.qld.gov.au). 4. Determine the potentially affected area and isolate if possible. Issue a Boil Water Alert and advise the effected consumers (via. the usual communication channels) or other precautions as required. 5. Flush all affected mains. 6. Provide additional/temporary chlorine dosing if practical. 7. Undertake a comprehensive contamination investigation and take necessary corrective actions. 8. Upon resolution, provide a written report to the OWSR (Part 2 of Incident Reporting Form).	Water Operator, Director of Infrastructure Services, Water Supply Regulator, Chief Executive Officer
	Major loss of drinking water supply (>24 hours) OR long-term drinking water infrastructure fail	1. Water Operator to notify Director of Infrastructure Services. 2. Director of Infrastructure Services to alert CEO. 3. Details of the supply loss or infrastructure fail are to be reported to the Water Supply Regulator within 3 hours via. the Drinking Water Hotline (P: 1300 596 709) and the online notification form within 24 hours (E:DrinkingWater.Reporting@rdmw.qld.gov.au). 4. Determine the potentially affected area and advise the affected consumers (via. the usual communication channels) and implement temporary water restrictions if applicable.	Water Operator, Director of Infrastructure Services, Water Supply Regulator, Chief Executive Officer

Level	Incident Or Emergency	Summary Of Actions to be Undertaken	Positions Responsible for Actions
		5. Make temporary water supply arrangements if required. 6. Rectify the problem. 7. Investigate options to avoid any reoccurrence. 8. Upon resolution, provide a written report to the OWSR (Part 2 of Incident Reporting Form).	
	Gross exceedance of an ADWG health value	1. Water Operator to notify Director of Infrastructure Services. 2. Director of Infrastructure Services to alert CEO. 3. Check with the testing laboratory to confirm the exceedance (a sudden gross exceedance is only likely to occur as the result of sabotage or an unreported chemical spill). 4. Report details of the exceedance to the Water Supply Regulator within 3 hours via. the Drinking Water Hotline (P: 1300 596 709) and the online notification form within 24 hours (E: DrinkingWater.Reporting@rdmw.qld.gov.au). 5. Determine the potentially affected area and advise the affected consumers (via. the usual communication channels) not to drink the water. 6. Re-test the drinking water supply and send samples to the external laboratory for confirmation that health exceedance was not a testing error. 7. Make temporary supply arrangements, including bottled potable water if required. 8. Commence investigation into exceedance and rectify the problem. 9. Once, rectified, re-test the drinking water supply and send samples to the external laboratory to confirm that the problem has been fixed and the drinking water is safe for consumption. 10. Investigate options to avoid any reoccurrence. 11. Upon resolution, provide a written report to the OWSR (Part 2 of Incident Reporting Form).	Water Operator, Director of Infrastructure Services, Water Supply Regulator, Chief Executive Officer
	Declared disaster	1. Water Operator to notify Director of Infrastructure Services. 2. Director of Infrastructure Services to alert CEO. 3. CEO to liaise with Local Disaster Management centre to monitor the potential effect of the disaster upon water supply and sewerage services. 4. If impact to drinking water services, details of the event to be reported to the Water Supply Regulator within 3 hours via. the Drinking Water Hotline (P: 1300 596 709)	Water Operator, Director of Infrastructure Services, Water Supply Regulator, Chief Executive Officer

Level	Incident Or Emergency	Summary Of Actions to be Undertaken	Positions Responsible for Actions
		and the online notification form within 24 hours (E:DrinkingWater.Reporting@rdmw.qld.gov.au). 5. If the water supply has been affected, consider a Boil Water Alert and take relevant actions as per the DWQMP and direction from the Local disaster Management Centre and Water Supply Regulator. 6. If the water supply has been affected, upon resolution, provide a written report to the OWSR (Part 2 of Incident Reporting Form).	
	Detection of *E.coli* in the treated water	1. Water Operator to notify Director of Infrastructure Services. 2. Director of Infrastructure Services to alert CEO. 3. Boil Water Alert to be issued and effected consumers to be advised (via. the usual communication channels). 4. Details of the outbreak are to be reported to the Water Supply Regulator within 3 hours via. the Drinking Water Hotline (P: 1300 596 709) and the online notification form within 24 hours (E:DrinkingWater.Reporting@rdmw.qld.gov.au). 5. Determine the potentially affected area and isolate if possible. 6. Flush all affected mains. 7. Provide additional/temporary chlorine dosing if practical. 8. Once corrective actions have been undertaken, re-test for *E.coli*, including verification monitoring to an external lab to confirm results. 9. Once two rounds of verification monitoring can confirm no *E.coli* detections, consider lifting the Boil Water Alert via. consolation with QLD Health and the Water Supply Regulator. 10. Upon resolution, provide a written report to the OWSR (Part 2 of Incident Reporting Form).	Water Operator, Director of Infrastructure Services, Water Supply Regulator, Chief Executive Officer

11.0 INFORMATION MANAGEMENT

Diamantina Shire Council is a relatively small organisation with a records system that is available to all relevant staff. Engineering services are provided by GBA Consulting Engineers who are based in Barcaldine. GBA provides technical support for Council's water operations, preparing tender documents and specifications for new works and as-constructed data for completed works. GBA also develops, maintains, and distributes the works procedures to cover construction, maintenance, testing and inspections to control risks to water supply quality.

All records are computerised and for at least for 7 years. Table 15 below outlines the specific details in relation to DSC's information management system.

Table 17: Drinking water information management details.

Information/ Document	Format (Hardcopy /Electronic)	Storage Location	Position Responsible	Comments
Operational Monitoring Data	Hardcopy/ Electronic	Filed on DSC/GBA servers.	DSC Town Foreman and GBA Environmental Officer	Operational monitoring data is recorded in an excel spreadsheet which is sent to the Bedourie Town Foreman to be stored in Council's electronic filing system and forwarded onto GBA.
Verification Monitoring Data	Electronic	Filed on DSC/GBA servers.	DSC Town Foreman and GBA Environmental Officer	Verification monitoring data is sent from the lab to the Bedourie Town Foreman and GBA where it is stored in the respective electronic filing systems.
Customer Complaints	Hardcopy/ Electronic	Filed on DSC server.	DSC Administrative Officer and Director of Infrastructure Services	Complaints may be received in person, over the phone or via. email or fax. Once received, all complaints are stored in Council's electronic filing system.
Maintenance	Hardcopy/ Electronic	Filed on DSC server.	DSC Administrative Officer and Director of Infrastructure Services	Maintenance issues are stored in Council's electronic filing system and collated for addition to Council's maintenance register.
Operation and Maintenance Procedures	Electronic	Filed on DSC/GBA servers.	DSC Administration Officer and GBA Environmental Officer.	O&M procedure are predominantly written by GBA and forwarded onto Council for storage in Council's electronic filing system.

APPENDIX A

DEPARTMENT OF RESOURCES BORE REPORT CARDS (BEDOURIE OLD BORE/BEDOURIE NEW BORE/BIRDSVILLE BORE)

Report Date: 25/09/2023 20:51

Bore Report

From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
316	Artesian - Controlled Flow	Existing	01/01/1905	Longreach	2750 - DIAMANTINA

Details

Description	RESERVE 1		
Parish	374 - BEDOURIE		
Original Name	BEDOURIE TOWN NO.2		
Driller Name	J. HANNAY, A.F. SPARHAM		
Drill Company	HANNAY BRO.		
Const Method	CABLE TOOL		
Bore Line			
D/O File No	25/12/B/1	**Polygon**	
R/O File No	25/12/B/1	**Equipment**	
H/O File No	L05527B	**RN of Bore Replaced**	
Log Received Date		**Data Owner**	
Roles			

Location

Latitude	24-21-45	**Basin**	0011
Longitude	139-28-08	**Sub-area**	
GIS Latitude	-24.3623661	**Lot**	2
GIS Longitude	139.4690122	**Plan**	SP127186
Easting	344708		
Northing	7304798	**Map Scale**	254 - 1: 250 000
Zone	54	**Map Series**	M - Metric Series
Accuracy		**Map No**	SG54-1
GPS Accuracy		**Map Name**	BEDOURIE
Checked	Yes	**Prog Section**	

Casing

7 ***records for RN*** **316**

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	01/01/1905	1	0.00	60.70	Steel Casing		WT - Wall Thickness	254
A	01/01/1905	2	0.00	119.20	Steel Casing		WT - Wall Thickness	203
A	01/01/1905	3	0.00	362.70	Steel Casing		WT - Wall Thickness	152
A	01/01/1905	4	362.70	400.50	Open End			
A	19/01/1981	6	0.00	363.30	Steel Casing	4.760	WT - Wall Thickness	127

Bore Report

From Year:

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
X	01/01/1905	5	0.00		Grout			
X	19/01/1981	7	0.00	363.00	Grout			

Strata Logs

20 *records for RN* **316**

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	9.75	SAND AND COPIE
2	9.75	19.20	CLAY, SAND, COPIE GRAVEL
3	19.20	31.39	SOAPSTONE, DRIFT SAND, GRAVEL
4	31.39	35.97	CLAY, MUD
5	35.97	52.73	CLAY CARRING COPIE
6	52.73	77.72	CLAY
7	77.72	86.87	FINE SAND AND CLAY
8	86.87	100.58	DRIFT SAND GRAVEL
9	100.58	104.24	SAND
10	104.24	114.30	SAND AND CLAY
11	114.30	201.17	SHALE
12	201.17	227.08	SHALE LAYERS CLAY
13	227.08	288.04	SHALE
14	288.04	297.18	SAND AND COPIE
15	297.18	319.74	SHALE STREAKS AND LIMESTONE
16	319.74	350.52	SHALE
17	350.52	365.15	SHALE SAND LIMESTONE AND CLAY
18	365.15	385.88	SANDSTONE
19	385.88	390.14	SAND GRAVEL AND SANDSTONE

Bore Report

From Year:

Rec	Top (m)	Bottom (m)	Strata Description
20	390.14	400.51	SANDSTONE

Stratigraphies

6 *records for RN* **316**

Source	Rec	Top (m)	Bottom (m)	Strata Description
DNR	1	0.00	31.40	QUATERNARY ALLUVIUM
DNR	2	31.40	121.90	MACKUNDA FORMATION
DNR	3	121.90	192.00	ALLARU MUDSTONE
DNR	4	192.00	214.90	TOOLEBUC FORMATION
DNR	5	214.90	342.60	WALLUMBILLA FORMATION
DNR	6	342.60	400.50	LONGSIGHT SANDSTONE

Aquifers

7 *records for RN* **316**

Rec	Top (m)	Bottom (m)	Lithology	Date	SWL (m)	Flow	Quality	Yield (L/s)	Contr	Cond	Formation Name
1	12.50		SDST - Sandstone							PS	QUATERNARY ALLUALUV
2	77.70		SDST - Sandstone							PS	MACKUNDA FORMATION
3	107.60		SDST - Sandstone							PS	MACKUNDA FORMATION
4	354.20		SDST - Sandstone							PS	LONGSIGHT SANDSFORM
5	362.70	366.70	SDST - Sandstone							PS	LONGSIGHT SANDSFORM
6	377.00	389.50	SDST - Sandstone							PS	LONGSIGHT SANDSFORM
7	390.10		SDST - Sandstone							PS	LONGSIGHT SANDSFORM

Pump Tests Part 1

15 *records for RN* **316**

Pipe	Date	Rec	RN of Pumped 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 (mins)	Pres on Arriv (m)	Q on Arriv (l/s/)

Bore Report

From Year:

Pipe	Date	Rec	RN of Pumped 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 (mins)	Pres on Arriv (m)	Q on Arriv (l/s/)
A	11/08/1905	1	316				F/F							139.36
A	24/10/1921	1					F/F							71.18
A	18/09/1922	1					F/F							70.18
A	20/10/1923	1					F/F							69.19
A	16/07/1925	1					F/F							57.73
A	20/06/1930	1					F/F							61.49
A	15/11/1938	1					F/F							65.31
A	01/07/1947	20	316	362.70	390.10	0.00	F/F	FR						15.78
A	21/10/1952	1					F/F							40.03
A	20/04/1953	1					F/F							40.03
A	11/08/1965	1					F/F							46.01
A	03/06/1970	1	316			1.50	ART	ST					1.08	44.28
A	18/01/1981	1	316			0.80	ART	DT						
A	03/07/1990	1	316			1.00	ART	FR ST					51.79	
A	01/08/2001	1	316			0.73	ART	ST FR ST					52.30	

Pump Tests Part 2

15 ***records for RN*** **316**

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	11/08/1905	1		94.49				139.36		139.36						
A	24/10/1921	1						71.18		71.18						
A	18/09/1922	1						70.18		70.18						
A	20/10/1923	1						69.19		69.19						

Bore Report

From Year:

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	16/07/1925	1						57.73		57.73						
A	20/06/1930	1						61.49		61.49						
A	15/11/1938	1		57.75				65.31		65.31						
A	01/07/1947	20						63.38		63.38						
A	21/10/1952	1						40.03		40.03						
A	20/04/1953	1						40.03		40.03						
A	11/08/1965	1						58.66		58.66						
A	03/06/1970	1	120	47.55				59.60	120	59.60					177	
A	18/01/1981	1	342	51.83			37.70	34.48	120			33.60	0.00		155	
A	03/07/1990	1	240	54.04			43.52	41.65	30	44.28	56.06				144	
A	01/08/2001	1	230	52.30			50.26	41.28	60	45.45	54.13				145	

Bore Conditions

1 *records for RN* 316

	Drain Details			*Headworks*									
Date	Tot Len (km)	Max Run (km)	Cond	Ret Len (km)	Cond	Ctrl	Leak	Flow Irreg	Precip	Est Use (ML/yr)	Num of Cattle	Num of Sheep	Comments
01/08/2001					Good	F							

Elevations

1 *records for RN* 316

Pipe	Date	Elevation (m)	Precision		Datum	Meas	Point	Survey Source
X	01/01/2100	91.40	SVY	Surveyed	STD - State Datum	N	Natural Surface	

Water Analysis Part 1

4 *records for RN* 316

Bore Report

From Year:

Pipe	Date	Rec	Analyst	Analysis No	Depth (m)	Meth	Src	Cond (uS/cm)	pH	Si (mg/L)	Total Ions (mg/L)	Total Solids (mg/L)	Hard	Alk	Fig. of Merit	SAR	RAH
A	01/01/1966	1	GCL	33000		PU	GB	900	8.3		741.60	535.74	8	348			6.80
A	03/06/1970	1	GCL	46449		PU	GB	900	8.3		763.35	543.76	11	354		29.1	6.86
A	01/01/1975	1	GCL	66036		PU	GB	935	8.2		708.40	500.51	21	342		18.6	6.41
A	03/07/1990	1	GCL	137085		MA	GR	863	8.5	17	733.52	546.47	9	345	0.0	32.2	6.71

Water Analysis Part 2

4 *records for RN* **316**

Pipe	Date	Rec	Na	K	Ca	Mg	Mn	HCO3	Fe	CO3	Cl	F	NO3	SO4	Zn	Al	B	Cu
A	01/01/1966	1	226.0		3.2	0.0		405.0		9.6	92.0	0.80		5.0				
A	03/06/1970	1	224.0		4.0	0.3		432.0			100.0	0.05	0.0	3.0				
A	01/01/1975	1	195.0	3.0	7.5	0.5		409.0		3.7	89.0	0.70						
A	03/07/1990	1	221.9	4.7	3.1	0.3	0.00	402.2	0.00	8.9	91.5	0.84	0.0	0.0				

Water Levels

0 *records for RN* **316**

Wire Line Logs

3 *records for RN* **316**

Date	Run	Type		Source	Top (m)	Bottom (m)	Operator	Comments
12/10/2000	1	CALU	Caliper Unspecified	BEDOURIE S C	-2.00	380.950		
12/10/2000	1	GR	Gamma Ray	BEDOURIE S C	-1.14	381.110		
23/10/2012	1	CAL3	Caliper 3 arm	PAPER	0.00	379.000		

Field Measurements

4 *records for RN* **316**

Pipe	Date	Depth (m)	Conduct (uS/cm)	pH	Temp (C)	NO3 (mg/L)	DO2 (mg/L)	Eh (mV)	Alkalinity (mV)	Samp	Method	Samp	Source
A	11/08/1965				43.0					PU	Pump - Other or Flowing Bore	GB	Groundwater - from Bore
A	18/01/1981				44.0					PU	Pump - Other or Flowing Bore	GB	Groundwater - from Bore

Bore Report

From Year:

Pipe	Date	Depth (m)	Conduct (uS/cm)	pH	Temp (C)	NO3 (mg/L)	DO2 (mg/L)	Eh (mV)	Alkalinity (mV)	Samp	Method	Samp	Source
A	03/07/1990				45.0					PU	Pump - Other or Flowing Bore	GB	Groundwater - from Bore
A	01/08/2001		897		44.0					PU	Pump - Other or Flowing Bore	GB	Groundwater - from Bore

Special Water Analysis

0 ***records for RN*** **316**

Bore Report

From Year:

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Report Date: 25/09/2023 20:50

Bore Report

From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
184306	Artesian - Controlled Flow	Existing	09/11/2019	Longreach	2750 - DIAMANTINA

Details

Description			
Parish	6000 - NO LONGER USED		
Original Name			
Driller Name	BEALE, WILLIAM		
Drill Company	WATER DRILL AUSTRALIA		
Const Method	ROTARY MUD		
Bore Line			
D/O File No		**Polygon**	
R/O File No		**Equipment**	
H/O File No		**RN of Bore Replaced**	
Log Received Date	28/01/2020	**Data Owner**	
Roles	Town Water Supply Underground Coal Gasification (UCG) Monitoring		

Location

Latitude	24-21-42	**Basin**	0011
Longitude	139-28-07	**Sub-area**	
GIS Latitude	-24.3617714363	**Lot**	610
GIS Longitude	139.4685112412	**Plan**	EU8
Easting	344657		
Northing	7304863	**Map Scale**	
Zone	54	**Map Series**	
Accuracy		**Map No**	
GPS Accuracy		**Map Name**	
Checked	Yes	**Prog Section**	

Casing

7 ***records for RN*** **184306**

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	09/11/2019	1	0.00	120.00	Steel Casing	6.400	WT - Wall Thickness	219
A	09/11/2019	2	0.00	348.00	Steel Casing	6.400	WT - Wall Thickness	168
A	09/11/2019	3	338.00	426.00	Steel Casing	6.600	WT - Wall Thickness	141
A	09/11/2019	4	360.00	420.00	Perforated or Slotted Casing	10.000	AP - Aperture Size	141
X	09/11/2019	5	4.00	343.00	Centraliser			

Bore Report

From Year:

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
X	09/11/2019	6	0.00	120.00	Grout			270
X	09/11/2019	7	0.00	348.00	Grout			200

Strata Logs

7 *records for RN* **184306**

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	1.00	FINE SAND
2	1.00	5.00	CLAY
3	5.00	110.00	SAND FINE/MEDIUM/COURSE & SMALL GRAVEL
4	110.00	348.00	SHALE
5	348.00	360.00	SHALE & HARD BANDS OF SILTSTONE
6	360.00	420.00	SANDSTONE SOFT & FINE/MEDIUM GRAIN SIZE*
7	420.00	426.00	SHALE

Stratigraphies

0 *records for RN* **184306**

Aquifers

1 *records for RN* **184306**

Rec	Top (m)	Bottom (m)	Lithology	Date	SWL (m)	Flow	Quality	Yield (L/s)	Contr	Cond	Formation Name
1	360.00	420.00	SDST - Sandstone	09/11/2019	52.10	Y	POTABLE	100.00	Y	PS	LONGSIGHT SANDSTONE

Pump Tests Part 1

0 *records for RN* **184306**

Pump Tests Part 2

0 *records for RN* **184306**

Bore Conditions

0 *records for RN* **184306**

Elevations

0 *records for RN* **184306**

Bore Report

From Year:

Water Analysis Part 1	**0**	***records for RN***	**184306**
Water Analysis Part 2	**0**	***records for RN***	**184306**
Water Levels	**0**	***records for RN***	**184306**
Wire Line Logs	**0**	***records for RN***	**184306**
Field Measurements	**0**	***records for RN***	**184306**
Special Water Analysis	**0**	***records for RN***	**184306**

Bore Report

From Year:

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Report Date: 25/09/2023 14:42

Bore Report

From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
14645	Artesian - Controlled Flow	Existing	25/04/1961	Longreach	2750 - DIAMANTINA

Details

Description	TOWN RESERVE		
Parish	3391 - MUDDAWARRY		
Original Name	BIRDSVILLE TOWN BORE		
Driller Name			
Drill Company			
Const Method	ROTARY RIG		
Bore Line			
D/O File No	140/044/0003	**Polygon**	
R/O File No	25/12/B/2	**Equipment**	NE
H/O File No	00065	**RN of Bore Replaced**	
Log Received Date		**Data Owner**	
Roles	GAB Monitoring Water Supply		

Location

Latitude	25-53-48	**Basin**	0021
Longitude	139-21-07	**Sub-area**	
GIS Latitude	-25.8966313	**Lot**	30
GIS Longitude	139.3518761	**Plan**	SP112844
Easting	334901		
Northing	7134726	**Map Scale**	254 - 1: 250 000
Zone	54	**Map Series**	M - Metric Series
Accuracy		**Map No**	SG54-5
GPS Accuracy		**Map Name**	BIRDSVILLE
Checked	Yes	**Prog Section**	

Casing

8 ***records for RN*** **14645**

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	05/05/1961	1	0.00	144.20	Steel Casing		WT - Wall Thickness	203
A	05/05/1961	2		1221.03	Steel Casing		WT - Wall Thickness	152
A	05/05/1961	3	1173.18	1219.20	Perforated or Slotted Casing		AP - Aperture Size	
A	05/05/1961	4			Grout			
A	16/06/1987	1	0.00	208.00	Steel Casing	4.760	WT - Wall Thickness	127

Bore Report

From Year:

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	16/06/1987	2	0.00	208.00	Grout			127
A	16/06/1987	3	0.00	182.00	Grout			152
A	16/06/1987	4	0.00	10.00	Grout			203

Strata Logs

16 *records for RN* **14645**

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	27.43	STONE
2	27.43	38.10	SANDSTONE
3	38.10	67.06	CLAY
4	67.06	275.84	MUDSTONE, SANDSTONE BANDS
5	275.84	455.68	SHALE AND SANDSTONE
6	455.68	496.82	SANDSTONE, SHALE AND COAL
7	496.82	710.18	SHALE BANDS SANDSTONE
8	710.18	752.86	SHALE BANDS LIMESTONE
9	752.86	792.48	HARD SHALE
10	792.48	821.44	SANDY SHALE
11	821.44	1112.52	HARD SHALE
12	1112.52	1176.53	SHALE AND SANDSTONE
13	1176.53	1221.03	SANDSTONE
902			00/04/1961 SWL +133.70 M TMP NUL C
903			00/04/1961 DISCH " M3D DRILLER
910	1176.50		QUALITY DESCRIP/CONDUCT: 820

Stratigraphies

9 *records for RN* **14645**

Bore Report

From Year:

Source	Rec	Top (m)	Bottom (m)	Strata Description
DNR	1	0.00		QUATERNARY DUNE SANDS
DNR	2		49.40	TERTIARY
DNR	3	49.40	423.70	WINTON FORMATION
DNR	4	423.70	589.80	MACKUNDA FORMATION
DNR	5	589.80	908.30	ALLARU MUDSTONE
DNR	6	908.30	918.40	TOOLEBUC FORMATION
DNR	7	918.40	1126.50	WALLUMBILLA FORMATION
DNR	8	1126.50	1175.60	CADNA-OWIE FORMATION
DNR	9	1175.60	1221.03	HOORAY SANDSTONE

Aquifers

1 *records for RN* **14645**

Rec	Top (m)	Bottom (m)	Lithology	Date	SWL (m)	Flow	Quality	Yield (L/s)	Contr	Cond	Formation Name
1	1176.50	1219.20	SDST - Sandstone			Y			Y	PS	HOORAY SANDSTONE

Pump Tests Part 1

9 *records for RN* **14645**

Pipe	Date	Rec	RN of Pumped 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 (mins)	Pres on Arriv (m)	Q on Arriv (l/s/)
A	01/05/1961	20	14645	1176.50		0.00	ART	FR DT ST					126.77	1.05
A	01/12/1964	20	14645	1176.50		0.00	ART	ST					123.96	1.05
A	10/06/1970	1					ART	FR ST DT					52.82	
A	03/10/1986	1				0.05	ART	FR DT			0.00	95	72.42	
A	18/06/1988	1	14645			0.87	ART	FR ST DT					111.75	6.02
A	30/07/1992	1	14645			1.00	ART	ST					97.05	
A	08/06/2001	1	14645			1.01	ART	ST FR ST					53.63	

Bore Report

From Year:

Pipe	Date	Rec	RN of Pumped 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 (mins)	Pres on Arriv (m)	Q on Arriv (l/s/)
A	11/08/2004	1	14645	1176.53	1219.20	0.91	ART	ST FR ST					43.11	
A	29/06/2010	1	14645	1176.55	1219.20	0.87	ART	ST FR ST					44.74	

Pump Tests Part 2

9 *records for RN* **14645**

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	01/05/1961	20		127.62				40.05		39.39	146.00	37.81			95	
A	01/12/1964	20		126.78				40.03			128.60				95	
A	10/06/1970	1		123.96				32.61		48.49	133.80	18.32			95	
A	03/10/1986	1	180	120.80				44.75	1	46.32	132.28	41.96			95	
A	18/06/1988	1	280	121.08			110.25	37.09	15	38.62	132.00	34.30			94	
A	30/07/1992	1	60	126.67	60						133.60				96	
A	08/06/2001	1	135	116.46			110.84	41.94	1	43.61	121.39	38.52			96	
A	11/08/2004	1	231	116.91			111.05	41.37	60	42.99	129.76	38.86			95	
A	29/06/2010	1	260	116.03	120		111.50	40.42	120	42.12	131.00	37.82			95	

Bore Conditions

4 *records for RN* **14645**

Date	*Drain Details*			*Headworks*									
	Tot Len (km)	Max Run (km)	Cond	Ret Len (km)	Cond	Ctrl	Leak	Flow Irreg	Precip	Est Use (ML/yr)	Num of Cattle	Num of Sheep	Comments
03/10/1986													Test aborted as mercury was lost in 2nd manometer making pressure readings dubius.
08/06/2001					Good	F							

Bore Report

From Year:

Date	Tot Len (km)	Max Run (km)	Cond	Ret Len (km)	Cond	Ctrl	Leak	Flow Irreg	Precip	Est Use (ML/yr)	Num of Cattle	Num of Sheep	Comments
11/08/2004	2.0	2.0	Fair							866.4			
29/06/2010					Good	F							Artesian facility, 1 year monitoring bore. Note bore water go's completly on the boil @ around the 103 degree mark rendering the orifice meter unmeasurable, although back pressure observations were recorde through out the entire flow recession test.

Elevations

2 *records for RN* **14645**

Pipe	Date	Elevation (m)	Precision		Datum	Meas	Point	Survey Source
X	05/05/1961	48.80	SVY	Surveyed	STD - State Datum	N	Natural Surface	
X	29/06/2010	47.00	GPS	Global Positioning System	ASD - Assumed Datum	N	Natural Surface	

Water Analysis Part 1

4 *records for RN* **14645**

Pipe	Date	Rec	Analyst	Analysis No	Depth (m)	Meth	Src	Cond (uS/cm)	pH	Si (mg/L)	Total Ions (mg/L)	Total Solids (mg/L)	Hard	Alk	Fig. of Merit	SAR	RAH
A	10/06/1970	1	GCL	046450	1176.00	PU	GB	820	8.1		714.00	0.00	8	358	0.0	32.4	7.01
A	02/10/1986	1	GCL	117988	1221.00	PU	GB	810	8.5	62	680.00	520.00	10	325	0.0	25.3	6.30
A	11/08/2004	1	GCL	216015	1219.20	PU	GB	807	8.0	72	659.83	524.85	3	339	0.0	49.1	6.72
X	29/06/2010	1	GCL	301453	1176.53	PU	GB	812	8.4	73	675.00	539.00	4	347	0.0	40.0	6.80

Water Analysis Part 2

4 *records for RN* **14645**

Pipe	Date	Rec	Na	K	Ca	Mg	Mn	HCO3	Fe	CO3	Cl	F	NO3	SO4	Zn	Al	B	Cu
A	10/06/1970	1	204.0		3.0			437.0			66.0	2.00		2.0				
A	02/10/1986	1	195.0	5.1	1.8	0.0	0.02	410.0	0.02	9.0	72.0	1.80	0.0	2.3				
A	11/08/2004	1	185.6	5.3	1.0	0.0	0.01	407.8	0.00	2.6	55.2	1.73	0.0	0.5	0.00	0.05	0.46	0.00

Bore Report

From Year:

Pipe	Date	Rec	Na	K	Ca	Mg	Mn	HCO3	Fe	CO3	Cl	F	NO3	SO4	Zn	Al	B	Cu
X	29/06/2010	1	193.0	5.2	1.7	0.1	0.01	410.0	<0.01	6.0	56.0	1.70	<0.5	1.0	<0.01	0.05	0.49	<0.03

Water Levels

1 ***records for RN*** **14645**

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
X	05/05/1961		133.70	N	Natural Surface		NR	Not Recorded	NR	NR	Not Recorded	130	Data is of unknown quality

Wire Line Logs

7 ***records for RN*** **14645**

Date	Run	Type		Source	Top (m)	Bottom (m)	Operator	Comments
05/10/1961	1	TEMPL	Temperature	DNR	0.00	1210.000		TEMP AT TOP 98.3 DEG C. TEMP AT BOTTOM 113.9 DEG C
02/10/2000	1	CCL	Casing Collar Locator	DNR	0.00	1211.000		CASING 0-1211M. UNKNOWN BELOW 1211M.
02/10/2000	1	CAL		DNR	0.00	1211.000		CASING 5" 0-207M. CASING 6" 207-1186M. UNKNOWN BELOW 1186M.
02/10/2000	1	GR	Gamma Ray	DNR	0.00	1224.000		SANDSTONE BANDED 1125-1179M. SANDSTONES GOOD 1179-1190, 1210-1224M.
09/10/2000	1	GR	Gamma Ray	BIRDSVILLE S C	0.14	1225.790		
09/10/2000	2	GR	Gamma Ray	BIRDSVILLE S C	-0.19	1225.660		
10/10/2000	1	CALU	Caliper Unspecified	BIRDSVILLE S C	-1.91	1186.590		

Field Measurements

4 ***records for RN*** **14645**

Pipe	Date	Depth (m)	Conduct (uS/cm)	pH	Temp (C)	NO3 (mg/L)	DO2 (mg/L)	Eh (mV)	Alkalinity (mV)	Samp	Method	Samp	Source
A	03/10/1986				98.5								
A	08/06/2001		747	8.4	99.9					PU	Pump - Other or Flowing Bore		
A	11/08/2004		753	7.3	97.8					PU	Pump - Other or Flowing Bore	GB	Groundwater - from Bore
A	29/06/2010		766	7.8	99.0					PU	Pump - Other or Flowing Bore	GB	Groundwater - from Bore

Bore Report

From Year:

Special Water Analysis

0 *records for RN* **14645**

Bore Report

From Year:

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APPENDIX B

HISTORIC WATER SAMPLING TRENDS BEDOURIE & BIRDSVILLE

Table 18: Bedourie historic verification monitoring data.

Bedourie Water Supply (2009- 2021)											
Analyte	Units	Summary of Results						Guideline Values			
		Samples Tested	Maximum Value	Mean Value	Minimum Values	Std Dev	95th %	Health	Exceedances	Aesthetic	Exceedances
Heterotrophic Plate Count	CFU/100ml	8	3800	999.5	1	1518.23	3660				
True Colour	HU	29	2	0.803	0.5	0.482	1.96			15	0
Dissolved Calcium	mg/L	10	4.9	3.53	2	0.854	4.765				
Dissolved Magnesium	mg/L	9	1	0.353	0.1	0.24	0.76				
Dissolved Potassium	mg/L	9	3.7	3.122	2.4	0.346	3.58				
Ammonia	mg/L	9	0.86	0.539	0.34	0.147	0.772			0.5	5
Nitrate	mg/L	9	0.25	0.04	0.005	0.076	0.174	50	0		
Nitrite	mg/L	9	0.25	0.038	0.002	0.077	0.174	3	0		
Sulphate	mg/L	11	1	0.95	0.5	0.144	1	500	0	250	0
Antimony	mg/L	12	0.003	0.0014	0.001	0.00064	0.0025	0.003	0		
Arsenic	mg/L	12	0.003	0.0014	0.001	0.00076	0.003	0.01	0		
Barium	mg/L	12	0.083	0.069	0.06	0.0065	0.0814	2	0		
Beryllium	mg/L	12	0.003	0.001	0.0001	0.00068	0.0019	0.06	0		
Boron	mg/L	12	0.34	0.223	0.19	0.041	0.29	4	0		
Cadmium	mg/L	12	0.002	0.00087	0.0001	0.0005	0.0015	0.002	0		
Cyanide	mg/L	6	0.004	0.004	0.004	0	0.004	0.08	0		
Hexavalent Chromium as Cr(VI)	mg/L	5	0.005	0.0048	0.004	0.0004	0.005	0.05	0		

Bedourie Water Supply (2009- 2021)											
Analyte	Units	Summary of Results						Guideline Values			
		Samples Tested	Maximum Value	Mean Value	Minimum Values	Std Dev	95th %	Health	Exceedances	Aesthetic	Exceedances
Copper	mg/L	12	0.15	0.02	0.001	0.041	0.0061	2	0	1	0
Lead	mg/L	12	0.003	0.0013	0.001	0.00062	0.0026	0.01	0		
Molybdenum	mg/L	12	0.002	0.00108	0.001	0.00028	0.0015	0.05	0		
Nickel	mg/L	12	0.001	0.001	0.001	0	0.001	0.02	0		
Silver	mg/L	12	0.003	0.0011	0.0001	0.0007	0.0025	0.1	0		
Zinc	mg/L	12	0.013	0.005	0.001	0.0028	0.009			3	0
Mercury	mg/L	12	0.0005	0.00026	0.00005	0.0002	0.0005	0.001	0		
Aesthetic Guideline Exceedance											
Health Guideline Exceedance											

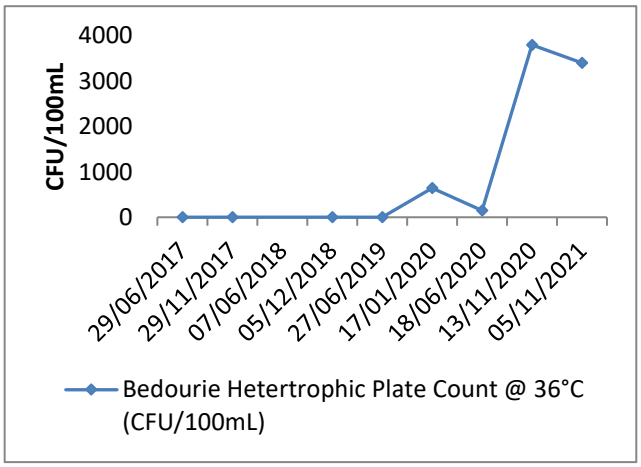


Figure 52: Bedourie verification monitoring trends for Heterotrophic Plate Count (2017- 2021).

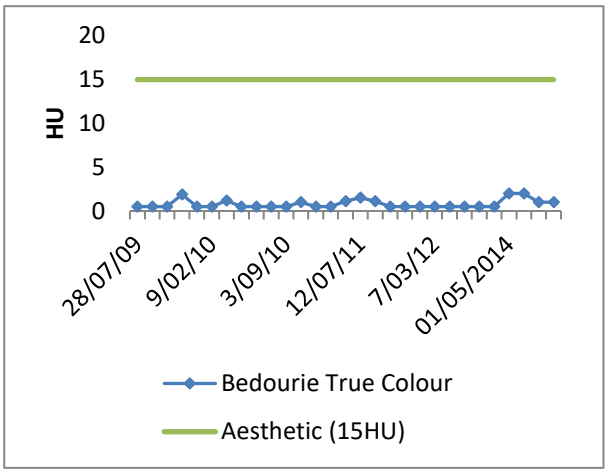


Figure 53: Bedourie verification monitoring trends for True Colour (2009- 2016).

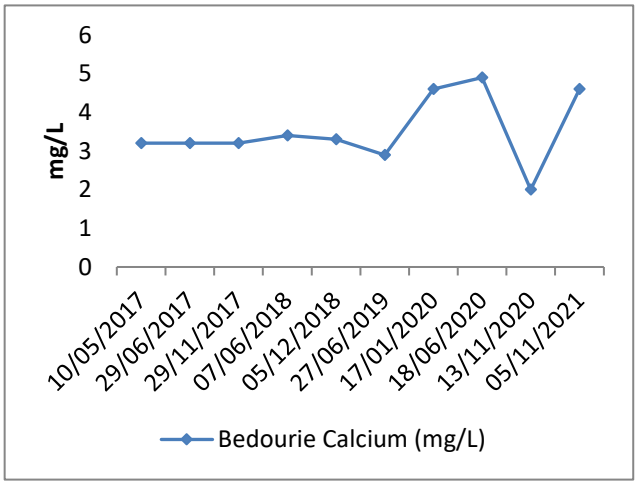


Figure 54: Bedourie verification monitoring trends for Calcium (2017- 2021).

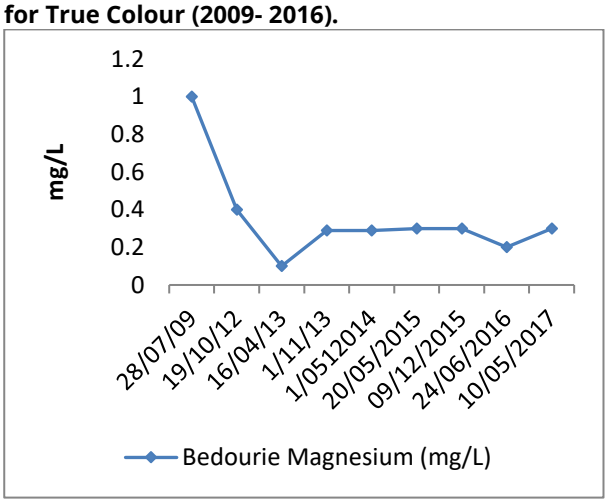


Figure 55: Bedourie verification monitoring trends for Magnesium (2009- 2017).

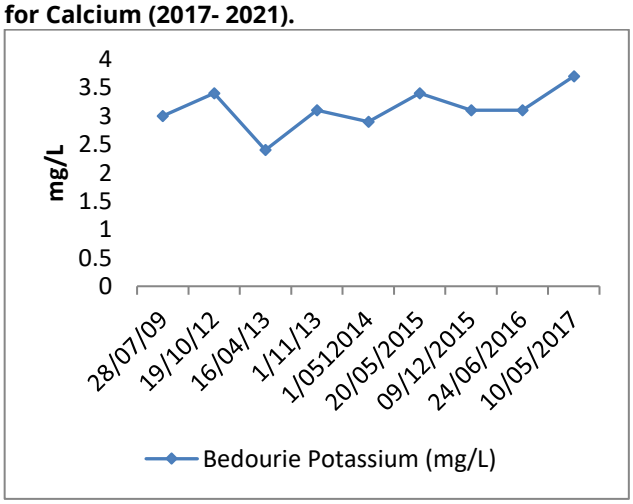


Figure 56: Bedourie verification monitoring trends for Potassium (2009- 2017).

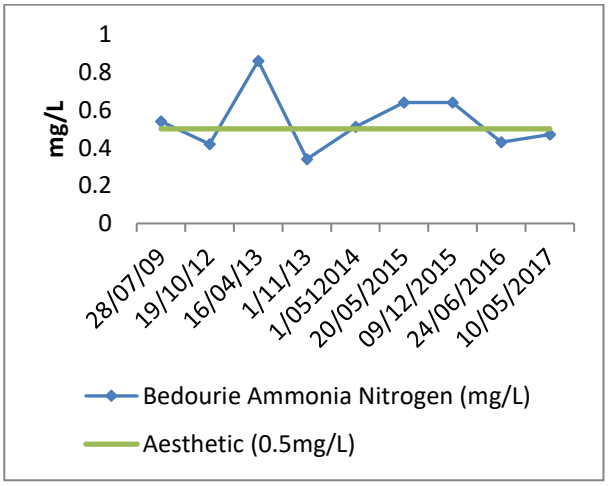


Figure 57: Bedourie verification monitoring trends for Ammonia Nitrogen (2009- 2017).

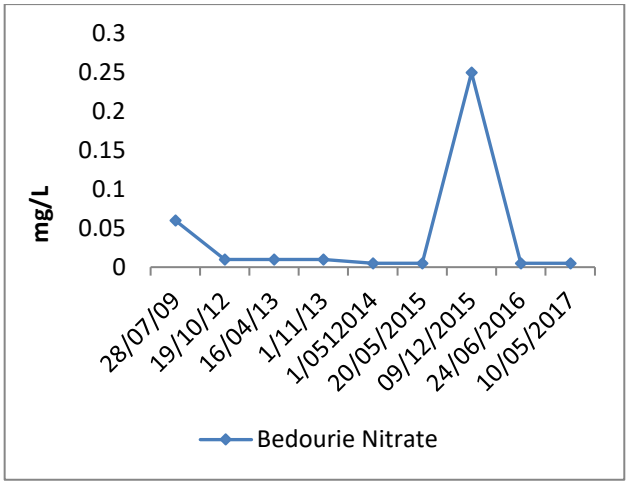


Figure 58: Bedourie verification monitoring trends for Nitrate (2009- 2017).

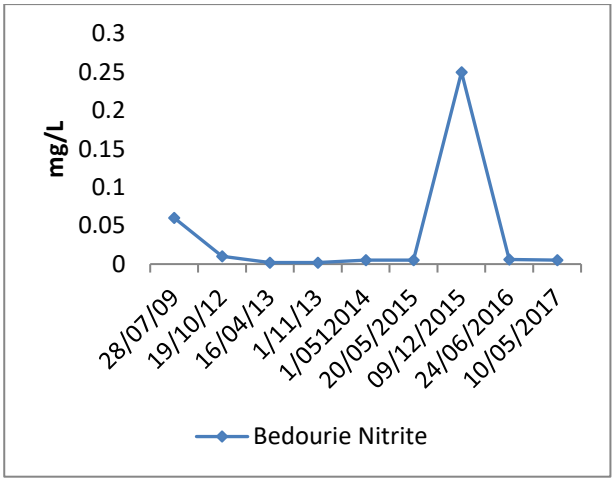


Figure 59: Bedourie verification monitoring trends for Nitrite (2009- 2017).

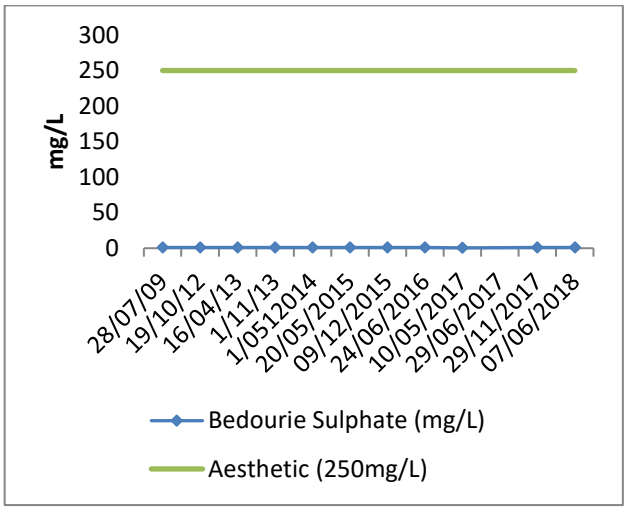


Figure 60: Bedourie verification monitoring trends for Sulphate (2009- 2018).

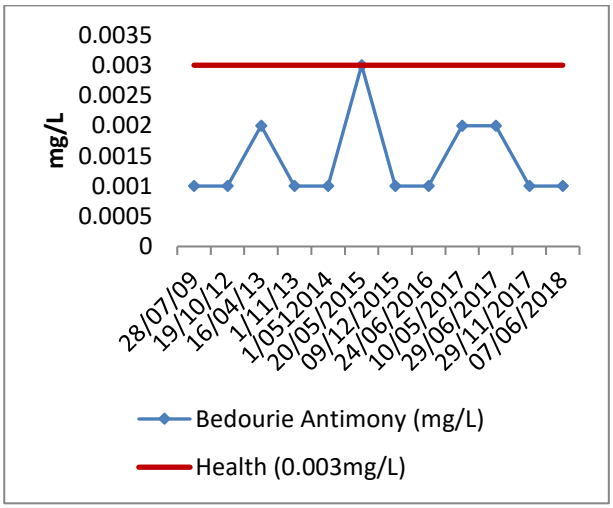


Figure 61: Bedourie verification monitoring trends for Antimony (2009- 2018).

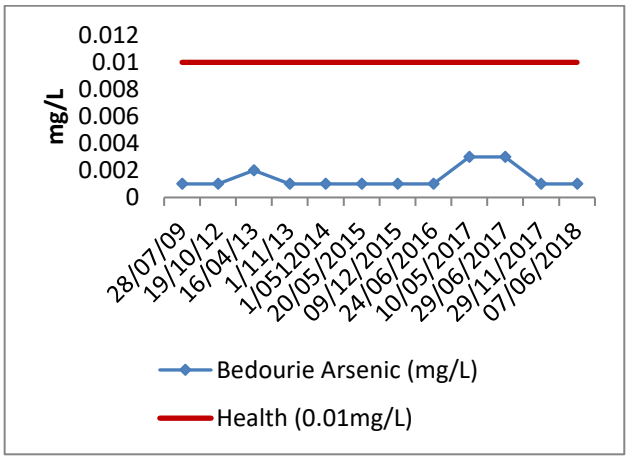


Figure 62: Bedourie verification monitoring trends for Arsenic (2009- 2018).

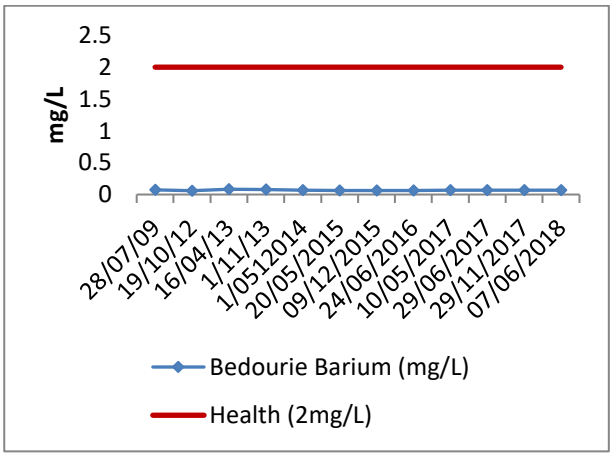


Figure 63: Bedourie verification monitoring trends for Barium (2009- 2018).

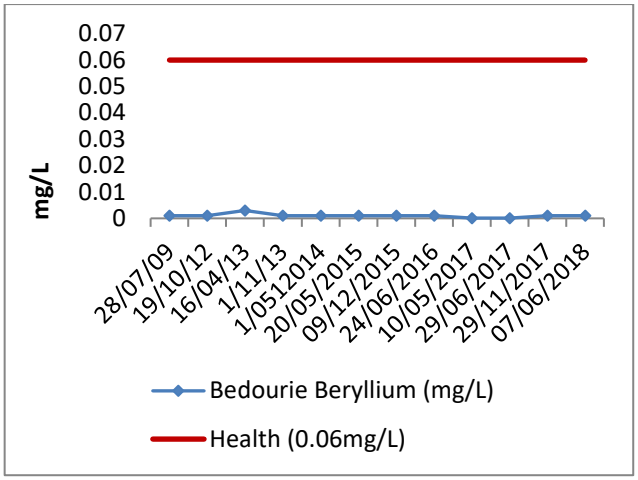


Figure 64: Bedourie verification monitoring trends for Beryllium (2009- 2018).

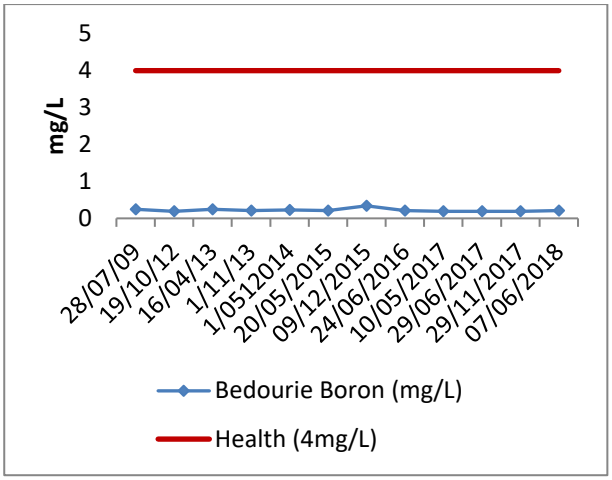


Figure 65: Bedourie verification monitoring trends for Boron (2009- 2018).

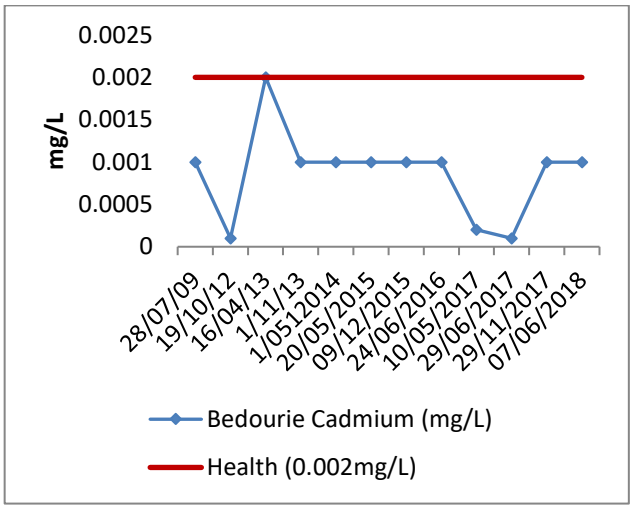


Figure 66: Bedourie verification monitoring trends for Cadmium (2009- 2018).

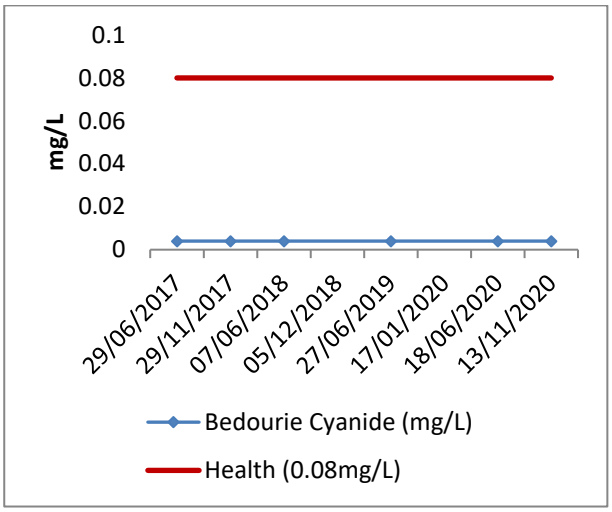


Figure 67: Bedourie verification monitoring trends for Cyanide (2017- 2020).

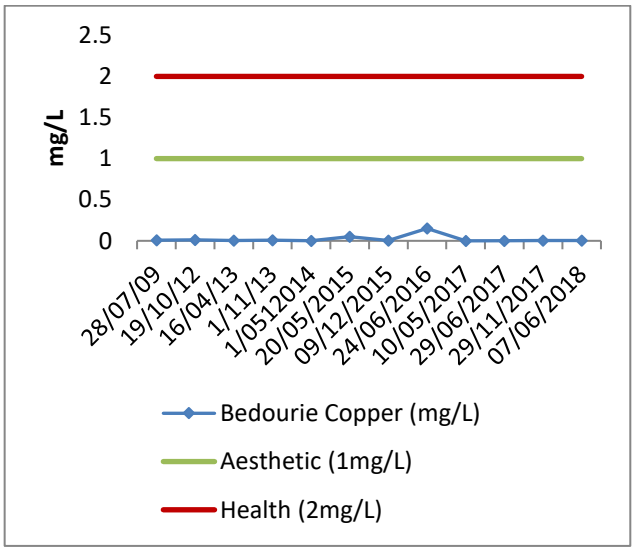


Figure 68: Bedourie verification monitoring trends for Copper (2009- 2018).

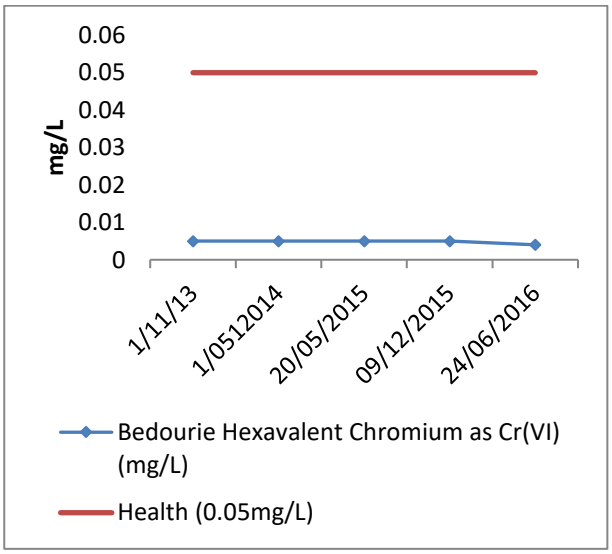


Figure 69: Bedourie verification monitoring trends for Hexavalent Chromium (2013- 2016).

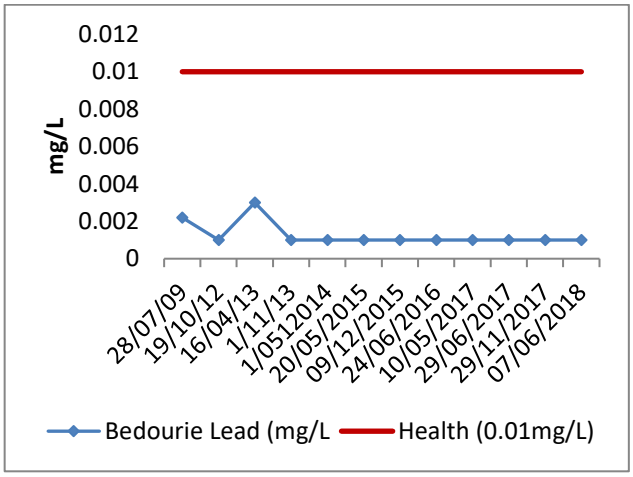


Figure 70: Bedourie verification monitoring trends for Lead (2009- 2018).

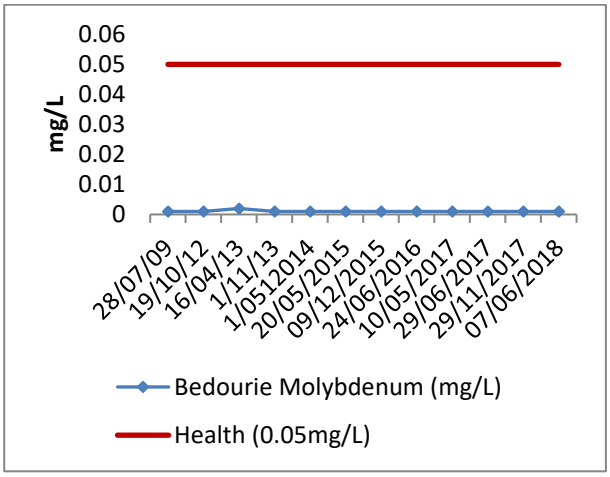


Figure 71: Bedourie verification monitoring trends for Molybdenum (2009- 2018).

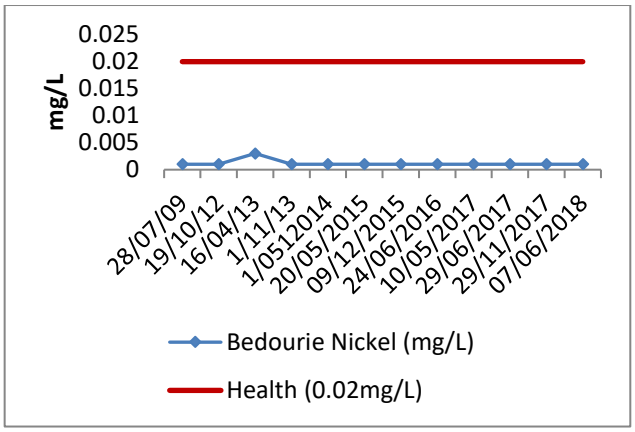


Figure 72: Bedourie verification monitoring trends for Nickel (2009- 2018).

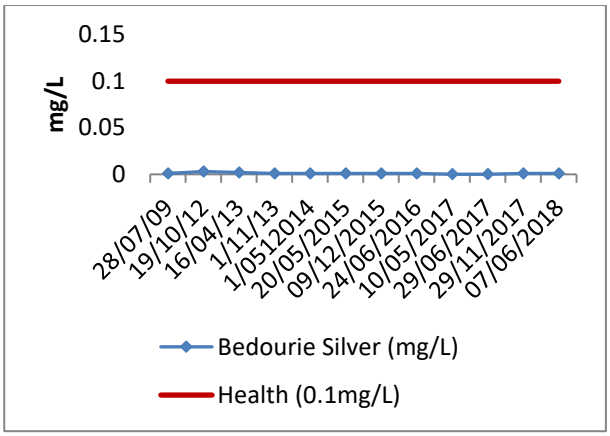


Figure 73: Bedourie verification monitoring trends for Silver (2009- 2018).

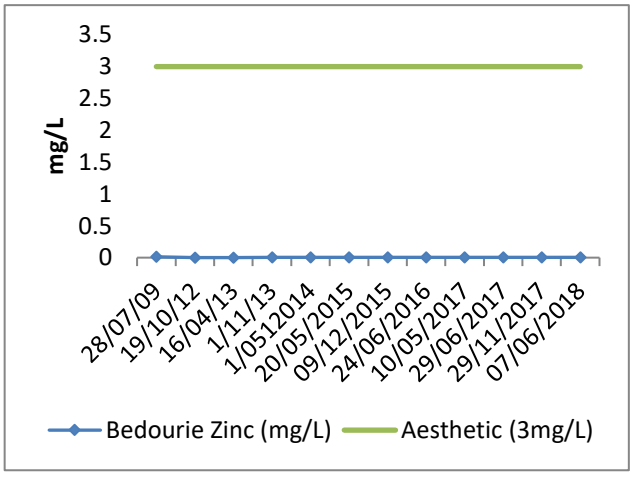


Figure 74: Bedourie verification monitoring trends for Zinc (2009- 2018).

Table 19: Birdsville historic verification monitoring data.

Birdsville Water Supply (2009- 2021)											
Analyte	Units	Summary of Results						Guideline Values			
		Samples Tested	Maximum Value	Mean Value	Minimum Values	Std Dev	95th %	Health	Exceedances	Aesthetic	Exceedances
Heterotrophic Plate Count	CFU/100ml	9	2100	305.56	1	647.58	1432				
True Colour	HU	33	2	0.78	0.5	0.49	2			15	0
Dissolved Calcium	mg/L	11	2	1.618	0.8	0.285	1.9				
Dissolved Magnesium	mg/L	7	1	0.229	0.1	0.315	0.73				
Dissolved Potassium	mg/L	7	6.2	5.64	5.1	0.33	6.11				
Ammonia Nitrogen	mg/L	7	0.33	0.156	0.05	0.1	0.303			0.5	0
Nitrate	mg/L	7	0.84	0.49	0.1	0.212	0.789	50	0		
Nitrite	mg/L	6	0.05	0.0175	0.002	0.016	0.044	3	0		
Sulphate	mg/L	10	2	1.16	1	0.29	1.64	500	0	250	0
Antimony	mg/L	9	0.001	0.001	0.001	0	0.001	0.003	0		
Arsenic	mg/L	9	0.001	0.001	0.001	0	0.001	0.01	0		
Barium	mg/L	9	0.18	0.162	0.15	0.0103	0.176	2	0		
Beryllium	mg/L	9	0.001	0.001	0.001	0	0.001	0.06	0		
Boron	mg/L	9	0.56	0.529	0.49	0.0213	0.556	4	0		
Cadmium	mg/L	9	0.001	0.001	0.001	0	0.001	0.002	0		
Cyanide	mg/L	9	0.009	0.00456	0.004	0.00157	0.007	0.08	0		
Hexavalent Chromium as Cr(VI)	mg/L	7	0.006	0.00429	0.001	0.00158	0.0057	0.05	0		
Total Chromium	mg/L	6	0.002	0.0017	0.001	0.00047	0.002				

Birdsville Water Supply (2009- 2021)											
Analyte	Units	Summary of Results						Guideline Values			
		Samples Tested	Maximum Value	Mean Value	Minimum Values	Std Dev	95th %	Health	Exceedances	Aesthetic	Exceedances
Dissolved Chromium	mg/L	8	0.001	0.001	0.001	0	0.001				
Copper	mg/L	9	0.58	0.158	0.001	0.2003	0.516	2	0	1	0
Lead	mg/L	10	0.001	0.001	0.001	0	0.001	0.01	0		
Molybdenum	mg/L	10	0.002	0.0012	0.001	0.0004	0.002	0.05	0		
Nickel	mg/L	10	0.001	0.001	0.001	0	0.001	0.02	0		
Silver	mg/L	10	0.001	0.001	0.001	0	0.001	0.1	0		
Zinc	mg/L	10	0.15	0.0303	0.005	0.0139	0.113			3	0
Mercury	mg/L	10	0.0005	0.00022	0.0001	0.00018	0.0005	0.001	0		
Aesthetic Guideline Exceedance											
Health Guideline Exceedance											

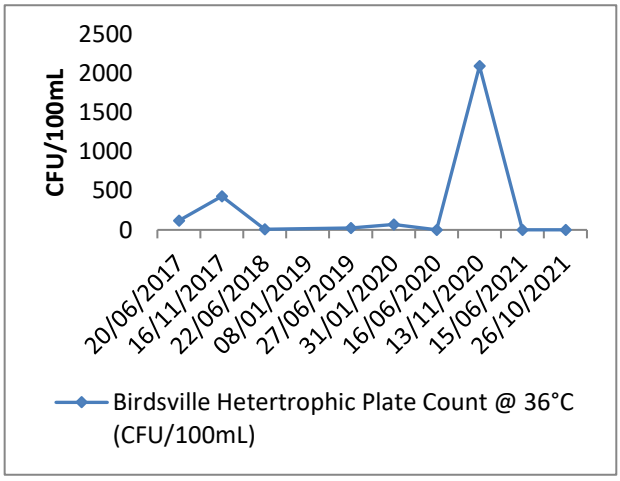


Figure 75: Birdsville verification monitoring trends for Heterotrophic Plate Count (2017- 2021).

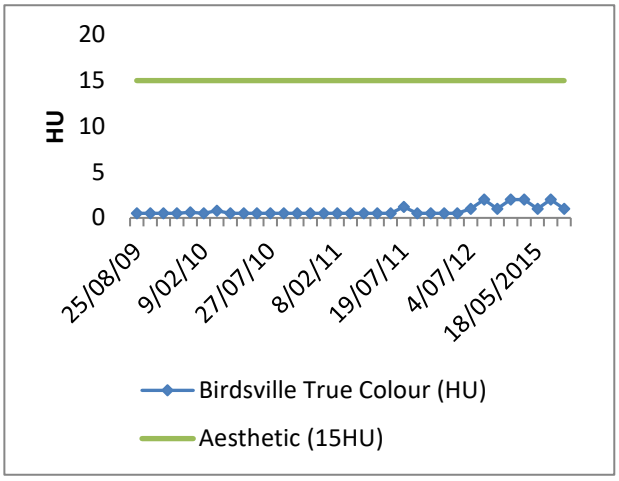


Figure 76: Birdsville verification monitoring trends for True Colour (2009- 2016).

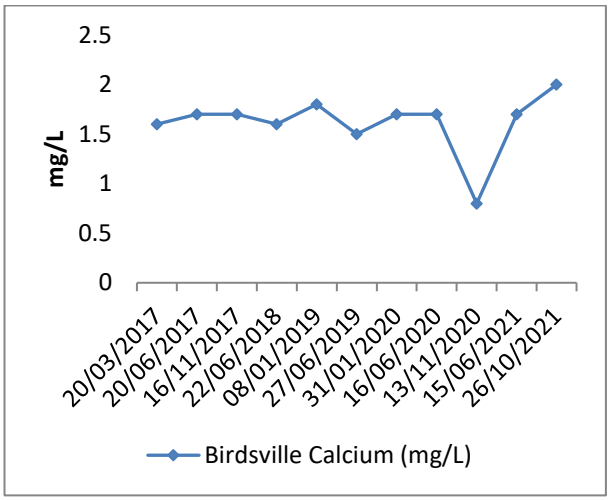


Figure 77: Birdsville verification monitoring trends for Calcium (2017- 2021).

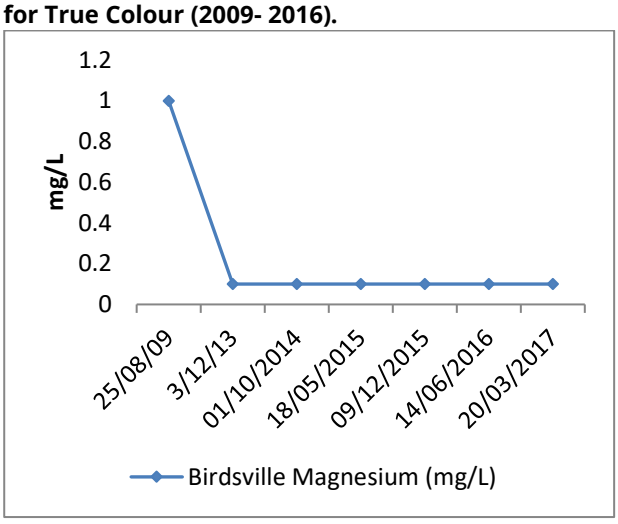


Figure 78: Birdsville verification monitoring trends for Magnesium (2009- 2017).

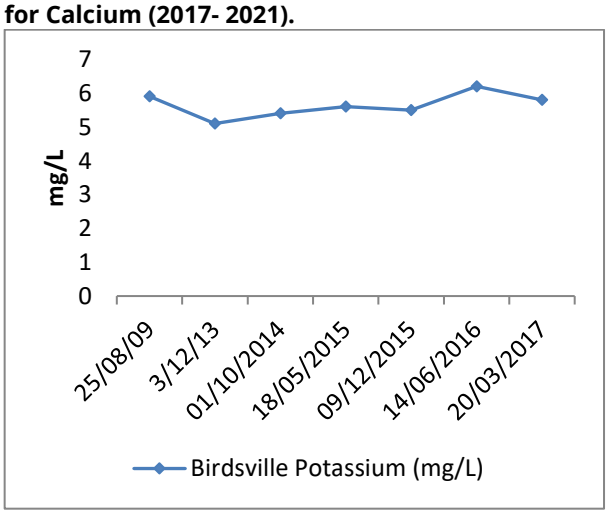


Figure 79: Birdsville verification monitoring trends for Potassium (2009- 2017).

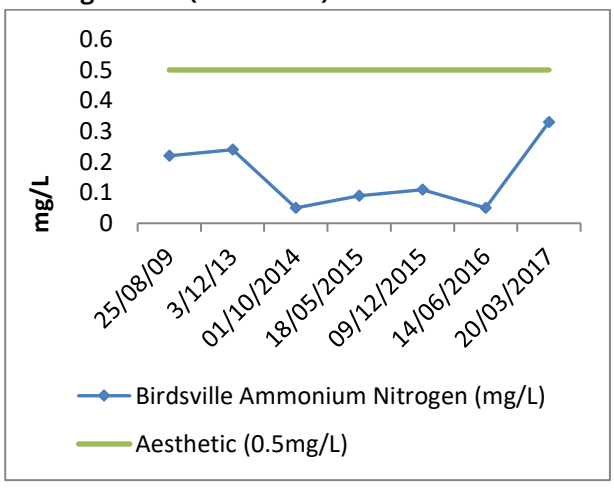


Figure 80: Birdsville verification monitoring trends for Ammonium Nitrogen (2009- 2017).

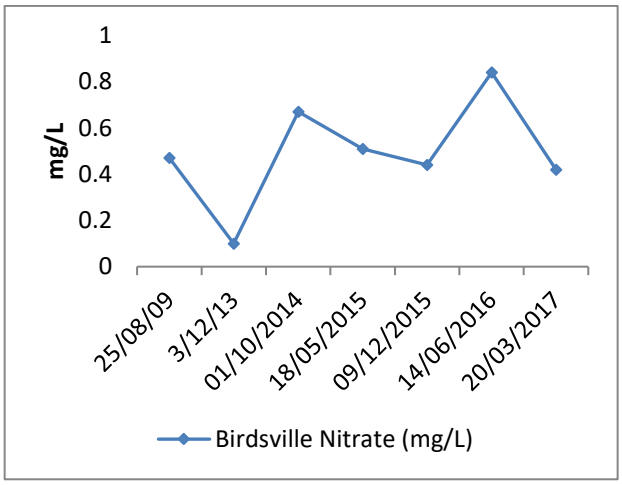


Figure 81: Birdsville verification monitoring trends for Nitrate (2009- 2017).

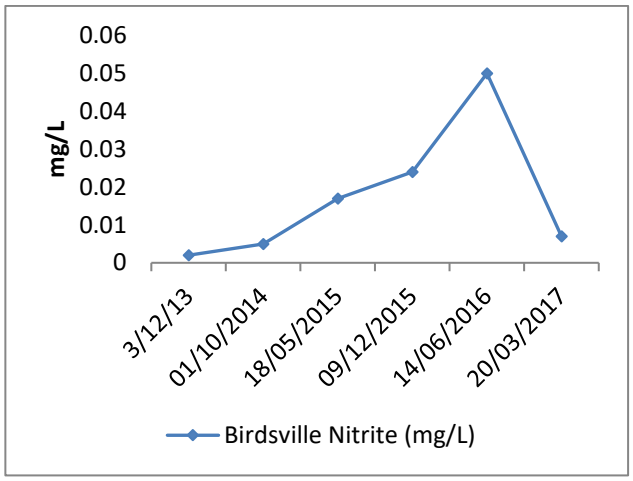


Figure 82: Birdsville verification monitoring trends for Nitrite (2013- 2017).

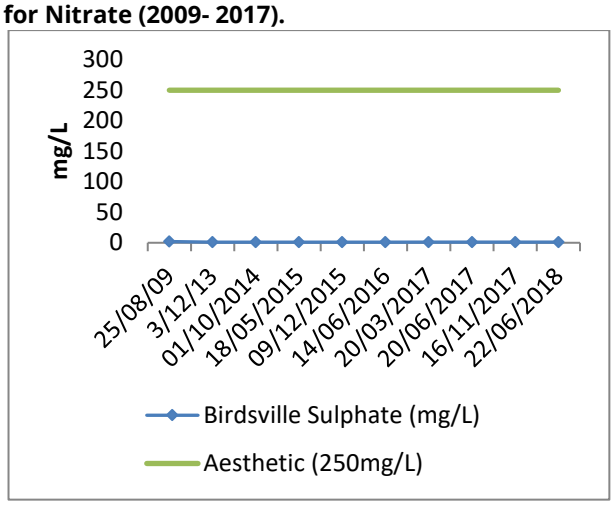


Figure 83: Birdsville verification monitoring trends for Sulphate (2009- 2018).

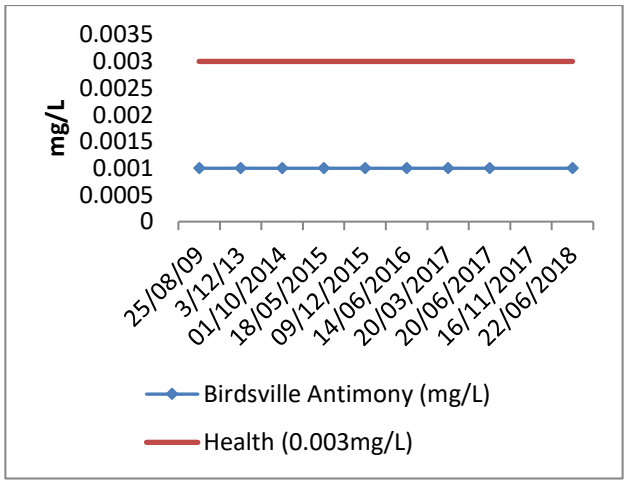


Figure 84: Birdsville verification monitoring trends for Antimony (2009- 2018).

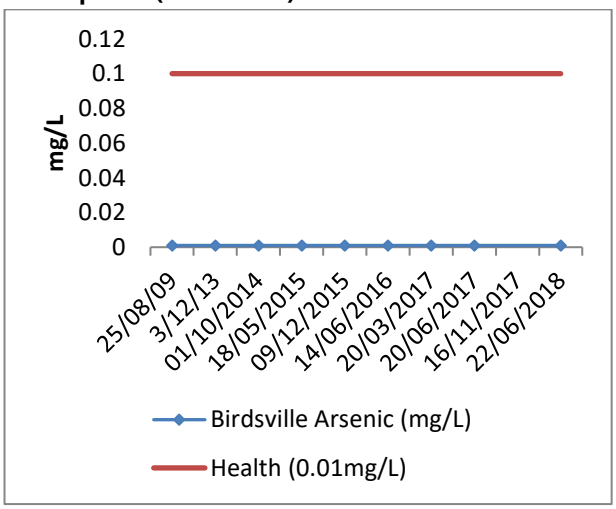


Figure 85: Birdsville verification monitoring trends for Arsenic (2009- 2018).

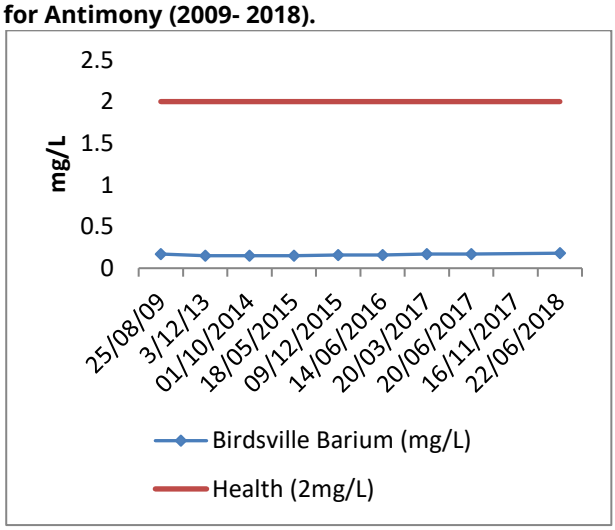


Figure 86: Birdsville verification monitoring trends for Barium (2009- 2018).

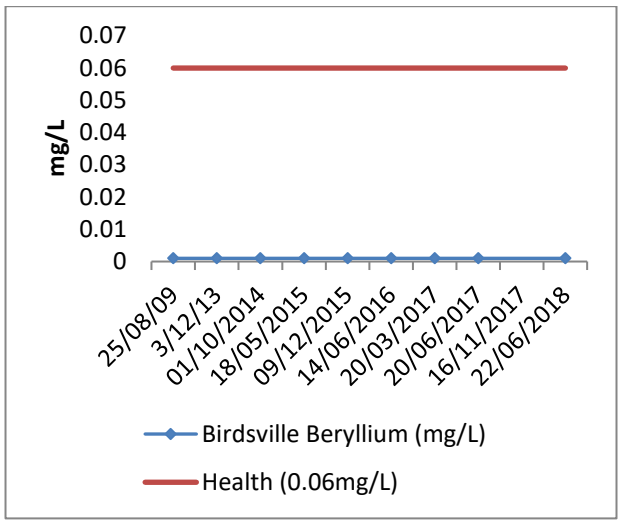


Figure 87: Birdsville verification monitoring trends for Beryllium (2009- 2018).

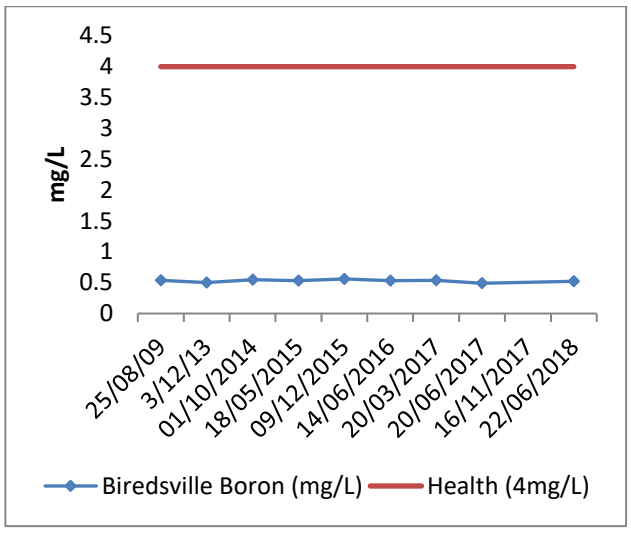


Figure 88: Birdsville verification monitoring trends for Boron (2009- 2018).

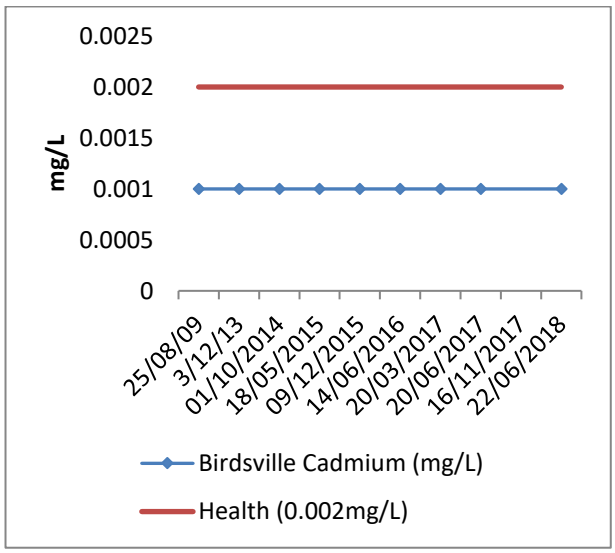


Figure 89: Birdsville verification monitoring trends for Cadmium (2009- 2018).

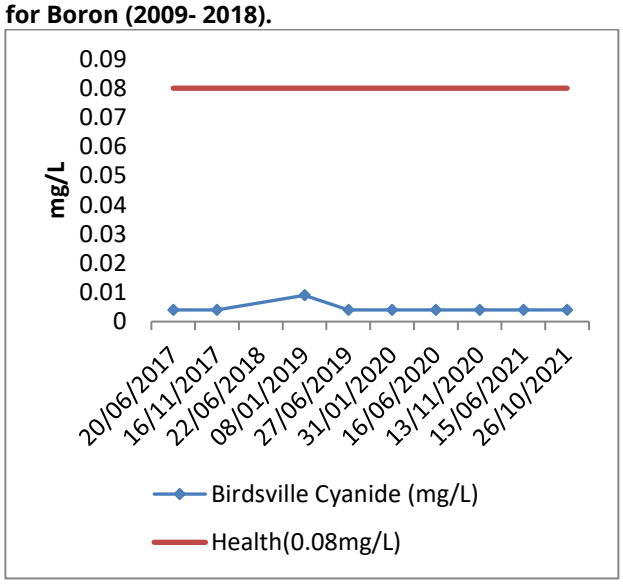


Figure 90: Birdsville verification monitoring trends for Cyanide (2017- 2021).

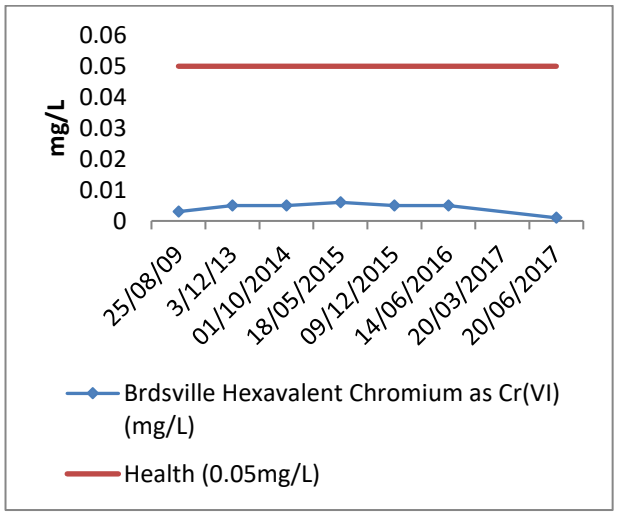


Figure 91: Birdsville verification monitoring trends for Hexavalent Chromium (2009- 2017).

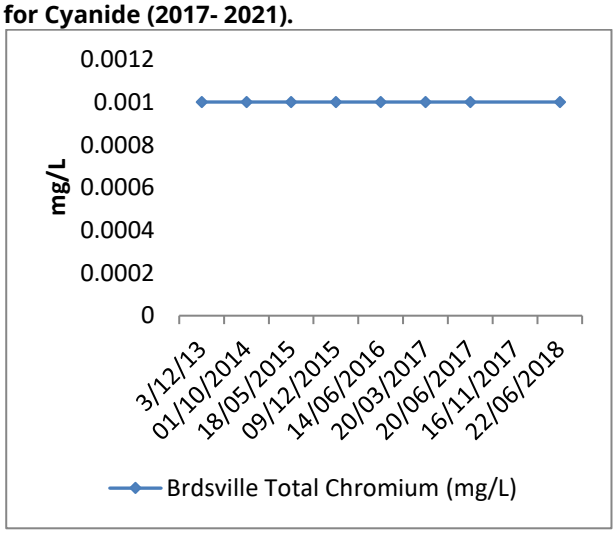


Figure 92: Birdsville verification monitoring trends for Total Chromium (2013- 2018).

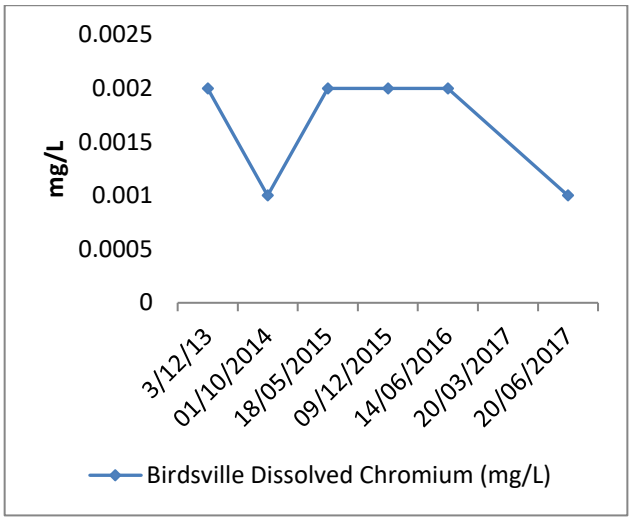


Figure 93: Birdsville verification monitoring trends for Dissolved Chromium (2013- 2017).

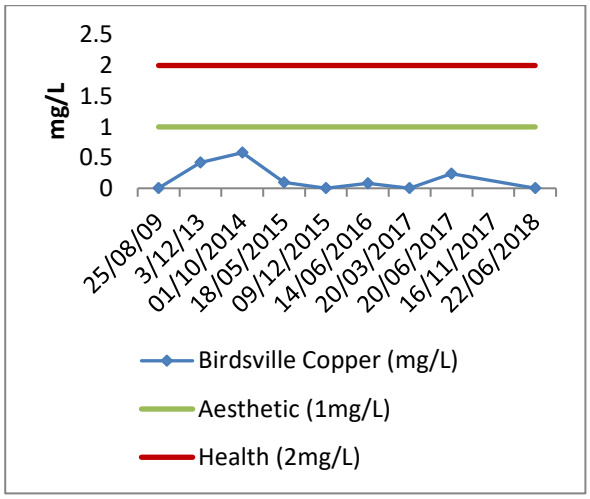


Figure 94: Birdsville verification monitoring trends for Copper (2009- 2018).

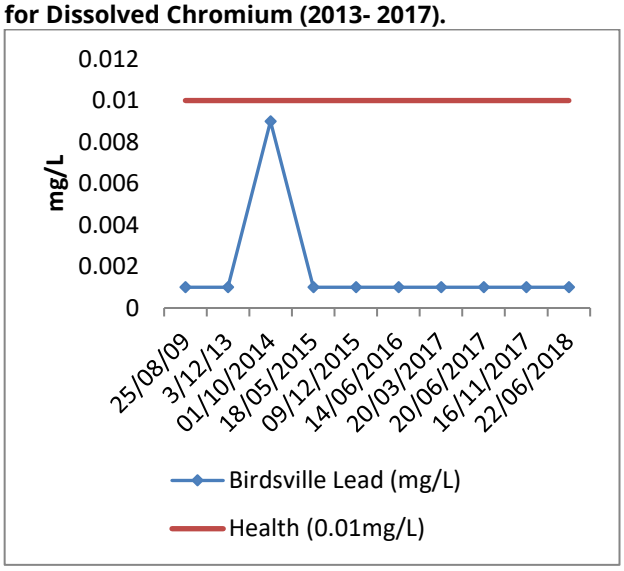


Figure 95: Birdsville verification monitoring trends for Lead (2009- 2018).

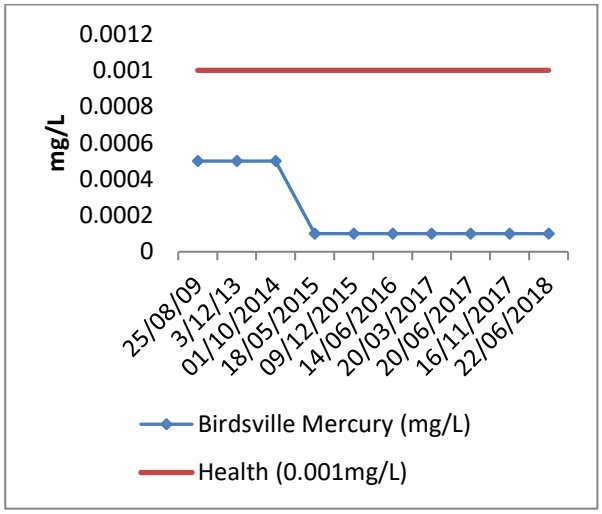


Figure 96: Birdsville verification monitoring trends for Mercury (2009- 2018).

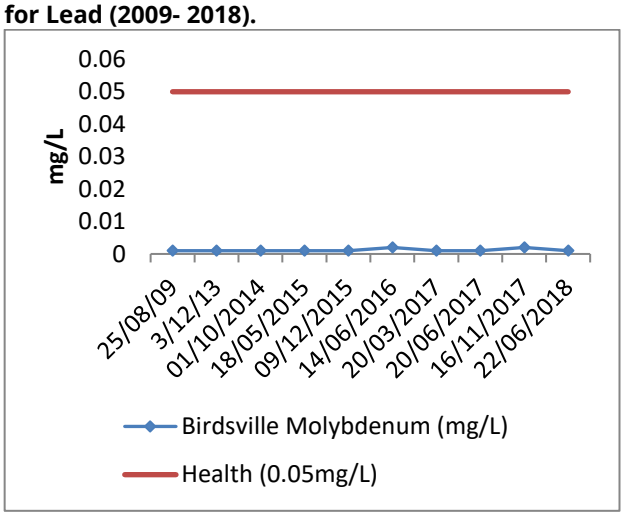


Figure 97: Birdsville verification monitoring trends for Molybdenum (2009- 2018).

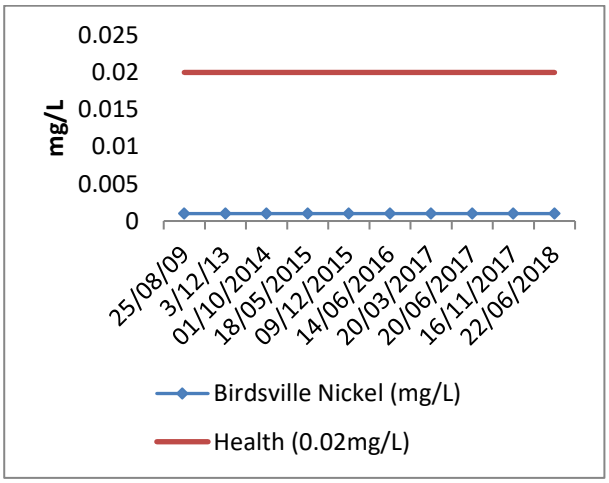


Figure 98: Birdsville verification monitoring trends for Nickel (2009- 2018).

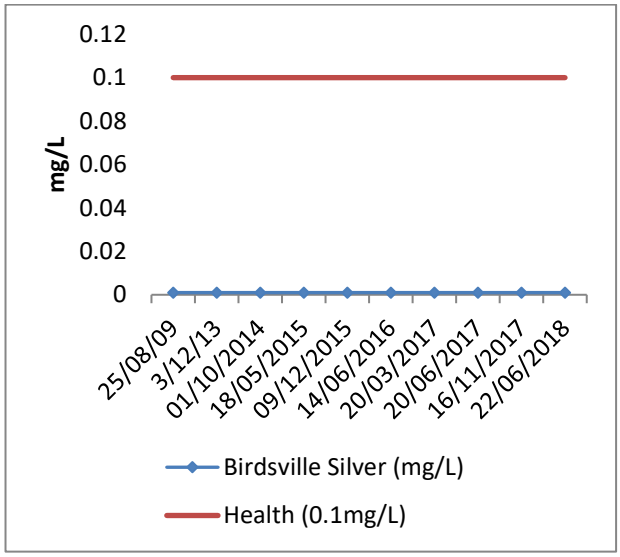


Figure 99: Birdsville verification monitoring trends for Silver (2009- 2018).

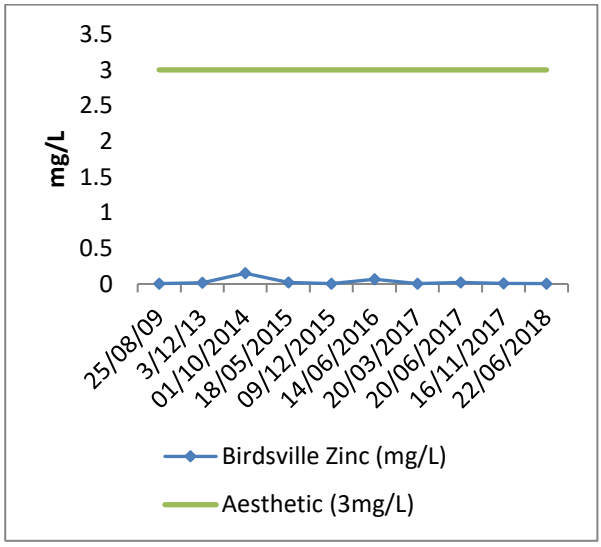


Figure 100: Birdsville verification monitoring trends for Zinc (2009- 2018).

APPENDIX C

BIRDSVILLE FLUORIDE FACT SHEET

Naturally occurring fluoride in Birdsville's drinking water

Fluoride is a natural element often found in water, plants, rocks, soil, air and some foods. Research shows that fluoride helps protect teeth against tooth decay. Regularly drinking water containing small amounts of fluoride can help reduce tooth decay for people of all ages.

What is the drinking water standard for fluoride?

The Australian Drinking Water Guidelines recommend an upper limit of 1.5 mg/L (or parts per million) of fluoride in drinking water. This is equivalent to one twentieth of a teaspoon of fluoride in a bathtub of water.

Many Western Queensland towns source their drinking water from groundwater (i.e. bores). These water sources can contain natural fluoride levels that are above this limit.

Monitoring of Birdsville's drinking water supply has indicated that it contains naturally occurring fluoride at an average concentration of 1.8 mg/L. This is slightly above the recommended limit in the Australian Drinking Water Guidelines.

Conventional water treatment processes and most domestic water filters do not reduce the level of fluoride present in your drinking water.

What are the risks of elevated levels of fluoride in drinking water?

There are two side effects that have been associated with elevated levels of fluoride in drinking water. The first is dental fluorosis and the second is skeletal fluorosis, which only occurs with very high levels of fluoride in drinking water.

What is dental fluorosis?

The main side effect associated with elevated levels of fluoride in drinking water is a condition known as dental fluorosis.

Dental fluorosis is largely an aesthetic concern and most often occurs as a mild change to the appearance of tooth enamel. It can appear as small, almost invisible, white lines in the enamel. More rarely, and in more severe cases, it can appear as pitting or staining of the enamel.

Dental fluorosis can occur if too much fluoride is ingested when teeth are developing at around one to four years of age. Teeth already present in the mouth are not at risk of developing fluorosis.

The risk of developing dental fluorosis, or experiencing more severe forms of the condition, increases with greater levels of fluoride in drinking water. However occasionally dental fluorosis occurs in developing teeth at relatively low fluoride levels.

Showering or bathing in water containing high levels of fluoride does not increase the risk of developing dental fluorosis.

What can I do to minimise the risk of dental fluorosis?

Most domestic water filters do not reduce the level of fluoride present in your drinking water. Parents can reduce the risk of children developing dental fluorosis by:

- Ensuring children do not take fluoride supplements (e.g. fluoride tablets and/or drops).
- Cleaning children's teeth with low fluoride or fluoride free toothpaste until the age of 18 months, unless otherwise recommended by a dentist.
- If fluoridated toothpaste is used, ensuring only a pea-sized amount of toothpaste is used and that children spit out after brushing and rinse their mouths with water.
- Monitoring and restricting other sources of fluoride in their children's diet (such as seafood and tea, which are known to contain fluoride).
- Providing bottled drinking water with low fluoride content where possible and not substituting bottled drinking water with soft drinks or other drinks high in sugar.
- Breast-feeding infants where possible and using bottled water to add to infant formula.

Help and assistance

For general enquiries contact your local Public Health Unit:

- Longreach: (07) 4658 4790
- Rockhampton: (07) 4920 6989
- Townsville: (07) 4433 6900

For more information:

- Contact your dental professional
- Visit www.health.qld.gov.au/oralhealth
- Call 13 HEALTH (13 43 25 84) for confidential health advice 24 hours a day, seven days a week
- Email oral_health@health.qld.gov.au

The information in this fact sheet applies only to those parts of Queensland with levels of naturally occurring fluoride above the drinking water Guideline or 1.5 milligrams per litre. It does not apply to locations with standard levels of water fluoridation.

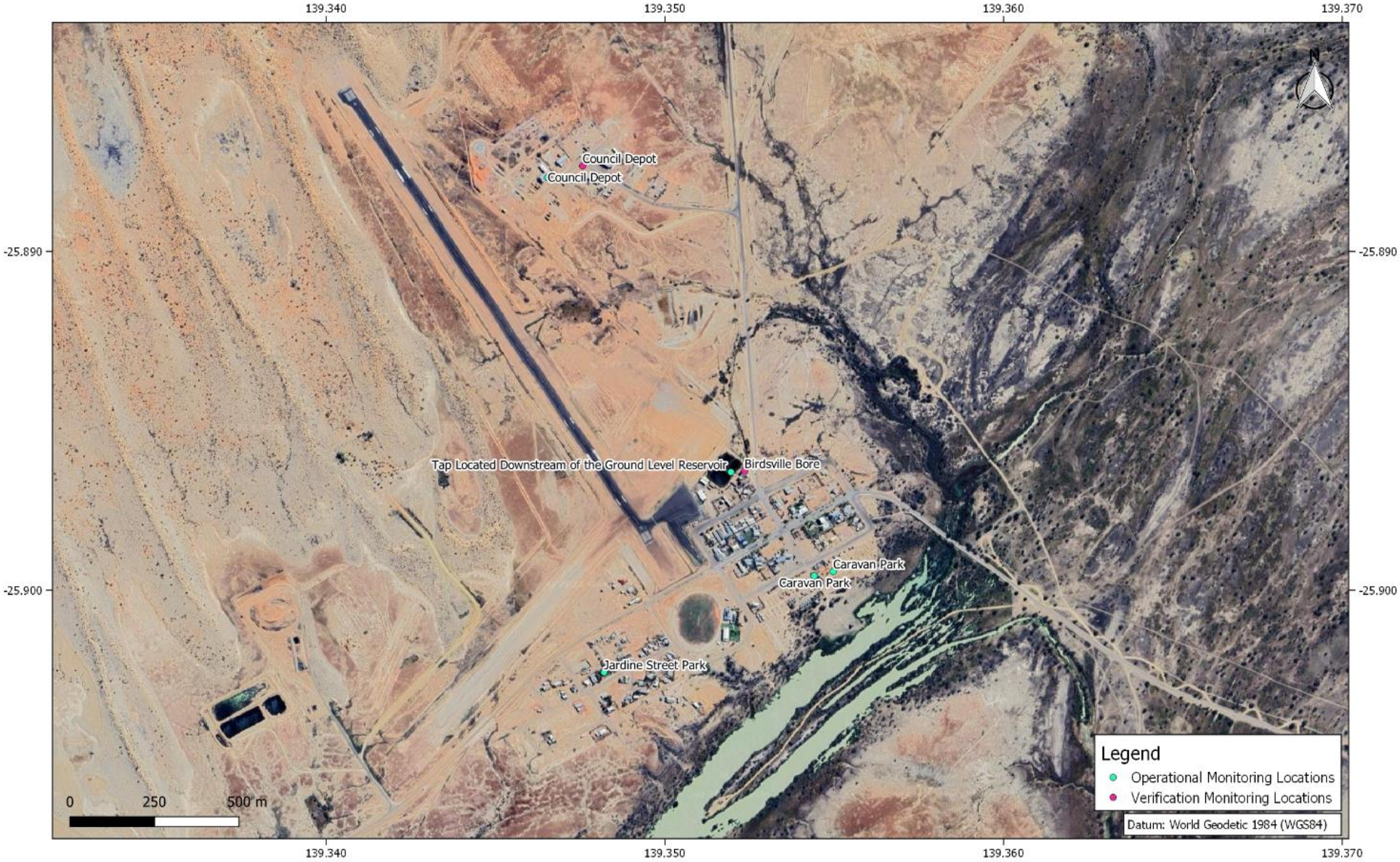
APPENDIX D

BEDOURIE & BIRDSVILLE OPERATIONAL MONITORING LOCATIONS

Map: 1

Diamantina Shire Council DWQMP Operational and Verification Monitoring Locations - Bedourie

GBA CONSULTING ENGINEERS



Map: 2

Diamantina Shire Council DWQMP Operational and Verification Monitoring Locations - Birdsville

GBA CONSULTING ENGINEERS