

**DRINKING WATER QUALITY MANAGEMENT
(DWQMP) REPORT 1 July 2020 – 30 June 2021**

Service Provider #473

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Assumptions

The assumptions made in this report are based on the following information and tools:

- Water Test Results.
- Approved Barcaldine Regional Council Drinking Water Quality Management Plan – 2018.

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LIST OF ACRONYMS (Glossary of Terms)

AWDG	Australian Drinking Water Guidelines (2011) – Published by the National Health and Medical Research Council of Australia
BRC	Barcaldine Regional Council
CEO	Chief Executive Officer
DWS	Director of Works and Services
ESC	Environmental and Safety Coordinator
DWQMP	Drinking Water Quality Management Plan
DWSP	Drinking Water Service Provider
OWSR	Office of the Water Safety Regulator
SPID	Service Provider Identification
E. coli	Escherichia coli, a bacterium which is considered to indicate the presence of faecal contamination and therefore a potential health risk
CFU/100ml	Colony Forming Units per 100 millilitres

1. INTRODUCTION

According to sections 99(2) (b) and 106 of the Water Supply (Safety and Reliability) Act 2008 (the Act), regular reporting on the implementation of the approved DWQMP should be undertaken. This formal report documents the performance of the Barcaldine Regional Council drinking water service, with regard to water quality and performance in implementing the actions detailed in the DWQMP.

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

This annual DWQMP report includes the following:

- Activities undertaken during the financial year in operating the drinking water scheme
- Drinking water quality summary
- Summary of performance in the implementation of the approved latest DWQMP
- Incidents reported to the regulator and customer complaints
- Review outcomes and audit findings.

The purpose of this report is the fulfillment of the Council regulatory requirement, by submission of this report to the Water Supply Regulator. The overall reason for the DWQMP and this annual report is to ensure the consistent supply of safe quality drinking water and to protect public health. This report will be made available publicly to Council customers through the website or upon request at the Council offices.

2. SUMMARY OF THE SCHEMES OPERATED

BRC is a medium Drinking Water Service Provider as defined in the Water Supply (Safety and Reliability) Act of 2008. BRC covers an area of approximately 54,000 square kilometers with an overall population of approximately 2,869 people. The overall population increases significantly during the cooler winter months due to travelling tourists. There are five operational water supply schemes within the council which consists of the townships of Alpha, Aramac, Barcaldine, Jericho and Muttaborra. The main administration centre for the region is Barcaldine.

The water supply schemes of Aramac, Barcaldine and Muttaborra are fairly similar in nature. Water is extracted from high yielding deep bores (depths ranging between 362 and 825 meters) situated within the Great Artesian Basin. Untreated water of a satisfactory quality is supplied to residents of the three towns by using booster pumps.

Alpha and Jericho are located towards the east of the BRC region, and the water supply schemes is of a similar nature. Water is extracted from much shallower sub-Artesian aquifers at depths ranging between 70 and 120 meters. The quality of the raw water is not of satisfactory quality for human consumption and water treatment plants are required at both these schemes.

During 2018 Council have submitted an amended DWQMP to the department. This demonstrated Council's commitment to manage its drinking water quality and complying with the requirements of the Act. The development of the DWQMP has documented potential risks with the operation of the water schemes and management strategies to ensure safe, quality drinking water to the public.

3. ACTIONS TAKEN TO IMPLEMENT THE DWQMP

BRC has implemented a number of actions as set out in the DWQMP to ensure greater surety for the supply of safe drinking water for the supply schemes within the region. The risk management components of the DWQMP have been a major focus for the BRC in maintaining a safe and reliable water source for the community and visitors.

The information below presents the risks identified in the DWQMP Risk Management Improvement Program (RMIP) and the strategies that have been implemented or are to be actioned to ensure the provision of drinking water quality in the BRC's water schemes.

Table 1: Risk Management Improvement Program Status

	Scheme	Improvement Item	Actions	Status at 30 June 2021
3.1.1	Alpha Aramac Barcaldine Jericho Muttaburra	Operational & Maintenance Procedures - Identify new procedures needed, develop and obtain approval and implement.	Operations and Maintenance procedures have been completed in April 2019.	Complete
3.1.2	Alpha Aramac Barcaldine Jericho Muttaburra	Commence Operational Monitoring of raw water quality - monitor individual bores to determine if individual bores have lower water quality.	Source water monitoring program in progress.	Actioned
3.1.3	Alpha	Catchment Characterisation: Identify the effect of flooding on bore water quality considering private bores which may not be capped or correctly constructed.	In accordance with the Risk Management Improvement plan of the DWQMP. When significant flood events occur in Alpha and Jericho sampling of bores will take place to identify if anthropogenic derived contaminants are making their way into the groundwater. There have been no significant flood events in recent times to determine the impact on the supply bore water quality.	Ongoing
3.1.4	Alpha	Seal uncapped bores	Seal bores which are abandoned under council jurisdiction.	Complete

	Scheme	Improvement Item	Actions	Status at 30 June 2021
3.1.5	Alpha Jericho	Operator Training and handover process: Allow for peer training approximately 5 days, source operator from other DWSP to train operator	Currently in Alpha and Jericho there are two employees capable of operating the plants and associated water infrastructure. A water services technician has been employed by council who has been trained to operate the schemes. The town supervisor who has experience in managing water operations is a backup staff member who has managed the system in the past.	Actioned
3.1.6	Aramac Muttaborra	Replace ageing mains in accordance with asset replacement program. Continue to apply for internal & external funding.	Major upgrades have been undertaken in the Aramac and Muttaborra schemes. These works have upgraded the lines which had reached their useful life span, completion of the current scope of works will result in these schemes working within their designed useful life expectancy.	Complete
3.1.7	Aramac Barcaldine Muttaborra	Create flushing schematic layout to go with the SOP Air scouring every 5 years. Implement reconfiguration of mains layout to improve flow.	Flushing locations have been identified for the Barcaldine drinking water scheme. Development of flushing points for other schemes has not been actioned due to recent mains upgrades.	Ongoing

4. WATER QUALITY MONITORING – COMPLIANCE WITH QUALITY CRITERIA

The drinking water quality should conform to the Australian Drinking Water Guidelines (ADWG) and the Queensland Public Health Regulations of 2018, recommended parameters for safe drinking water.

Both external and internal testing are performed on the drinking water at each water supply scheme. There are different testing requirements for the towns of Alpha and Jericho with water treatment plants, in comparison to Aramac, Barcaldine and Muttaborra where no treatment is required. Township results for external testing by an approved laboratory and internal bacteriological testing will be discussed in separate sections of the report.

4.1. External Verification Testing (Approved Laboratory)

According to the approved DWQMP, testing by an approved external laboratory is required on a quarterly basis. The required testing parameters are provided in the DWQMP. Quarterly tests are required at three defined locations at Barcaldine. At Alpha, Aramac, Jericho and Muttaborra only two quarterly tests are required at the defined locations. A summary of the test results are provided for each town in tables 2 – 6 below. Testing parameters should conform to the AWDG health and aesthetic guidelines. Any deviations from the guidelines will be discussed in detail.

Table 2:- Alpha – External Verification Test Results

Description/ Parameter	Unit	Number of Samples	Minimum Value	Maximum Value	Average Value	Health Guideline	Aesthetic Guideline
Alkalinity	mg/L CaCO ₃	6	191	200	195		
Calcium	mg/L	6	34	37	35.83		
Carbonate	mg/L	6	0.6	1.5	1.10		
Chlorate	mg/L	6	0.11	0.16	0.13		
Chloride	mg/L	6	350	370	361		250
Coliform Count	uS/cm	92	0	0	0.00		
Conductivity	mg/L	6	1600	1650	1626		
Fluoride	mg/L	6	0.29	0.31	0.30	1.5	
Iron	mg/L	6	0.01	0.01	0.01		0.3
Magnesium	mg/L	6	32	36	35.3		
Manganese	mg/L	6	0	0	0.00	0.5	0.1
Nitrate	mg/L	6	28	29	28.3	50	
pH	mg/L	6	7.57	8.06	7.85		< 6.5-8.5 >
Potassium	mg/L	6	10	10	10.0		
Silica	mg/L	6	75	82	78.50		80
Sodium	mg/L	6	230	240	235		180
Sulphate	mg/L	6	38	40	39.00	500	250
Total Dissolved Ions	mg/L	6	964	995	984		
Total Dissolved Solids	mg/L	6	920	953	944		600
Total Hardness	mg/L CaCO ₃	6	217	241	234		200
True Colour	Hazen	6	1	8	5.33		15
Turbidity	NTU	6	1	1	1.00		5
Zinc	mg/L	6	0.06	0.06	0.06		3
Exceeding the Aesthetic Limit							
Exceeding the Health Limit							

Table 3:- Aramac – External Verification Test Results

Description/ Parameter	Unit	Number of Samples	Minimum Value	Maximum Value	Average Value	Health Guideline	Aesthetic Guideline
Alkalinity	mg/L CaCO ₃	9	170	190	176		
Calcium	mg/L	9	3.8	7.1	6.3		
Carbonate	mg/L	9	0.1	1	0.3		
Chlorate	mg/L						
Chloride	mg/L	9	41	42	41.1		250
Coliform Count	uS/cm	18	0	0	0		
Conductivity	mg/L	9	449	470	454		
Fluoride	mg/L	9	0.49	0.53	0.51	1.5	
Iron	mg/L	9	0.01	0.13	0.07		0.3
Magnesium	mg/L	9	0.26	3.2	0.74		
Manganese	mg/L	9	0.02	0.03	0.03	0.5	0.1
Nitrate	mg/L	9	0.05	0.05	0.05	50	
pH	mg/L	9	7.06	7.87	7.34		< 6.5-8.5 >
Potassium	mg/L	9	5.9	6.3	6.1		
Silica	mg/L	9	18	20	19.3		80
Sodium	mg/L	9	92	100	94.6		180
Sulphate	mg/L	9	0.2	0.2	0.2	500	250
Total Dissolved Ions	mg/L	9	357	380	364		
Total Dissolved Solids	mg/L	9	270	290	275		600
Total Hardness	mg/L CaCO ₃	9	17	23	18.7		200
True Colour	Hazen	9	1	8	6.2		15
Turbidity	NTU	9	1	1	1		5
Zinc	mg/L	9	0.06	0.06	0.06		3
Exceeding the Aesthetic Limit							
Exceeding the Health Limit							

Table 4:- Barcardine – External Verification Test Results

Description/ Parameter	Unit	Number of Samples	Minimum Value	Maximum Value	Average Value	Health Guideline	Aesthetic Guideline
Alkalinity	mg/L CaCO ₃	9	139	142	140		
Calcium	mg/L	9	2.6	4.7	3.9		
Carbonate	mg/L	9	0.2	1.4	0.5		
Chlorate	mg/L						
Chloride	mg/L	9	37	42	38.9		250
Coliform Count	uS/cm	198	0	0	0.00		
Conductivity	mg/L	9	383	400	391		
Fluoride	mg/L	9	0.21	0.24	0.23	1.5	
Iron	mg/L	9	0.01	0.05	0.03		0.3
Magnesium	mg/L	9	0.07	0.3	0.20		
Manganese	mg/L	9	0	0.03	0.01	0.5	0.1
Nitrate	mg/L	9	0.05	0.85	0.59	50	
pH	mg/L	9	7.3	8.19	7.66		< 6.5-8.5 >
Potassium	mg/L	9	1.8	3.6	2.94		
Silica	mg/L	9	22	24	22.9		80
Sodium	mg/L	9	82	89	84		180
Sulphate	mg/L	9	3.2	4.7	3.7	500	250
Total Dissolved Ions	mg/L	9	298	315	306		
Total Dissolved Solids	mg/L	9	237	250	242		600
Total Hardness	mg/L CaCO ₃	9	8.1	13	11		200
True Colour	Hazen	9	1	8	5.7		15
Turbidity	NTU	9	1	2	1.1		5
Zinc	mg/L	9	0.06	0.06	0.06		3
Exceeding the Aesthetic Limit							
Exceeding the Health Limit							

Table 5:- Jericho – External Verification Test Results

Description/ Parameter	Unit	Number of Samples	Minimum Value	Maximum Value	Average Value	Health Guideline	Aesthetic Guideline
Alkalinity	mg/L CaCO ₃	6	47	200	77		
Calcium	mg/L	6	6.5	36	11.5		
Carbonate	mg/L	6	0	1	0.2		
Chlorate	mg/L	6	0.08	0.15	0.11		
Chloride	mg/L	6	220	360	243		250
Coliform Count	uS/cm	91	0	8.5**	0.09**		
Conductivity	mg/L	6	900	1600	1021		
Fluoride	mg/L	6	0.18	0.29	0.20	1.5	
Iron	mg/L	6	0.01	0.01	0.01		0.3
Magnesium	mg/L	6	16	36	20.0		
Manganese	mg/L	6	0	0	0	0.5	0.1
Nitrate	mg/L	6	0.46	28	5.08	50	
pH	mg/L	6	6.59	7.76	7.05		< 6.5-8.5 >
Potassium	mg/L	6	7.47	10	8.06		
Silica	mg/L	6	12	75	23		80
Sodium	mg/L	6	140	240	157		180
Sulphate	mg/L	6	36	38	36.5	500	250
Total Dissolved Ions	mg/L	6	483	995	574		
Total Dissolved Solids	mg/L	6	467	950	551		600
Total Hardness	mg/L CaCO ₃	6	83	238	110.6		200
True Colour	Hazen	6	1	8	5.3		15
Turbidity	NTU	6	1	1	1		5
Zinc	mg/L	6	0.06	0.06	0.06		3
Exceeding the Aesthetic Limit							
Exceeding the Health Limit							

Table 6:- Muttaborra – External Verification Test Results

Description/ Parameter	Unit	Number of Samples	Minimum Value	Maximum Value	Average Value	Health Guideline	Aesthetic Guideline
Alkalinity	mg/L CaCO ₃	6	180	190	184.5		
Calcium	mg/L	6	2.1	2.8	2.5		
Carbonate	mg/L	6	0.1	0.4	0.2		
Chlorate	mg/L	6					
Chloride	mg/L	6	32	33	32.5		250
Coliform Count	uS/cm	17	0	0	0		
Conductivity	mg/L	6	430	450	438.8		
Fluoride	mg/L	6	0.23	0.26	0.25	1.5	
Iron	mg/L	6	0.04	0.77	0.29		0.3
Magnesium	mg/L	6	0.2	0.24	0.22		
Manganese	mg/L	6	0.05	0.08	0.07	0.5	0.1
Nitrate	mg/L	6	0.05	0.05	0.05	50	
pH	mg/L	6	6.91	7.51	7.16		< 6.5-8.5 >
Potassium	mg/L	6	8.7	9.2	8.9		
Silica	mg/L	6	28	29	28.1		80
Sodium	mg/L	6	92	100	94.8		180
Sulphate	mg/L	6	0.2	0.2	0.2	500	250
Total Dissolved Ions	mg/L	6	359	376	364		
Total Dissolved Solids	mg/L	6	276	290	280		600
Total Hardness	mg/L CaCO ₃	6	6	7.9	7.1		200
True Colour	Hazen	6	1	24	9.3		15
Turbidity	NTU	6	1	1	1.		5
Zinc	mg/L	6	0.06	0.06	0.06		3
Exceeding the Aesthetic Limit							
Exceeding the Health Limit							

4.1.1. Alpha

According to the DWQMP quarterly test results are required at three specific testing locations. A total of eight tests are therefore required, but only six tests were performed. The external verification test results at Alpha indicate that ADWG aesthetic guidelines were exceeded for several parameters and ADWG Health guidelines are not exceeded by any of the results.

The chloride content for all of the samples exceeded the aesthetic guideline of 250mg/L. The chloride content are probably natural mineral salts that occur in the groundwater catchment. Taste of the water should only be affected at levels > 400mg/L of chloride. Water is in order for drinking purposes; however, the chloride can cause corrosion of metal pipes and appliances. The silica content of two of the tested samples are in excess of the 80mg/L guideline. Silica occurs naturally in certain water sources and is extremely difficult to remove from drinking water. Silica has purely aesthetical consequences and might form a film or stain glass and porcelain ware.

All of the tested samples are above the guideline value of 180mg/L for sodium. This again is only an aesthetic guideline, and the water should have a slightly salty taste. All of the test results for total dissolved solids are within 900 – 1200mg/L that is classified by the ADWG as poor-quality drinking water. The TDS is probably another indication of the relatively high level of certain other parameters in the drinking water. The total hardness aesthetic guideline of 200mg/L CaCO₃ is exceeded by all the test samples. The hardness should not have any health or taste issues, but might lead to issues when water is used for washing purposes.

A total number of 92 additional bacteriological tests were performed and no evidence of coliform count could be found in the drinking water. The exceedances of the aesthetic guidelines is a preexisting characteristic of the shallow groundwater aquifer from which the drinking water is sourced, the impacts of these aesthetic guideline exceedances might have to be investigated in detail at a later stage.

4.1.2. Aramac

A total number of 9 external tests were performed for Aramac. This exceeds the testing requirement of two tests on a quarterly basis. Further to the above 18 bacteriological tests (coliform count) were performed. Test results are 100% in order according to the ADWG. None of the ADWG guidelines values for health or aesthetic has been exceeded.

4.1.3. Barcaldine

According to the DWQMP quarterly testing are required at three specific locations. Although twelve detailed tests are required, only nine tests were performed. An additional 198 bacteriological tests were performed, with no detection of bacteria per 100mL of water. Tests results that were performed are in accordance with ADWG as none of the health or aesthetic guidelines have been exceeded for any of the parameters.

4.1.4. Jericho

According to the DWQMP eight tests were required for the 2020 / 2021 year. However, only six external tests were performed. All of the test results are in order, except one sample that was collected on 17 May 2021 at the water treatment plant. This specific test result is very different to the previous five results and ADWG aesthetic guidelines were exceeded for chloride, sodium and

total hardness. This specific test result should be investigated. Possible reasons for this test result could be raw water (untreated water) that was tested, or a contaminated sample. Follow up testing will confirm if this test result is a true reflection of the drinking water quality.

A total number of 91 external bacteriological tests were performed. Coliform bacteria were found in one of the samples tested. Sample was collected on 1 February 2021 and is untreated water from the Jericho East bore. The test result is not a major concern, because bacteria should be eliminated by the treatment process. However, council should be aware of possible contamination to the water source and should perform follow up testing or investigations.

4.1.5. Muttaborra

Six test samples were tested by an external laboratory. However, according to the DWQMP eight test results should have been available. ADWG aesthetic guideline of 0.3mg/L for iron are exceeded by two of the test results. Iron occurs naturally in water, and has no health concerns, but might influence the taste of the water and might result in stained laundry and appliances. One of the test results exceeded the aesthetic guideline of 15 Hazen Units for the true colour of the water. The value for the specific sample were very different from other samples, although it might be due to the iron concentration in the water. Future testing will have to confirm if water colour is a concern, or if this was an isolated incident. 17 samples were tested for coliform bacteria count and all of the tests returned negative results.

4.1.6. Accuracy of Verification Monitoring with the DWQMP

The verification monitoring has not been undertaken entirely in accordance with the verification monitoring program detailed in the DWQM. The main reason for the dissociation between the verification monitoring program and the monitoring that has taken place is that the testing of heavy metals required the application of hydrochloric acid to the testing bottles. The operational staff at BRC were not comfortable with the changes to the testing regime and questioned the safety and whether specific training and facilities should be provided for the use of corrosive chemicals when undertaking water sampling.

4.2. Internal Operational Monitoring Testing

According to the approved DWQMP, internal operational testing should be performed at each town water scheme. The frequency of testing and the location thereof is defined in the DWQMP. The purpose of operational testing is to determine if the water is safe for human consumption and to find if the water contains any coliform bacteria with specific reference to E-coli. Testing and results will be described separately for Alpha and Jericho, as these town have treatment plants and different testing requirements. A summary of the operational monitoring tests are provided in table 7 below.

4.2.1. Alpha and Jericho

According to the DWQMP weekly operational testing is required at two locations for each of the townships. A total of 92 operational tests were performed at Alpha. No coliform count or E-Coli were detected in the test results. The same number of tests were performed at the town of Jericho with no indication of coliform count or E-coli in any of the results.

4.2.2. Aramac, Barcaldine and Muttaborra

According to the DWQMP monthly operational testing is required for two locations at both Aramac and Muttaborra. Fortnightly (2-weekly) testing is required at Barcaldine, at three specified locations. 19 test results were obtained for Aramac and 18 test results were obtained for Muttaborra. The test results were satisfactory, and no coliform count or bacteria were reported. However, a number of 24 test results were required for each town.

A total number of 125 bacteriological tests were conducted and reported at Barcaldine. Operational test results were in order, as no coliform count or E-coli were present in the drinking water.

Table 7:- Internal Operational Testing Summary

Township	Number of Tests Required as per ADWQMP	Number of Actual Tests Performed	Number of Non-Conforming Tests
Alpha	104	92	0
Aramac	24	19	0
Barcaldine	78	125	0
Jericho	104	92	0
Muttaborra	24	18	0

4.3. Incidents

An ongoing incident from 2014 was closed out in May 2021, this incident was related to elevated chlorate levels detected in the Alpha and Jericho drinking water. Changes to the operation of the disinfection systems in Alpha and Jericho, namely the use of calcium hypochlorite which does not have the same issues associated with degradation in storage and disinfection byproducts as the sodium hypochlorite. The transition to the Calcium Hypochlorite reduced the level of chlorates in the water which has been consistently below the ADWG levels since 2018.

5. NOTIFICATIONS TO THE REGULATOR

Notifications can be submitted to the regulator according to sections 102 and 102A of the Water Supply Act. Notifications will only be submitted to the regulator in the event of a serious incident. No formal notifications have been submitted to the regulator during the 2020 / 2021 reporting period.

6. CUSTOMER COMPLAINTS REGARDING THE WATER QUALITY

Customer complaints were logged and recorded for the 2020 / 2021 reporting period. These complaints are categorised as either service complaints or water quality complaints. Complaints were only logged and recorded for the town of Barcaldine. The number of complaints has reduced significantly from a total of 133 for the previous year to 42 complaints for the 2020 / 2021 recording period. The fact that only two complaints regarding water quality were received is very positive. The root cause for the 42 number of service complaints should be investigated, with possible remedial works to improve the future situation.

A summary of the received complaints are provided in table 8 below.

Table 8:- Summary of Customer Complaints

Township	Water Complaints	Service	Water Quality Complaints	Total Complaints
Alpha	0		0	0
Aramac	0		0	0
Barcaldine	40		2	42
Jericho	0		0	0
Muttaburra	0		0	0
Total Complaints	40		2	42

7. FINDINGS AND RECOMMENDATIONS OF THE DWQMP AUDITOR

No audit was conducted during the 2020 / 2021 reporting period, the next audit will be performed in the first half of 2022.

8. DWQMP REVIEW FINDINGS AND RECOMMENDATIONS

The review of BRC's DWQMP has identified a number of minor improvements to be integrated into the DWQMP. Some aspects of the Plan have been identified as outdated and requiring updating. These items are summarised below:

Details of Infrastructure

There have been upgrades to the water treatment plants in Alpha and Jericho over the extent of the review period these changes should be updated in the DWQMP.

Operation and Maintenance Procedures

Due to upgrades in the Jericho and Alpha Operations Procedures will need to be updated.

Management of Incidents and Emergencies

OWSR incident contact number listed in DWQMP is incorrect and requires updating.

Risk Management Improvement Program (RMIP)

Some of the original actions included in the DWQMP have not been completed by the planned completion date. RMIP action items and dates will be updated, and new timeframes provided.

The risk assessment process should be revisited, and a risk assessment workshop implemented with key stakeholders. Newly identified risks should be implemented into the plan.

Operational and verification Monitoring

Updates to the Jericho and Alpha water treatment plants including the automated systems and SCADA telemetry will reduce the amount of water testing required. The operational and verification monitoring plan will be updated to reflect these changes.

The agreed improvement items detailed above are to be implemented into the BRC DWQMP. The amended DWQMP will be submitted to the DNRME by BRC.