GLADSTONE
REGIONAL COUNCIL

ABN: 27 330 979 106

DRINKING WATER QUALITY MANAGEMENT PLAN REPORT

2016/2017

SPID: 483

Gladstone Regional Council
101 Goondoon Street
GLADSTONE 4680

07 4970 0700
jane.doran@gladstone.qld.gov.au

Glossary of terms

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

1. Introduction

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

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

2. Overview of Operations

The Gladstone Regional Council provides water to its residents through four water schemes:

- **Lake Awoonga Scheme.** Under this scheme the Gladstone Area Water Board (GAWB) collects and treats raw water harvested from the Lake Awoonga Dam. The water is treated through a conventional water treatment plant before being sold to Gladstone Regional Council at a number of reservoir and supply points throughout Gladstone, Boyne Island, Tannum and Calliope. GRC distributes the water to approximately 22,800 connections.
- **Bororen Scheme.** GRC sources water from two production bores located to the west of Lagoon Creek within the Baffle Creek catchment. The groundwater is treated at the Bororen Water Treatment Plant (WTP) and disinfected before being reticulated to 90 connections within the Bororen Township.
- **Miriam Vale Scheme.** GRC sources water from Baffle Creek (~80%) and the Thorne Road bore. The water is mixed and treated through a conventional treatment process and disinfected before being reticulated to approximately 200 connections.
- **Agnes Water/1770 Scheme.** GRC sources water from seawater and 4 groundwater bores along Springs Road. The seawater is treated through a reverse osmosis desalination plant, and the bore water is treated through a conventional plant. Disinfected water is supplied to approximately 900 connections within the townships of Agnes Water and 1770. The treatment plants are operated and maintained under contract by Trility Pty Ltd.

GRC manages drinking water quality through an approved Drinking Water Quality Management Plan (DWQMP). This ensures that water supplied to its 23,900 customers is safe and public health is maintained.

3. Actions taken to implement the DWQMP

PROGRESS IN IMPLEMENTING THE RISK MANAGEMENT IMPROVEMENT PROGRAM

GRC is progressing with the implementation of the open improvement actions identified in the initial drinking water quality management plan.

Key initiatives implemented in 2016-2017 include:

- Aluminium chlorohydrate (ACH) is now being used at the Bororen WTP resulting in improved turbidity levels;

- A new Water Quality Management System (including a dedicated database) was developed and implemented successfully throughout the year. The system has been integrated into the council business systems/workflows and will continue to undergo continual improvement;
- Refer to the Appendix B for a full summary of progress in implementing each of the Improvement Program actions.

REVISIONS MADE TO THE OPERATIONAL MONITORING PROGRAM TO ASSIST IN MAINTAINING THE COMPLIANCE WITH WATER QUALITY CRITERIA[1] IN VERIFICATION MONITORING.

- No changes have been made to the verification monitoring program. This is scheduled to occur during the 2017/2018 DWQMP review.
- The internally developed Water Quality Management System (WQMS) has been in use for the entire 2016/2017 year. The system is constantly being improved as any issues/potential upgrades are identified, rectified or implemented. The WQMS will be audited as part of the DWQMP review to verify the status of the data contained with the database.

AMENDMENTS MADE TO THE DWQMP

No amendments have been made to the DWQMP. The plan is scheduled to be reviewed and updated in 2017/18. Amendments will incorporate the new Miriam Vale WTP, the Bororen WTP optimization upgrades, water quality modelling results and other capital works.

4. Compliance with water quality criteria for drinking water

A summary of water quality performance over the four schemes is summarised in Tables 2 to 5 in Appendix A.

GRC have produced a consistent and safe water supply that meet the requirements set by the Public Health Regulation 2005 for drinking water with 100% of the 886 samples tested free of *E. coli*.

The chemical testing program included over 12000 individual samples, and >99.95% met all applicable health guideline values stated in the Australian Drinking Water Guidelines 2011 for the parameters tested.

Six (6) non-compliance of bromate occurred in the Lake Awoonga Scheme in the 2016/2017 financial year.

The Bororen, Miriam Vale and Agnes Water/1770 water supply schemes were fully compliant against our regulated water quality criteria.

As per the 2015/2016 Annual Report, GAWB ceased Fluoride dosing on the 25 August 2016. Compliance monitoring for Fluoride continued until the 30 June 2017.

[1] Refer to *Water Quality and Reporting Guideline for a Drinking Water Service* for the water quality criteria for drinking water.

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

There have been three (3) instances where the Regulator was notified under sections 102 or 102A of the Act.

NON-COMPLIANCES WITH THE WATER QUALITY CRITERIA AND CORRECTIVE AND PREVENTIVE ACTIONS UNDERTAKEN

DWI-7-483-00015 - Detection of a parameter with no water quality criteria

Incident Description:
Notification of the detection of chlorate within the Lake Awoonga Scheme above GRC's internal limit of 1 mg/L

Investigation and Cause:
Chlorate is a breakdown product of the sodium hypochlorite solutions used to disinfect water to ensure that it is free from pathogens. Due to our climate, we need to re-dose disinfectant within the reticulation network. This will inevitably increase the chlorate levels with each dose whilst sodium hypochlorite is used as the disinfectant. Chlorate does not currently have a health guideline value.

Corrective and Preventative Actions:
GRC has discussed the issue with GAWB and have been advised that they (GAWB) are exploring the option to use chlorine gas as a disinfectant which does not form chlorate in the same way.

DWI-7-483-00014 - Event

Incident Description:
On 25/01/2017 GRC Water Services staff discovered that the Lilly Hills Reservoir security had been compromised.

Investigation and Cause:
- The reservoir had been inspected less than 18 hours previously.
- Upon notification of the security breach the reservoir was immediately isolated from service.
- Samples for microbiological analysis were collected from the reservoir and from representative residential areas that are supplied by the Lilly Hills Reservoir. All samples returned a negative result for the presence of *E. coli*.
- Police were informed and an investigation commenced

Corrective and Preventative Actions:
- Flushing was carried out to draw water in from an alternate supply.
- The reservoir was drained and cleaned as per AS3500 requirements and security re-instated

DWI-7-483-00016- Noncompliance with Water Quality Criteria

Incident Description:
During routine monitoring in May and June 2017, exceedances of Bromate detected in the Lake Awoonga scheme above the health guideline value of 0.02 mg/L on six (6) occasions.

Investigation and Cause:

- This is likely due to bromine within Lake Awoonga, but the source has not been identified.

Corrective and Preventative Actions:

- Continue to investigate causes and possible management options.

6. Customer complaints related to water quality

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

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

Table 1 - Complaints Relating to Water Quality

	Suspected Illness	Discoloured water	Taste and Odour	Other	Total
Lake Awoonga Scheme	5	22	12	3	42
Agnes Water/1770 Scheme	0	0	0	1	1
Miriam Vale Scheme	0	3	0	0	3
Bororen Scheme	0	0	0	0	0
Total	**5**	**25**	**12**	**4**	**46**

Suspected Illness

Gladstone Regional Council investigates each complaint relating to alleged illness from our water quality, typically by conducting *E. coli* analysis from the source tap and monitoring the levels of free chlorine present in the water.

During 2016/2017, there were no confirmed cases of illness arising from the water supply system.

Discoloured water

Twenty-Two (22) customer complaints were received in the Lake Awoonga scheme related to dirty water. In response to dirty water complaints, Council staff flush the relevant mains until the water runs clear. Council staff also makes contact with the customer to advise them of the actions taken. Council proactively flushes mains on a routine basis in areas with a history of dirty water complaints. This has reduced the number of complaints received.

It is standard practice for Council to flush mains after breaks and in response to abnormal water quality sample results and low residual free chlorine.

Taste and odour

Gladstone Regional Council investigates taste and odour complaints and devise plans for prompt resolution, which may include flushing the reticulation system. Investigation of each complaint found no public health risks. The taste and odour complaints are possibly due to variations in chlorine concentration throughout the year and or due to operational changes (i.e. setpoint increase).

7. Findings and recommendations of the DWQMP auditor

No audit was carried out in 2016/2017 financial year.

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

No review was undertaken in the 2016/2017 financial year.

Appendix A – Summary of compliance with water quality criteria

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

Table 2 - Verification monitoring results - Lake Awoonga Scheme - Reticulation System

Parameter	Unit Of Measure	Total number of samples taken	Number of samples in which the parameter was detected	Non-compliance with ADWG 2011 health guidelines	Minimum concentration or count	Maximum concentration or count	Average (Mean) concentration or count
Alkalinity	mg/L $CaCO_3$	156	156	0	60	96	75
Aluminium	mg/L	150	150	0	0.03	0.27	0.059
Antimony	mg/L	13	0	0	0	0	0
Arsenic	mg/L	12	0	0	0	0	0
Barium	mg/L	12	12	0	0.008	0.013	0.011
Boron	mg/L	13	1	0	0	0.05	0.004
Bromate	mg/L	152	45	6	0	0.047	0.004
Bromide	mg/L	152	128	0	0	0.965	0.035
Bromodichloromethane	mg/L	162	161	0	0	0.04	0.019
Cadmium	mg/L	13	0	0	0	0	0.000
Chlorate	mg/L	169	168	0	0	1.66	0.347
Chloride	mg/L	311	311	0	0.056	41.7	28.0
Chromium	mg/L	13	2	0	0	0.002	0
Copper	mg/L	13	12	0	0	0.024	0.008
Dibromochloromethane	mg/L	162	161	0	0	0.12	0.013
Dissolved Oxygen	mg/L	156	156	0	4.71	9.05	8.05
E. coli	MPN/100mL	617	0	0	0	0	0
Electrical Conductivity	µS/cm	770	770	0	266	859	313
Fluoride	mg/L	597	589	0	0	0.858	0.185
Free Chlorine	mg/L	772	770	0	0	2.9	0.93
HPC	MPN/mL	206	28	0	0	35	0.96

Verification monitoring results - Lake Awoonga Scheme - Reticulation System

Parameter	Unit Of Measure	Total number of samples taken	Number of samples in which the parameter was detected	Non-compliance with ADWG 2011 health guidelines	Minimum concentration or count	Maximum concentration or count	Average (Mean) concentration or count
Iron	mg/L	150	9	0	0	0.36	0.007
Lead	mg/L	13	1	0	0	0.001	0
Mercury	mg/L	14	0	0	0	0	0
Molybdenum	mg/L	13	0	0	0	0	0
Nickel	mg/L	13	0	0	0	0	0
Nitrate	mg/l	312	303	0	0	0.38	0.14
Nitrite	mg/l	312	5	0	0	0.29	0.002
pH		770	770	0	1.03	11.16	7.76
Phosphate	mg/L	306	11	0	0	0.11	0.001
Selenium	mg/L	13	0	0	0	0	0
Soluble Manganese	mg/L	74	14	0	0	0.06	0.002
Sulphate	mg/L	307	307	0	0.464	49	31.8
Temperature	°C	770	770	0	19.3	36	26.4
Total (Insoluble) Manganese	mg/L	150	60	0	0	0.11	0.002
Total Hardness	mg/L $CaCO_3$	156	156	0	56	132	84.1
Tribromomethane	mg/L	162	3	0	0	0.071	0.001
Trichloromethane	mg/L	162	161	0	0	0.056	0.028
True Colour	HU	770	482	0	0	13	1.2
Turbidity	NTU	771	771	0	0.04	5.85	0.166
Zinc	mg/L	13	7	0	0	0.104	0.014

Table 3 - Verification monitoring results - Bororen Scheme - Reticulation System

Parameter	Unit Of Measure	Total number of samples taken	Number of samples in which the parameter was detected	Non-compliance with ADWG 2011 health guidelines	Minimum concentration or count	Maximum concentration or count	Average (Mean) concentration or count
Alkalinity	mg/L $CaCO_3$	5	5	0	231	248	241
Aluminium	mg/L	5	1	0	0	0.5	0.1
Bromate	mg/L	3	1	0	0	0.005	0.002
Bromide	mg/L	3	3	0	0.072	0.1	0.085
Bromodichloromethane	mg/L	5	5	0	0.009	0.015	0.012
Chlorate	mg/L	4	4	0	0.206	0.502	0.395
Chloride	mg/L	3	3	0	121	138	132
Dibromochloromethane	mg/L	5	5	0	0.021	0.032	0.026
Dissolved Oxygen	mg/L	4	4	0	7.2	8.07	7.72
E. coli	MPN/100mL	6	0	0	0	0	0.000
Electrical Conductivity	µS/cm	9	9	0	0.86	877	769
Free Chlorine	mg/L	9	9	0	0.36	2.1	0.94
HPC	MPN/mL	3	2	0	0	2	1
Iron	mg/L	5	5	0	0.06	0.16	0.096
Nitrate	mg/l	3	3	0	0.02	0.03	0.02
Nitrite	mg/l	3	1	0	0	0.02	0.01
pH		7	7	0	7.74	8.14	7.90
Phosphate	mg/L	3	2	0	0	0.03	0.02
Soluble Manganese	mg/L	5	1	0	0	0.001	0.
Sulphate	mg/L	3	3	0	3.3	3.6	3.5
Temperature	°C	9	8	0	0	37.4	29.0
Total (Insoluble) Manganese	mg/L	5	4	0	0	0.017	0.004
Total Hardness	mg/L $CaCO_3$	4	4	0	281	327	303
Tribromomethane	mg/L	5	5	0	0.012	0.036	0.020
Trichloromethane	mg/L	5	2	0	0	0.06	0.02
True Colour	HU	9	3	0	0	2	0.4
Turbidity	NTU	9	9	0	0.56	1.2	0.88

Table 4 - Verification monitoring results - Miriam Vale Scheme - Reticulation System

Parameter	Unit Of Measure	Total number of samples taken	Number of samples in which the parameter was detected	Non-compliance with ADWG 2011 health guidelines	Minimum concentration or count	Maximum concentration or count	Average (Mean) concentration or count
Alkalinity	mg/L $CaCO_3$	35	35	0	43	125	80
Aluminium	mg/L	36	36	2	0.02	0.89	0.071
Bromate	mg/L	6	1	0	0	0.005	0.001
Bromide	mg/L	6	6	0	0.014	0.046	0.032
Bromodichloromethane	mg/L	35	34	0	0	0.044	0.022
Chlorate	mg/L	33	32	0	0	1.03	0.470
Chloride	mg/L	12	12	0	38	127	93.4
Dibromochloromethane	mg/L	35	34	0	0	0.08	0.02
Dissolved Oxygen	mg/L	36	36	0	6.9	9.2	8.4
E. coli	MPN/100mL	37	0	0	0	0	0
Electrical Conductivity	µS/cm	36	36	0	221	709	481
Free Chlorine	mg/L	36	36	0	0.03	1.96	0.621
HPC	MPN/mL	12	3	0	0	4	0. 7
Iron	mg/L	36	19	0	0	0.45	0.06
Nitrate	mg/l	12	12	0	0.04	0.11	0.08
Nitrite	mg/l	12	2	0	0	0.1	0.01
pH		36	36	0	7.04	7.67	7.36
Phosphate	mg/L	12	0	0	0	0	0
Soluble Manganese	mg/L	19	12	0	0	0.02	0.004
Sulphate	mg/L	12	12	0	1.42	4	2.74
Temperature	°C	33	33	0	0.03	32.1	25.13
Total (Insoluble) Manganese	mg/L	36	36	0	0.003	0.208	0.041
Total Hardness	mg/L $CaCO_3$	35	35	0	35	126	82.4
Tribromomethane	mg/L	35	6	0	0	0.008	0.001
Trichloromethane	mg/L	35	34	0	0	0.078	0.033
True Colour	HU	36	22	0	0	9	1.4
Turbidity	NTU	37	36	0	0	6.54	0.656

Table 5 - Verification monitoring results - Agnes Water/1770 - Reticulation System

Parameter	Unit Of Measure	Total number of samples taken	Number of samples in which the parameter was detected	Non-compliance with ADWG 2011 health guidelines	Minimum concentration or count	Maximum concentration or count	Average (Mean) concentration or count
Alkalinity	mg/L $CaCO_3$	22	22	0	46	59	51.364
Aluminium	mg/L	23	23	0	0.04	0.12	0.073
Antimony	mg/L	1	0	0	0	0	0
Arsenic	mg/L	1	0	0	0	0	0
Barium	mg/L	1	1	0	0.01	0.01	0.01
Boron	mg/L	1	1	0	0.92	0.92	0.92
Bromate	mg/L	28	7	0	0	0.017	0.002
Bromide	mg/L	28	28	0	0.052	0.774	0.394
Bromodichloromethane	mg/L	23	0	0	0	0	0
Cadmium	mg/L	1	0	0	0	0	0
Chlorate	mg/L	21	21	0	0.044	0.254	0.121
Chloride	mg/L	35	35	0	64.4	208	151
Chromium	mg/L	1	0	0	0	0	0
Copper	mg/L	1	1	0	0.003	0.003	0.003
Dibromochloromethane	mg/L	23	5	0	0	0.006	0.001
Dissolved Oxygen	mg/L	25	25	0	7.36	9.75	8.75
E. coli	MPN/100mL	154	0	0	0	0	0
Electrical Conductivity	µS/cm	98	98	0	8.38	829	612
Free Chlorine	mg/L	98	98	0	0.5	1.67	0.94
HPC	MPN/mL	21	0	0	0	0	0
Iron	mg/L	23	3	0	0	0.06	0.005
Lead	mg/L	1	0	0	0	0	0
Mercury	mg/L	1	0	0	0	0	0
Molybdenum	mg/L	1	0	0	0	0	0
Nickel	mg/L	1	0	0	0	0	0
Nitrate	mg/l	36	36	0	0.02	0.21	0.072
Nitrite	mg/l	35	1	0	0	0.01	0

Verification monitoring results - Agnes Water/1770 - Reticulation System

Parameter	Unit Of Measure	Total number of samples taken	Number of samples in which the parameter was detected	Non-compliance with ADWG 2011 health guidelines.	Minimum concentration or count	Maximum concentration or count	Average (Mean) concentration or count
pH		98	98	0	8.02	8.52	8.26
Phosphate	mg/L	35	2	0	0	0.02	0.001
Selenium	mg/L	1	0	0	0	0	0
Soluble Manganese	mg/L	11	5	0	0	0.001	0.000
Sulphate	mg/L	35	35	0	1.88	5.2	3.64
Temperature	°C	98	98	0	21	36.1	28.5
Total (Insoluble) Manganese	mg/L	23	19	0	0	0.003	0.001
Total Hardness	mg/L $CaCO_3$	22	22	0	41	56	49
Tribromomethane	mg/L	23	23	0	0.01	0.06	0.027
Trichloromethane	mg/L	23	0	0	0	0	0
True Colour	HU	98	38	0	0	3	0.56
Turbidity	NTU	98	98	0	0.08	30.8	0.54
Zinc	mg/L	1	1	0	0.025	0.025	0.025

Table 6 - Reticulation *E. coli* verification monitoring - Lake Awoonga Scheme

Drinking water scheme Lake Awoonga (Gladstone)	Year ending 2017											
Month	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Number of *E. coli* Samples Collected	52	53	52	52	52	52	52	52	52	55	55	54
Number of times *E. coli* was detected (i.e. A failure)	0	0	0	0	0	0	0	0	0	0	0	0
Number of samples collected in the previous 12 months	513	565	617	664	665	666	668	670	668	668	669	669
Number of failures for the previous 12 months	0	0	0	0	0	0	0	0	0	0	0	0
% of samples that comply	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Compliance with 98% annual value	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 7 - Reticulation *E. coli* verification monitoring - Bororen Scheme

Drinking water scheme Bororen	Year ending 2017											
Month	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Number of *E. coli* Samples Collected	0	0	0	0	0	2	1	1	2	0	0	0
Number of times *E. coli* was detected (i.e. A failure)	0	0	0	0	0	0	0	0	0	0	0	0
Number of samples collected in the previous 12 months	5	5	5	5	4	5	5	5	6	6	6	6
Number of failures for the previous 12 months	0	0	0	0	0	0	0	0	0	0	0	0
% of samples that comply	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Compliance with 98% annual value	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 8 - Reticulation *E. coli* verification monitoring - Miriam Vale Scheme

Drinking water scheme Miriam Vale	Year ending 2017											
Month	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Number of *E. coli* Samples Collected	3	3	3	3	3	3	3	4	3	3	3	3
Number of times *E. coli* was detected (i.e. A failure)	0	0	0	0	0	0	0	0	0	0	0	0
Number of samples collected in the previous 12 months	29	32	35	38	38	38	38	39	39	40	40	40
Number of failures for the previous 12 months	0	0	0	0	0	0	0	0	0	0	0	0
% of samples that comply	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Compliance with 98% annual value	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 9 - Reticulation *E. coli* verification monitoring - Agnes Water/1770

Drinking water scheme 1770-AW	Year ending 2017											
Month	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Number of *E. coli* Samples Collected	12	12	12	12	18	12	12	12	12	12	18	12
Number of times *E. coli* was detected (i.e. A failure)	0	0	0	0	0	0	0	0	0	0	0	0
Number of samples collected in the previous 12 months	130	142	154	161	168	170	171	171	171	165	171	171
Number of failures for the previous 12 months	0	0	0	0	0	0	0	0	0	0	0	0
% of samples that comply	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Compliance with 98% annual value	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Appendix B – Implementation of the DWQMP Risk Management Improvement Program

Table 10 – Progress against the risk management improvement program in the approved DWQMP

Item No.	Scheme	Scheme component	Action / Task	Comments	Status
1	Bororen	Catchment & Raw Water Bores	Investigate the boundaries of the Bororen bores recharge area to understand the risks better	Report completed.	Completed
2	Bororen	Catchment & Raw Water Bores	Investigate locations of dip sites within the catchment	No sites were registered on the Contaminated Land Register. Survey distributed 24/04/2017. To date 57 responses have been received.	In progress
3	Bororen	Catchment & Raw Water Bores	Increase monitoring during rain events to understand risks better, include arsenic and Standing Water Level testing where feasible.	Lagoon Creek monitoring was delayed. A dedicated monitoring program will be developed for Lagoon Creek in 2017-18.	In progress
4	Bororen	Catchment & Raw Water Bores	Review fire management practices around bore field, such mowing frequency	Risk profile has changed, in that the trees were cleared in 2013 and rock placed around the bores in November 2014. The bores were able to survive a grass fire. Access track is maintained and mowed.	Completed
5	Bororen	Catchment & Raw Water Bores	Review flood management practices including flood event monitoring and repair of damage	The weir is a local heritage site (steam locomotion). Access issues to the bore fields are associated with gaining access by road from Agnes Water. Bores capped to prevent water ingress. No incidents reported following 1 in 2000 year event. Monitoring river height is not considered to be of value in managing the risk.	Completed
6	Bororen	Catchment & Raw Water Bores	Review the operating philosophy of the WTP and look into options for optimisation	New Overseer has joined the process team and has the necessary water treatment qualifications and experience to review the process and provide recommendations for optimisation. Investigation has been performed and several issues have been identified for rectification.	In progress
7	Bororen	Catchment & Raw Water Bores	Investigate through consultation with farmers and other land holders the presence of bores drawing from the aquifer and the condition of the bores. Consider mentoring the farmers on best practice to prevent aquifer contamination such as capping etc. and to ensure production security	Survey form has been developed. Internal resources to be used to consult with the landowners. Survey distributed 24/04/2017. To date 57 responses have been received.	In progress
8	Bororen	Catchment & Raw Water Bores	Implement refurbishment of monitoring bore	A review identified that the bores were refurbished/relined around 2011. GRC to liaise with Trility and combine inspections with Agnes bores. Funds allocated to refurbish bores in Miriam Vale/Bororen in 17/18-20/21 ($500K)	Completed
9	Bororen	Catchment & Raw Water Bores	Carry out an in-depth desk top study and review of the soil and catchment characteristics for Bororen	Desktop study was completed	Completed

Item No.	Scheme	Scheme component	Action / Task	Comments	Status
10	Bororen	Oxidation	Develop SOP on changing of potassium permanganate dose and implement chain of authority process for changing of dose rate	A new process overseer has been employed to improve the operational performance of all treatment plants. An improvement program has been established to optimise the plant, including additional jar testing. The procedures will be updated as part of that program.	In progress
11	Bororen	Oxidation	Implement supply agreement with chemical supplier	Supply agreement has been set with Elite Chemicals for supply of Chlorine to WWTPs which can be extended to Rechlorination. Improvements have been identified for supply of sodium hypochlorite from local shops in Bororen and Miriam Vale.	Completed
12	Bororen	Oxidation	Develop SOP for the correct storage and use of potassium permanganate	Will be included in the Bororen optimisation project.	In progress
13	Bororen	All	Develop SOP for analysing SCADA trends	Will be included in the Bororen optimisation project.	In progress
14	Bororen	Clarification	Develop Plant Duty Checklist for operators to complete when attending site	A checklist exists and will be reviewed as part of the optimisation project.	In progress
15	Bororen	Clarification	Complete online turbidity meters installation for monitoring process steps performance	Will be included in the Bororen optimisation project.	In progress
16	Bororen	Clarification	Develop SOP on changing of alum dose and implement chain of authority process for changing of dose rate	Will be included in the Bororen optimisation project.	In progress
17	Bororen	Filtration	Review filter design and maintenance requirements	A review has commenced - a program has been developed to implement identified improvements.	In progress
18	Bororen	All	Review WTP operating philosophy, including coagulant type and suitability	Will be included in the Bororen optimisation project.	In progress
19	Bororen	Disinfection	Complete installation of online chlorine & pH meter	Trialled a chlorine and pH meter at Auckland Creek booster - Same meter to be purchased and installed at Bororen.	In progress
20	Bororen	Catchment & Raw Water Bores	Register bores with EHP due to legal liability and possible supply issues as aquifer is not regulated.	Review identified that there is no benefit to registering the bores.	Completed
21	Bororen	Catchment & Raw Water Bores	Develop and implement a Catchment Management Plan	Catchment management plan developed.	Completed
22	Bororen	Catchment & Raw Water Bores	Obtain independent water samples for each of the two production bores (GRC#1 and GRC#3). Conduct the standard water quality analysis to determine the extent of the variation between the two bores, on at least a monthly basis for two years.	September 2012: Included SWA for GRC#1 and GRC#3 in sampling schedule on a monthly basis. Frequency to be reviewed.	In progress
23	Bororen	Catchment & Raw Water Bores	Conduct testing of raw bore water for Cryptosporidium and Giardia at least quarterly. If detected testing interval should be increased to monthly.	Included in the 2016.17 monitoring program	In progress
24	Bororen	Catchment & Raw Water Bores	Unknown water quality of lagoon creek. Undertake investigation of water quality within Lagoon Creek, including Blue- green (cyanobacteria), herbicides and microbial	Lagoon Creek monitoring was delayed. A dedicated monitoring program will be developed for Lagoon Creek in 2017-18.	In progress

Item No.	Scheme	Scheme component	Action / Task	Comments	Status
			analysis. Initially a detailed investigation is planned at multiple sampling locations to determine temporal and spatial variations.		
25	Bororen	Catchment & Raw Water Bores	Establish and maintain regular contact with the owner of the immediate area surrounding the bore field (previously owned by Elders and operated as a tree farm). It is critical that the owner of this property is aware that the Bororen water supply is drawn from an aquifer beneath this property.	To be addressed in property owner survey. Survey distributed 24/04/2017. To date 57 responses have been received.	In progress
26	Bororen	All	Develop SOP for the chain authority in operating valves in the reticulation	Completed SOP on operating the valves for zoning.	Completed
27	All Schemes	All	Finalise Drinking Water Quality Policy Statement and put to Council for ratification	Been superseded by the Customer Service Standard.	Completed
28	All Schemes	All	Develop Customer Service Standards for the whole of Gladstone Regional Council Water and Sewage	Current Standards for Gladstone City Council (released in 2007). A revised Customer Service standard submitted at Commercial Services meeting, 11 October 2016. Draft Customer Services were released for public comment in November 2016 - no comments received to date.	In progress
29	All Schemes	All	Develop Emergency Management Plan with whole of council and sub plan specifically for WS	Provided to the Disaster Management Coordinator	Completed
30	All Schemes	All	Develop SOP for chemical acceptance and handling	Trility has provided an SOP for reference.	In progress
31	All Schemes	All	Develop and implement chemical supplier agreements	Completed for chlorine – in progress for other chemicals.	In progress
32	All Schemes	All	Develop SOP for testing chemicals for quality	Chlorine suppliers charge $100 for a chemical analysis. Look at setting up monitoring program for each chemical. SOP in place for testing chlorates in chlorine.	Completed
33	All Schemes	All	Unable to maintain knowledge about historical water quality. All historic and ongoing water data should be collated and maintained in a spread sheet to enable ready data analysis (e.g. 90%ile). This would facilitate plotting of control graphs to enable efficient interpretation of water quality data.	A water quality database has been developed and all historical data has been imported. There is also functionality in the database to graph, export and analyse data.	Completed
34	All Schemes	All	Review operator training records and implement training where deemed necessary	Operators and overseers have Cert III or Cert IV, or are completing training to these levels.	Completed
35	All Schemes	All	Develop SOPs and review communication protocols	Part of information management system. Refer Task 33 and 74	
36	All Schemes	All	Review maintenance program and assets list	Bringing assets lists in as part of the asset verification process. Reviewed fortnightly at Assets meeting.	In progress
37	All Schemes	All	Review mains repairs SOPs	Review has been completed	Completed
38	Miriam Vale	Catchment & Raw Water Bores	Undertake water quality determination upstream of the Baffle Creek water extraction area, taking into account the	Refer Task 49 - included in research project conducted by CQU student's PHD project. PhD student requested an extension	In progress

Item No.	Scheme	Scheme component	Action / Task	Comments	Status
			observations of the physical survey which will inform the types of parameters appropriate for testing.	until December 2017.	
39	Agnes Water / 1770	Stakeholder Engagement	Initiate and open communications with the Sunrise Development 1770	Potential risk of contamination of bores from activities from Sunrise development - undertake a survey of the bores to see if there is a real potential for contamination to migrate. Survey to be generated with local landholders to obtain whole of catchment data.	In progress
40	Lake Awoonga	Stakeholder Engagement	Finalise the agreement with GAWB relating to information sharing	GAWB have provided GRC with a portal to view relevant data. Other data is available on request from GAWB. GRC/GAWB combined workshop to discuss Cl and water age in networks held in September 2016. Formalised agreement still required.	In progress
41	Lake Awoonga	Reticulation	Finalise investigations into the unexplained high pH readings that have been recorded for Boyne Island.	Test during incidents, seasonal. No pH went out of exceedance - appears to be seasonal. Raw data to be obtained from GAWB.	Completed
42	Lake Awoonga	Reticulation	Review mains flushing program and ensure areas of concern regarding low free chlorine levels are included.	Will be directed by consultants modelling - GRC to investigate automatic flushing units. In the meantime flush based on sample results. GRC to implement a monthly flushing program of sites that regularly return low Chlorine readings.	In progress
43	All Schemes	Disinfection	Review result and investigate further to establish possible causes. Further detailed investigation including additional monitoring if required Implement best practice storage procedures to reduce impact of external influences such as temperature etc. Review and negotiate with supplier chemical characteristics to reduce formation of chlorate Investigate and communicate with bulk water supplier to further possible reduction of chlorate received in bulk water Further discussions with the Regulator in regards to notifiable concentration levels	Chemical supplier has the tender and provide the chlorine fresh as they produce in Gladstone and supply to GAWB as well. Issues are with Bororen & Miriam Vale where small quantities from local supplier. Review been completed and chlorate levels found to be below 0.7mg/L.	Completed
44	All Schemes	All	Co-ordinate a program to add calibration data into H2OMAP software package to be able to reflect the existing conditions within the supply system	Council awarded water quality modelling project in 2015. Final model provided to GRC in October 2016.	Completed
45	Bororen	Catchment & Raw Water Bores	Install a weather station including rain gauge, preferably with automatic logging capabilities and linked to the remote access SCADA system.	Meteorology weather stations have been installed by BOM. Rain gauge installed at the Bororen bores.	Completed
46	Bororen	Reticulation	Develop SOP for flushing and returning to service the reticulation system after a fire event which required raw water to be connected through the reticulation system	Cross connection removed	Completed
47	Bororen	Catchment & Raw Water Bores	Review monitoring program with relation to Bororen bores and consider implementing total petroleum hydrocarbon monitoring	Extra monitoring included in 2016.17 monitoring program and will be monitored for 2 years.	In progress

Item No.	Scheme	Scheme component	Action / Task	Comments	Status
48	Miriam Vale	Catchment & Raw Water Bores	Conduct physical survey upstream of the Baffle Creek water extraction area to assess vegetation condition, bank stability and cattle/wild deer access locations.	Student unable to complete. Scope of works to be included in Lagoon Creek project.	In progress
49	Miriam Vale	Catchment & Raw Water Bores	Undertake water quality determination upstream of the Baffle Creek water extraction area, taking into account the observations of the physical survey which will inform the types of parameters appropriate for testing.	Refer Task 38 To be included in research project conducted by CQU student's PHD project. PhD student should do his first paper in July 2016. First paper will be water quality items. PhD student requested an extension until December 2017.	In progress
50	Miriam Vale	Catchment & Raw Water Bores	Further investigate the known occurrence and potential for toxicity of blue green algae (Cyanobacteria) with advice from local experts (e.g. Dr Larelle Fabbro, CQU and/or Howard Howell, Ecoscope).	Included in research project conducted by CQU student's PHD project. Risks identified and included in new design for treatment plant - ie Blue Green A. PhD student requested an extension until December 2017.	In progress
51	Miriam Vale	Catchment & Raw Water Bores	Develop and implement a Catchment Management Plan	Catchment management plan requires further information. Scope of work to be included with Lagoon & Baffle Creek project.	Completed
52	Miriam Vale	Catchment & Raw Water Bores	Investigate locations of dip sites within the catchment	Desktop study completed. A survey has been developed to seek additional feedback from landowners. Survey distributed 24/04/2017. To date 57 responses have been received.	In progress
53	Miriam Vale	Catchment & Raw Water Bores	Implement annual TPH monitoring	Additional monitoring included in 2016.17 monitoring program	Completed
54	Miriam Vale	Catchment & Raw Water Bores	Review monitoring program with relation to Miriam Vale raw water to enable better assessment of the risks	Included in research project conducted by CQU student's PHD project. PhD student due complete his first paper in July 2016. PhD student requested an extension until December 2017.	In progress
55	Miriam Vale	Catchment & Raw Water Bores	Distribute information pamphlets with annual rates notices to the community to educate the community on the importance of proper maintenance of septic tanks	Prepared a flyer and placed on website as FACT SHEET NO. 0050.	Completed
56	Miriam Vale	Catchment & Raw Water Bores	Consider undertaking a camera inspection of the bore to gain further information about bore construction and condition.	Pump was installed in 2015. GRC to add in list of critical spares to the works. New pump installed April 2017. Feedback to be provided re: structural integrity.	In progress
57	Miriam Vale	Catchment & Raw Water Bores	Obtain further information about the Thorne's bore aquifer from DERM. Consider registering the bore with DERM.	No value in registering the bore. Bore information included in catchment management plan	Completed
58	Miriam Vale	WTP	Complete the disconnection and blanking off of the raw water by pass.	Was removed with upgrade of WTP	Completed
59	Miriam Vale	WTP	Finalise improvement strategies for Miriam Vale WTP and begin implementation of upgrades	Contract for WTP upgrade awarded in December 2015. Completion expected Sep/Oct 2016.	Completed
60	Miriam Vale	Catchment & Raw Water Bores	E. coli, Cryptosporidium and Giardia testing to be implemented at least monthly for the raw waters of Baffle Creek and Thorne's Creek bore. The determination of other biological parameters such as Salmonella may also be considered.	Has been included in the 2016.17 monitoring program - due to cost going to be quarterly (06/16).	Completed
61	Miriam Vale	Catchment & Raw Water Bores	Implement annual radionuclide testing to assess the risk in Thorne's Road bore groundwater	Included in the schedule. - Tests reviewed 06/16 and no issues identified.	Completed

Item No.	Scheme	Scheme component	Action / Task	Comments	Status
62	Agnes Water / 1770	Stakeholder Engagement	Establish legal documentation and/or Memorandum Of Understanding (MOU) with Sunrise@1770 Development regarding usage of water relating to management of bores to prevent contamination and managing water use to ensure viable ongoing use of aquifer.	Agreement to be reviewed. Survey to be generated with local landholders to obtain whole of catchment data.	In progress
63	Agnes Water / 1770	Catchment & Raw Water Bores	Instigate annual inspection and water quality sampling of waste water treatment plants and septic tanks within the Cove Estate area.	Additional investigation required to identify what records are currently kept by Plumbing. Plumbing section commenced monitoring 7 years ago. WWTP's and Septic Tanks are now inspected every 3 months and the reports uploaded to the GRC records system.	Completed
64	Agnes Water / 1770	Catchment & Raw Water Bores	Investigate options for upgrading the sewage system in Agnes Water and 1770	Low pressure sewer system at 1770, which is progressively being implemented. Service areas have been identified in planning scheme.	Completed
65	Agnes Water / 1770	Catchment & Raw Water Bores	Conduct water quality investigation of trenches and various ponds to include analysis for blue/green, arsenic and TPH in addition to standard parameters to determine temporal and rain event response.	Appropriate remedial action to be taken may include decommissioning of trenches Refer Task 78. Trility have confirmed that the trenches have been decommissioned.	Completed
66	Agnes Water / 1770	Catchment & Raw Water Bores	Implement regular analysis of TPH in raw water	GRC have requested that Trility perform this analysis for a period of 12 months.	In progress
67	Agnes Water / 1770	WTP	Include THM's and Chlorates in monitoring program at WTP outlet	MWH Report indicated that this issue is low risk. .	Completed
68	Agnes Water / 1770	WTP	E. coli (monthly), Cryptosporidium and Giardia testing to be conducted at least quarterly for the raw and treated waters.	Monitoring Program is currently under review and microbiological testing will be undertaken in line with the new schedule.	In progress
69	All Schemes	All	Review and update monitoring program for all schemes and all components	Verification Monitoring Program review to be included in the DWQMP Review 2017/2018.	In progress
70	All Schemes	Disinfection	Implement upgrades of rechlorination facilities	Model indicated that rechlorination is not required.	Completed.
71	All Schemes	Reticulation	Review mains flushing program and ensure correct procedures and protocols are in place.	Procedures developed for dirty water complaints and low free chlorine. Available on share point and ECM - Doc set ID 3269704	Completed
72	All Schemes	All	Complete upgrade of all SCADA systems and components	GRC now has visibility on all its own reservoirs. Bororen and Miriam Vale WTPs are also both online.	Completed
73	All Schemes	All	Review and update standard operating procedure for monitoring of drinking water for all schemes	Works were Completed - procedure decommissioned and contents divided between new SOPs, Laboratory Manual and Monitoring Program.	Ongoing reviews required
74	All Schemes	All	Review incident recording and response and records of actions undertaken. Review how changes are implemented to prevent	Water quality incidents are recorded in GRC's ECM system as well as reported to DEWS.	Completed

Item No.	Scheme	Scheme component	Action / Task	Comments	Status
			reoccurrences.		
75	All Schemes	All	Review the risk methodology implemented including risk matrix and GRC's view on acceptable risk. As no "Extreme" or "High" consequence will result in an acceptable risk.	All future risk assessments will be carried out using the GRC risk matrix	Completed
76	Agnes Water / 1770	All	Review communication between Trility and GRC and how GRC manages Trility and ensures they are operating as per contractual requirements and as per legislative requirements. Also look at the reporting of incidents between the two parties.	Monthly reports provided by Trility along with monthly and quarterly meetings where performance is discussed.	Completed
77	All Schemes	All	Implement document management system	All documents in ECM or the cloud. Kiosks provided to allow field staff to access data.	Completed
78	Agnes Water / 1770	Catchment & Raw Water Bores	Consider filling in trenches	Refer Task 65	
79	Agnes Water / 1770	Catchment & Raw Water Bores	Review fire management practices around bore field, such mowing frequency	Confirmed part of monthly inspection	Completed
80	Agnes Water / 1770	Catchment & Raw Water Bores	Review flood management practices	Trility has a monitoring process in place and if water quality deteriorates they can swap to desalination mode.	Completed
81	All Schemes	All	Review reservoirs inspection and maintenance program	Reservoir data has ben collected, and captured on Sharepoint. Program in inspect included in 2016.17 budget. Condition Assessments completed on Reservoirs. Monthly Reservoir Checks have also been implemented and are uploaded to Sharepoint.	Completed
82	Miriam Vale	Catchment & Raw Water Bores	Review fire management practices around bore field, such mowing frequency	Bore low risk, part of maintenance activities.	Completed
83	Miriam Vale	Catchment & Raw Water Bores	Review flood management practices including flood event monitoring of bores	Remote control to be included as part of WTP upgrade and review design of infrastructure. Online turbidity monitoring downstream of where the bore and surface waters combine. The new plant is designed to respond to water quality changes. New plant has been commissioned and includes the remote-control aspects for flood management.	Completed
84	Miriam Vale	WTP	Develop Plant Duty Checklist for operators to complete when attending site	Completed for existing plant. A new one to be developed for the new plant. As per Item 6.	In progress
85	Miriam Vale	Reservoir	Complete repairs to reservoir hatch	Hatch has been repaired	Completed
86	Lake Awoonga	Reticulation	Develop SOP regarding the operation and chain of authority for operating zone valves within the system	Isolation process being finalised and due for completion 30/6/16.	Completed
87	All Schemes	All	Review security for infrastructure, in particular look at reservoirs	Monthly inspection of the reservoirs has commenced which allows for early notification. Identified works will be	Completed

Item No.	Scheme	Scheme component	Action / Task	Comments	Status
				completed as budget allows .	
88	All Schemes	All	Develop SOP for mains flushing	See Task 71	Completed
88	All Schemes	All	Develop backflow register and inspection program	Plumbing Section - completed and done electronically on i-pad and in conquest.	Completed
89	Agnes Water / 1770	WTP	Monitor and collect water quality data on the desalination plant when it becomes operational. Re-assess risks when data is available.	Data provided by Trility and reviewed monthly with GRC. No noticeable changes to influent.	Completed
90	Lake Awoonga	Bulk water	Investigate through water quality modelling excerise being undertaken by MWH (2015) the need for chlorine monitoring on the inlet to GRC reservoirs from GAWB sites	Report completed	Completed
New	Bororen WTP	Disinfection	1. Cover window or move storage drums and metering drum to different location in shed to reduce effects of UV light and increased temperatures 2. Replace metering drum with 2 blue or black drums to reduce effects of UV light 3. Dilute chlorine with water on purchase reduces degradation rate 4. Ensure metering drums are filled only when empty to reduce the accumulation of settled solids 5. Discuss storage options with supplier	Options developed and implemented. Ongoing monitoring to ensure effectiveness.	Completed
New	Miriam Vale	Disinfection	Implement recommendations from Anne Maree's chlorate investigation report when designing and constructing the new WTP.	Options developed and implemented. Ongoing monitoring to ensure effectiveness.	Completed
New	All Schemes	Water Quality and Water Age	A review of Water Quality and Water Age to be completed.	Water age and quality model completed..	Completed
New	Lake Awoonga	Water Age	Riverstone Rise - Limited drawoff from the main (ie development did not eventuate as planned). Allocate money in next year's budget.	Funding has been allocated for Tech Services to carry out investigation and design in the 17/18 budget.	Completed
New	All Schemes	Water Quality	Review water quality risks associated with Trickle Feed tanks - ie what sort of backflow is in place.	Testing has been carried out on some backflow devices that are specific to this issue. Tech Services to tasked with a CSR to investigate the installation of meters on trickle feeds with similar configuration to those used in Central Highlands Regional Council. Liaise with Water Service and Plumbing Inspectors.	In progress
New	All Schemes	Water Quality	Provide refresher course on hygiene for staff - looking at the 5C program	L&D to organise a refresher course.	In progress
New	All Schemes	Water Quality	CCP - review of information provided in the DWQMP for the reticulation system.	Included in the DWQMP Review scope of works.	In progress

Item No.	Scheme	Scheme component	Action / Task	Comments	Status
New	All Schemes	Water Quality	Asbestos roofs remaining on reservoirs - need to add into the 2017/18 works program.	Multi criteria assessment tender to be released to manage the project	In progress