Drinking Water Quality Management DWQMP – Annual Report

2020-2021

Whitsunday Regional Council

Service Provider No.: 501

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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
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
<	Less than
>	Greater than

Date	Report	Author	Reviewed By	Authorised by COO
16/12/2021	Annual Report	Kerrie Pearson	Peter Stapleton Darren Raeck	Troy Pettiford

Introduction

This report documents the performance of Whitsunday Regional Council's drinking water service with respect to water quality and performance in implementing the actions detailed in the 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.

Whitsunday Regional Council is operating under an approved DWQMP to ensure consistent supply of safe quality drinking water in order to protect public health. This is done through proactive identification and minimisation of public health related risks associated with drinking water.

It has been prepared in accordance with the *Drinking Water Quality Management Plan Report Guidance Note* published by the Department of Natural Resources, Mines and Energy, Queensland, September 2018 accessible at www.business.qld.gov.au (now Department of Regional Development, Manufacturing and Water).

1. Overview of Operations

Water and wastewater is managed within Whitsunday Regional Council by a separate business unit "Whitsunday Water" since July 2015.

Whitsunday Water maintains and operates 4 water treatment plants, supplying water to a seasonally fluctuating population of over 35 000 people, including residential, commercial, tourism and industrial customers.

Scheme	Communities Served	Population served	Source	Treatment	Treatment Capacity, ML/day
Bowen	Bowen, Brisk Bay, Merinda	10400	Sub-surface / open water intake in the Proserpine River	Conventional Flocculation with lamella plate settling and Dual media filtration. Disinfected with Sodium Hypochlorite.	16.5
Collinsville	Collinsville, Scottsville	1500	Bowen River Weir, from Eungella Dam (Sunwater)	Conventional Flocculation and filtration. Disinfected with Sodium Hypochlorite.	6
Proserpine	Proserpine, Mt Julian (can supply Cannonvale/Airlie Beach)	4200	Aquifer bores, supplemented from Peter Faust Dam	Conventional Flocculation with Dual media filtration. Disinfected with Sodium Hypochlorite.	14
Coastal	Cannonvale, Airlie Beach, Mt Julian, Jubilee Pocket	14600	Aquifer bores	Conventional Flocculation with Dual media filtration. Disinfected with Sodium Hypochlorite.	9.6

Table 1- Drinking Water Supplies

During the 2021-2022 year there will be some major changes to the Coastal Water Supply Scheme. These will be included in a future amendment of the DWQMP.

In summary the changes will include:

- Bulk supply pipeline – replace existing 225 bulk water supply pipeline from Proserpine WTP to Coastal WTP with a 559 diameter pipe; new pump station to pump 140L/s through the new pipeline; redirect Bore 10 from Coastal to Proserpine WTP.
- Cannon Valley Reservoirs – Construct 2 new 12ML reservoirs; redirecting water from the new bulk supply pipeline to the new reservoirs only, with the rest of the network then being gravity fed from the Cannon Valley Reservoirs.
- Cannonvale water network augmentation project – to construct various trunk water mains and interconnecting links to optimise the utilisation of the existing reservoirs and partition the network.
- Cannonvale reservoir reconfiguration – to allow refurbishment, repair and reconfigure its inlet and outlet. This can only take place after the new Cannon Valley reservoirs are complete.
- Other reservoir upgrades – Coyne Road high level and Moonlight Drive.

These projects will take the pressure off the Coastal WTP to allow it to be taken off-line for maintenance or other works and not to be in production 24hrs every day.

2. DWQMP Implementation

Water quality has been ensured by the implementation of safeguards and barriers identified in the DWQMP. Water quality in all areas has been kept to high standards with the implementation of sampling regimes, maintenance schedules and hazard identifications highlighted in the DWQMP.

2.1 Implementing the Risk Management Improvement Program

Refer to Appendix B for a summary of progress in implementing each of the Improvement Program actions.

All risk management improvement programs outlined in the DWQMP are being or have been implemented or are part of an ongoing maintenance strategy.

Items in the Risk Management Improvement Plan (RMIP) that have been Updated include

- Bowen open water intake – 3 stage capital process – building repair, electrical (switchboard), mechanical (pumps)
- Proserpine Bores – New pump station complete; funding application for construction of 4 bores (1 bore funded)
- Bulk potable water project in the Coastal and Proserpine reticulation network. Bore 10 isolated from network, redirected to Proserpine WTP; pipeline from Proserpine to Coastal completed (see above); 2 x reservoirs under construction, completion due June 2022; network configuration after finalised construction.
- Cybersecurity and site security split into separate actions.

There have been some new projects included in the RMIP. These include

- Replace Turbidity analysers when replacement required – due to service technician reliability issues
- Collinsville Solar Project – will incorporate electrical upgrade at Collinsville WTP with more SCADA upgrades.
- Staffing for relief periods.

2.2 The Monitoring Program

Operational monitoring and Verification monitoring programs have continued unchanged throughout the year.

2.3 Amendments made to the DWQMP

The Approved DWQMP, version 2.3, was audited by external consultant, Bligh Tanner in May 2021, with the audit report submitted 15 June 2021.

A review is scheduled by October 2021.

The Approved DWQMP as at 30 June 2021 is Version 2.3, approved in September 2019.

3. Compliance with Water Quality Criteria

The water quality criteria mean health guideline values in the most current Australian Drinking Water Guidelines, as well as the standards in the Public Health Regulation 2005.

A summary of water quality characteristics for each scheme is contained in Appendix A.

3.1 Chemical

All samples taken during this financial year met the recommended values in the Australian Drinking Water Guidelines, with the exception of Manganese at Bowen in relation to a dirty water event, refer to section 4. Chlorate was also detected again in Bowen Reticulated water in January 2021, refer to exceedance report in section 4.

3.2 E. coli

There were no E.coli detected in any sample taken during this financial year.

3.3 Fluoride

Fluoride is not added to water within the Whitsunday Regional Council area, so levels detected are natural background levels.

4. Notifications to the Regulator

There were no notifications involving the detection of *E. coli* – an organism that may not directly represent a hazard to human health but indicates the presence of recent faecal contamination.

Some events to note during 2020-2021 are summarised below, including the notifications made to the regulator.

Wet weather event – January 2021

During the period 24 December 2020 to 13 January 2021 the Whitsunday region experienced a significant weather event as the result of a monsoon trough sitting over the region and (ex) Tropical Cyclone Kimi. The Bowen area received over 540mm of rain, Cannonvale / Airlie Beach (Coastal WTP) over 680mm, Proserpine approximately 730mm of rain and Collinsville received almost 220mm over the period. No issues were experienced at any of the Water Treatment Plants or in the networks during this period.

Bowen Dirty Water Event – January 2021 – DWI-501-21-08872

During the period 11 January 2021 to 10 February 2021 a total of 113 dirty water complaints had been received in the Bowen area, in total 163 dirty water complaints were attributed to this event. All relating to red / brown / black water as a result of Manganese in the water. There were multiple contributing factors to the manganese issue: starting with increased levels of Manganese in the raw water from Peter Faust Dam; changing from a subsurface / surface water blend to straight subsurface water; the oxidation process during treatment not being optimized; re-chlorination of the water in Bowen (which oxidized Iron and Manganese) and high water temperatures that can contribute to oxidizing Iron and Manganese in the network and also increase degradation of biofilms in the network which showed as having to flush some areas multiple times. Rectifications actions taken include: optimizing the oxidation process at the Bowen WTP; optimizing the chlorine dose rate at the Bowen reservoirs; increased monitoring and extensive flushing throughout the network. Further actions included adjusting procedures for cleaning the river spears, include Manganese levels as operational control points and better communications packages for customers.

Coastal Dirty Water Event – May 2021 – DWI-501-21-08981

A total of 55 dirty water complaints were received in the Coastal reticulation network between 9 May 2021 and 14 May 2021, with 42 received on Monday 10 May 2021. The cause of the discoloured water was linked to a failure of level instrumentation located in the Squatter tank at Proserpine, giving a false high level. The water level in the Squatter Tank ran low creating a vortex, which allowed air to enter the Booster 1 Pump station, causing an air scouring effect in the trunk main through to Mount Julian and the Coastal WTP Clear Water Storage, the discoloured water continued to the reticulation throughout Cannon Valley, Cannonvale, Airlie Beach and Jubilee Pocket. Four key points of failure were identified – Proserpine WTP running at below normal production (feed bores out of service); Squatter tank level instrumentation failure potentially due to age; Coastal WTP Clear Water Storage SCADA alarms not set correctly and scour valve not able to be opened; as well as Whitsunday Water office event response inadequate due to insufficient staffing and lack of relevant information. Rectification actions taken include additional operational monitoring, further inspections and replacements and extensive flushing throughout the network. Further actions included SCADA CCP control reinstatement, contingency plans for staff leave and better communications packages for customers.

High Chlorate result in Bowen – June 2021 – DWI-501-21-08984

A review of information provided in the Annual report indicated an elevated Chlorate result for Bowen Treated Water and also Bowen Reticulated Water. Historical results indicate increased levels during the summer months, with at least one sample each year exceeding the limit of 0.8 mg/L. Sodium Hypochlorite

solution strength is more closely monitored in the existing tank before and after new deliveries. An options analysis report is due in 2022 on the conversion of existing Hypochlorite systems to Chlorine Gas. Budget for the conversions has been allocated for this project across the 2022-23 and 2023-24 years.

5. Customer Complaints Related to Water Quality

Whitsunday 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:

	Suspected Illness	Dirty water	Taste and odour	Total
Bowen	0	189	6	195
Coastal	0	93	8	101
Collinsville	0	3	1	4
Proserpine	0	5	1	6
Total	0	290	16	306

Table 2 – Complaints about water quality

5.1 Suspected Illness

There were no suspected illness complaints attributed to water.

5.2 Discoloured Water

The large number of dirty water complaints received in the Bowen and Coastal areas can be attributed to the events as discussed in Section 4.

The other dirty water complaints in the Collinsville and Proserpine areas during the 2020-21 year were, in each case, just a localised area and was flushed to achieve clear water. No further action was required.

5.3 Taste and Odour

Approximately half of the taste and odour complaints in the Bowen and Coastal areas were during the events as discussed in Section 4. The remaining were determined to be unsubstantiated and no further action was required other than flushing in some cases.

The odour related complaint in Collinsville was flushed with no further action required. The Proserpine complaint was determined to not be a water related issue, no further action was required.

6. DWQMP Review

There was no official review of the DWQMP carried out in the 2020-2021 year.

An external audit was carried out by 30 June 2021, with a review due 4 October 2021.

The external audit was carried out by Bligh Tanner on 25 May 2021. As the previous audit included all 4 drinking water schemes, the 2021 audit focussed on the Bowen and Collinsville drinking water schemes. These schemes are considered to be representative as they represent the treatment plant that produces the most water (Bowen) and a smaller, older scheme (Collinsville).

Result comments from the auditor (taken directly from the audit report) - The audit identified a number of aspects that are managed well. For example, the verification monitoring program is robust and implemented as stated.

However, there were also a number of non-conformances identified. A number of the non-conformances are due to differences between the specific stated action in the DWQMP and the way that the actions are implemented in practice. For example, some operational monitoring is identified as occurring daily, when in practice it is undertaken on weekdays only. These types of non-conformances should be able to be resolved by minor amendments to the DWQMP.

There were other non-conformances that were identified that have the potential to impact drinking water safety. At the Collinsville WTP, it was identified that a pH meter is unreliable and that as a result all plant shutdown alarms have been disabled. The disabling of filtered water and chlorine alarms is contrary to the DWQMP and has potential for water outside of specification to be provided to customers without the operator's knowledge of an issue.

The Bowen WTP is a more modern WTP with more online instrumentation available to operators. However, there were a number of issues identified that impact the effectiveness of the CCPs that are approved in the DWQMP. These were identified as non-conformances where the audit identified operation outside of the CCP limits. Issues were identified with all CCPs and in some cases the operational philosophy of the treatment plant should be reviewed to determine if it is appropriate.

All of these non-conformances were included in an action plan and are to be addressed during the Review of the DWQMP in October 2021. An amendment application for an amended DWQMP will be included with the review report.

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*.

Verification monitoring was carried out as per the program stated in the DWQMP.

A summary of water quality characteristics for each scheme are contained in the following tables.

Table 3a - Verification monitoring results - Bowen Scheme

	Parameter	Unit of Measure	LOR	Total Samples Collected	No. Samples in which parameter was detected	No. of samples exceeding water quality criteria	Minimum Result	Maximum Result	Average of Results
In-House Test Results	pH	mg/L	0.1	364	364	0	2.17	7.51	7.18
	Turbidity	NTU	0.01	364	364	0	0.011	3.38	0.19
	Conductivity	µS/cm	1	52	52	0	253	428	344
	Colour	Pt/Co	1	364	233	6	0	30	2.06
	Free chlorine residual	mg/L	0.1	363	363	0	1.31	3.33	2.36
	Total chlorine residual	mg/L	0.1	37	37	0	1.58	3.61	2.76
	Alkalinity	mg/L	0.1	101	101		48.4	124.4	81.8
	Total hardness	mg/L	0.1	102	102	0	2.87	116.8	77.5
	Iron	mg/L	0.01	362	323	0	0	0.04	0.013
	Manganese	mg/L	0.001	339	183	0	0	0.09	0.004
	Aluminium	mg/L	0.001	362	362	0	0.01	0.069	0.027
NATA Lab Results	pH	mg/L	0.1	24	24	0	6.58	7.44	6.98
	Turbidity	NTU	1	24	0	0	<1	<1	<1
	Colour	Pt/Co	1	24	1	0	1	1	1.0
	Conductivity	µS/cm	5	24	24	0	262	595	416.3
	Alkalinity	mg/L	5	24	24	0	50	113	84.0
	Total hardness	mg/L	5	24	24	0	48	116	80.4
	Total dissolved solids	mg/L	10	24	24	0	147	327	230.3
	Chloride	mg/L	2	24	24	0	37	96	66.1
	Sulphate	mg/L	2	24	24	0	10	32	17.5
	Fluoride	mg/L	0.05	24	24	0	0.08	0.11	0.10
	Nitrate	mg/L	0.05	24	24	0	0.08	3.5	0.52
	Silica	mg/L	5	24	24	0	12	16	14.5
	Sodium	mg/L	0.05	24	24	0	31	75	52.0
	Potassium	mg/L	0.05	24	24	0	2.5	3.5	2.9
	Calcium	mg/L	0.05	24	24	0	9.7	25	17.8
	Magnesium	mg/L	0.05	24	24	0	5.3	13	8.7
	Chlorate	mg/L	0.01	24	24	*1*	0.21	0.86	0.405
	Aluminium	mg/L	0.01	24	24	0	0.01	0.15	0.029
	Antimony	mg/L	0.0001	24	0	0	<0.0001	<0.0001	<0.0001
	Arsenic	mg/L	0.0001	24	24	0	0.0002	0.0004	0.0003
	Barium	mg/L	0.001	24	24	0	0.027	0.066	0.041
	Beryllium	mg/L	0.0001	24	0	0	<0.0001	<0.0001	<0.0001
	Boron	mg/L	0.001	24	24	0	0.027	0.033	0.029
	Cadmium	mg/L	0.0001	24	5	0	0.0001	0.0005	0.00024
	Chromium	mg/L	0.0001	24	6	0	0.0001	0.0002	0.0001
	Cobalt	mg/L	0.0001	24	1	0	0.0001	0.0001	0.0001
	Copper	mg/L	0.001	24	24	0	0.002	0.037	0.0179
	Iron	mg/L	0.005	24	9	0	0.006	0.021	0.0102
	Lead	mg/L	0.0001	24	15	0	0.0001	0.0013	0.0005
	Mercury	mg/L	0.0001	24	0	0	<0.0001	<0.0001	<0.0001
	Manganese	mg/L	0.001	24	24	*2*	0.0003	0.17	0.0194
	Molybdenum	mg/L	0.0001	24	24	0	0.0003	0.0005	0.0004
	Nickel	mg/L	0.0001	24	24	0	0.0001	0.0009	0.0002
	Selenium	mg/L	0.0001	24	0	0	<0.0001	<0.0001	<0.0001
	Silver	mg/L	0.001	24	0	0	<0.001	<0.001	<0.001
	Strontium	mg/L	0.01	24	24	0	0.13	0.28	0.205
	Thallium	mg/L	0.0001	24	0	0	<0.0001	<0.0001	<0.0001
	Tin	mg/L	0.0001	24	3	0	0.0001	0.0027	0.0010
	Titanium	mg/L	0.001	24	0	0	<0.001	<0.001	<0.001
	Uranium	mg/L	0.0001	24	0	0	<0.0001	<0.0001	<0.0001
	Vanadium	mg/L	0.0001	24	17	0	0.0001	0.0004	0.0002
	Zinc	mg/L	0.001	24	22	0	0.001	0.007	0.0040
	Chloroform	µg/L	1	24	24	0	9	110	33.4
	Bromodichloro methane	µg/L	1	24	24	0	15	61	29.2
	Dibromochloro methane	µg/L	1	24	24	0	11	38	22.3
	Bromoform	µg/L	1	24	24	0	1	7	3.8
	Total THM's	µg/L	1	24	24	0	43	200	88.9
	PFOS	µg/L	0.005	8	0	0	<0.005	<0.005	<0.005

Table 3b - Verification monitoring results - Coastal Scheme

	Parameter	Unit of Measure	LOR	Total Samples Collected	No. Samples in which parameter was detected	No. of samples exceeding water quality criteria	Minimum Result	Maximum Result	Average of Results
In-House Test Results	pH	mg/L	0.1	364	364	0	7.21	7.53	7.36
	Turbidity	NTU	0.01	364	364	0	0.06	1.31	0.10
	Conductivity	µS/cm	1	98	98	0	375.00	694.00	475.13
	Colour	Pt/Co	1	364	176	0	0.00	5.00	0.57
	Free chlorine residual	mg/L	0.1	363	363	0	1.15	1.98	1.58
	Total chlorine residual	mg/L	0.1	47	47	0	1.33	2.03	1.74
	Alkalinity	mg/L	0.1	97	97	0	74.00	144.40	95.00
	Total hardness	mg/L	0.1	97	97	0	84.00	181.60	109.91
	Iron	mg/L	0.01	362	326	0	0.000	0.070	0.012
	Manganese	mg/L	0.001	364	66	0	0.000	0.060	0.001
	Aluminium	mg/L	0.001	364	364	0	0.026	0.194	0.053
NATA Lab Results	pH	mg/L	0.1	24	24	0	6.68	7.8	7.16
	Turbidity	NTU	1	24	0	0	<1	<1	<1
	Colour	Pt/Co	1	24	0	0	<1	<1	<1
	Conductivity	µS/cm	5	24	24	0	382	595	480.2
	Alkalinity	mg/L	5	24	24	0	78	112	90.6
	Total hardness	mg/L	5	24	24	0	80	136	106.9
	Total dissolved solids	mg/L	10	24	24	0	227	356	284.9
	Chloride	mg/L	2	24	24	0	63	100	83.5
	Sulphate	mg/L	2	24	24	0	8.5	13	10.8
	Fluoride	mg/L	0.05	24	24	0	0.1	0.12	0.11
	Nitrate	mg/L	0.05	24	24	0	3	9.2	6.15
	Silica	mg/L	5	24	24	0	31	51	39.88
	Sodium	mg/L	0.05	24	24	0	45	67	53.46
	Potassium	mg/L	0.05	24	24	0	0.89	1.5	1.34
	Calcium	mg/L	0.05	24	24	0	17	28	22.17
	Magnesium	mg/L	0.05	24	24	0	9.2	16	12.56
	Chlorate	mg/L	0.01	24	23	0	0.24	0.49	0.367
	Aluminium	mg/L	0.01	24	24	0	0.036	0.071	0.053
	Antimony	mg/L	0.0001	24	0	0	<0.0001	<0.0001	<0.0001
	Arsenic	mg/L	0.0001	24	24	0	0.0002	0.0004	0.00030
	Barium	mg/L	0.001	24	24	0	0.023	0.031	0.0275
	Beryllium	mg/L	0.0001	24	0	0	<0.0001	<0.0001	<0.0001
	Boron	mg/L	0.001	24	24	0	0.022	0.028	0.0255
	Cadmium	mg/L	0.0001	24	1	0	0.0002	0.0002	0.0002
	Chromium	mg/L	0.0001	24	2	0	0.0002	0.0002	0.0002
	Cobalt	mg/L	0.0001	24	0	0	<0.0001	<0.0001	<0.0001
	Copper	mg/L	0.001	24	12	0	0.001	0.011	0.0031
	Iron	mg/L	0.005	24	5	0	0.005	0.011	0.0072
	Lead	mg/L	0.0001	24	11	0	0.0001	0.0006	0.00019
	Mercury	mg/L	0.0001	24	0	0	<0.0001	<0.0001	<0.0001
	Manganese	mg/L	0.001	24	24	0	0.0003	0.024	0.0020
	Molybdenum	mg/L	0.0001	24	24	0	0.0002	0.0004	0.0003
	Nickel	mg/L	0.0001	24	13	0	0.0002	0.0002	0.0002
	Selenium	mg/L	0.0001	24	24	0	0.0001	0.0002	0.00018
	Silver	mg/L	0.001	24	0	0	<0.001	<0.001	<0.001
	Strontium	mg/L	0.01	24	24	0	0.21	0.37	0.280
	Thallium	mg/L	0.0001	24	0	0	<0.0001	<0.0001	<0.0001
	Tin	mg/L	0.0001	24	0	0	<0.0001	<0.0001	<0.0001
	Titanium	mg/L	0.001	24	0	0	<0.001	<0.001	<0.001
	Uranium	mg/L	0.0001	24	4	0	0.0001	0.0002	0.00013
	Vanadium	mg/L	0.0001	24	23	0	0.0008	0.0027	0.0016
	Zinc	mg/L	0.001	24	12	0	0.002	0.006	0.0036
	Chloroform	µg/L	1	24	24	0	2	13	6.4
	Bromodichloro methane	µg/L	1	24	24	0	9	22	14.4
	Dibromochloro methane	µg/L	1	24	24	0	17	36	24.0
	Bromoform	µg/L	1	24	24	0	7	16	11.4
	Total THM's	µg/L	1	24	24	0	41	83	56.2
	PFOS	µg/L	0.005	8	0	0	<0.005	<0.005	<0.005

Table 3c - Verification monitoring results - Collinsville Scheme

	Parameter	Unit of Measure	LOR	Total Samples Collected	No. Samples in which parameter was detected	No. of samples exceeding water quality criteria	Minimum Result	Maximum Result	Average of Results
In-House Test Results	pH	mg/L	0.1	358	358	1	6.8	8.92	7.24
	Turbidity	NTU	0.01	359	359	0	0.04	0.183	0.08
	Conductivity	µS/cm	1	91	91	0	95.4	222	137
	Colour	Pt/Co	1	358	71	0	0	4	0.31
	Free chlorine residual	mg/L	0.1	359	359	0	0.36	1.84	1.41
	Total chlorine residual	mg/L	0.1	47	47	0	1.37	1.9	1.67
	Alkalinity	mg/L	0.1	90	90	0	30	70	46.09
	Total hardness	mg/L	0.1	0					
	Iron	mg/L	0.01	359	359	0	0.01	0.03	0.012
	Manganese	mg/L	0.001	359	359	0	0.001	0.017	0.003
	Aluminium	mg/L	0.001	359	359	0	0.008	0.142	0.019
NATA Lab Results	pH	mg/L	0.1	24	24	9	6.3	7.24	6.61
	Turbidity	NTU	1	24	0	0	<1	<1	<1
	Colour	Pt/Co	1	24	0	0	<1	<1	<1
	Conductivity	µS/cm	5	24	24	0	136	224	169.3
	Alkalinity	mg/L	5	24	24	0	25	52	34.6
	Total hardness	mg/L	5	24	24	0	27	68	42.6
	Total dissolved solids	mg/L	10	24	24	0	84	135	104.3
	Chloride	mg/L	2	24	24	0	12	20	14.5
	Sulphate	mg/L	2	24	24	0	12	45	23.8
	Fluoride	mg/L	0.05	24	24	0	0.03	0.06	0.040
	Nitrate	mg/L	0.05	24	24	0	0.11	1	0.292
	Silica	mg/L	5	24	24	0	11	17	13.4
	Sodium	mg/L	0.05	24	24	0	11	24	15.4
	Potassium	mg/L	0.05	24	24	0	0.76	2	1.20
	Calcium	mg/L	0.05	24	24	0	6.8	16	10.7
	Magnesium	mg/L	0.05	24	24	0	2.5	6.7	3.89
	Chlorate	mg/L	0.01	24	24	0	0.13	0.41	0.220
	Aluminium	mg/L	0.01	24	24	0	0.006	0.05	0.0169
	Antimony	mg/L	0.0001	24	0	0	<0.0001	<0.0001	<0.0001
	Arsenic	mg/L	0.0001	24	11	0	0.0001	0.0003	0.00019
	Barium	mg/L	0.001	24	24	0	0.0097	0.038	0.0203
	Beryllium	mg/L	0.0001	24	0	0	<0.0001	<0.0001	<0.0001
	Boron	mg/L	0.001	24	24	0	0.0095	0.022	0.015
	Cadmium	mg/L	0.0001	24	0	0	<0.0001	<0.0001	<0.0001
	Chromium	mg/L	0.0001	24	3	0	0.0001	0.0001	0.0001
	Cobalt	mg/L	0.0001	24	0	0	<0.0001	<0.0001	<0.0001
	Copper	mg/L	0.001	24	24	0	0.003	0.088	0.0153
	Iron	mg/L	0.005	24	11	0	0.005	0.032	0.0128
	Lead	mg/L	0.0001	24	10	0	0.0001	0.0002	0.00012
	Mercury	mg/L	0.0001	24	0	0	<0.0001	<0.0001	<0.0001
	Manganese	mg/L	0.001	24	24	0	0.0003	0.039	0.0027
	Molybdenum	mg/L	0.0001	24	24	0	0.0001	0.0004	0.0002
	Nickel	mg/L	0.0001	24	22	0	0.0001	0.0004	0.00023
	Selenium	mg/L	0.0001	24	0	0	<0.0001	<0.0001	<0.0001
	Silver	mg/L	0.001	24	0	0	<0.001	<0.001	<0.001
	Strontium	mg/L	0.01	24	24	0	0.047	0.15	0.085
	Thallium	mg/L	0.0001	24	0	0	<0.0001	<0.0001	<0.0001
	Tin	mg/L	0.0001	24	0	0	<0.0001	<0.0001	<0.0001
	Titanium	mg/L	0.001	24	0	0	<0.001	<0.001	<0.001
	Uranium	mg/L	0.0001	24	0	0	<0.0001	<0.0001	<0.0001
	Vanadium	mg/L	0.0001	24	24	0	0.0006	0.011	0.0017
	Zinc	mg/L	0.001	24	23	0	0.002	0.03	0.0145
	Chloroform	µg/L	1	24	24	0	7	51	21.7
	Bromodichloro methane	µg/L	1	24	24	0	6	20	11.3
	Dibromochloro methane	µg/L	1	24	24	0	2	9	4.3
	Bromoform	µg/L	1	24	2	0	1	1	1.0
	Total THM's	µg/L	1	24	24	0	16	66	37.3
	PFOS	µg/L	0.005	8	0	0	<0.005	<0.005	<0.005

Table 3d - Verification monitoring results - Proserpine Scheme

	Parameter	Unit of Measure	LOR	Total Samples Collected	No. Samples in which parameter was detected	No. of samples exceeding water quality criteria	Minimum Result	Maximum Result	Average of Results
In-House Test Results	pH	mg/L	0.1	364	364	0	7.13	7.62	7.40
	Turbidity	NTU	0.01	361	361	0	0.039	0.121	0.07
	Conductivity	µS/cm	1	98	98	0	37	526	375
	Colour	Pt/Co	1	364	58	0	0	4	0.17
	Free chlorine residual	mg/L	0.1	363	363	0	1.11	2.16	1.50
	Total chlorine residual	mg/L	0.1	49	49	0	1.45	2.47	1.70
	Alkalinity	mg/L	0.1	99	99	0	50.8	169.2	85.5
	Total hardness	mg/L	0.1	99	99	0	51.2	128.8	84.1
	Iron	mg/L	0.01	364	346	0	0	0.08	0.013
	Manganese	mg/L	0.001	364	89	0	0	0.017	0.000
	Aluminium	mg/L	0.001	364	364	0	0.0048	0.085	0.052
NATA Lab Results	pH	mg/L	0.1	24	24	0	6.73	7.85	7.22
	Turbidity	NTU	1	24	0	0	<1	<1	<1
	Colour	Pt/Co	1	24	0	0	<1	<1	<1
	Conductivity	µS/cm	5	24	24	0	337	450	378.2
	Alkalinity	mg/L	5	24	24	0	70	100	79.6
	Total hardness	mg/L	5	24	24	0	64	108	76.9
	Total dissolved solids	mg/L	10	24	24	0	210	280	228.9
	Chloride	mg/L	2	24	24	0	54	66	59.8
	Sulphate	mg/L	2	24	24	0	11	15	12.1
	Fluoride	mg/L	0.05	24	24	0	0.1	0.12	0.115
	Nitrate	mg/L	0.05	24	24	0	1.7	6.8	3.17
	Silica	mg/L	5	24	24	0	29	45	33.9
	Sodium	mg/L	0.05	24	24	0	39	50	46.0
	Potassium	mg/L	0.05	24	24	0	1.2	1.8	1.49
	Calcium	mg/L	0.05	24	24	0	13	22	15.42
	Magnesium	mg/L	0.05	24	24	0	7.8	13	9.32
	Chlorate	mg/L	0.01	24	24	0	0.27	0.57	0.428
	Aluminium	mg/L	0.01	24	24	0	0.036	0.083	0.054
	Antimony	mg/L	0.0001	24	0	0	<0.0001	<0.0001	<0.0001
	Arsenic	mg/L	0.0001	24	24	0	0.0002	0.0004	0.0003
	Barium	mg/L	0.001	24	24	0	0.026	0.034	0.029
	Beryllium	mg/L	0.0001	24	0	0	<0.0001	<0.0001	<0.0001
	Boron	mg/L	0.001	24	24	0	0.023	0.03	0.0270
	Cadmium	mg/L	0.0001	24	2	0	0.0001	0.0002	0.00015
	Chromium	mg/L	0.0001	24	2	0	0.0001	0.0001	0.0001
	Cobalt	mg/L	0.0001	24	0	0	<0.0001	<0.0001	<0.0001
	Copper	mg/L	0.001	24	23	0	0.001	0.006	0.0030
	Iron	mg/L	0.005	24	1	0	0.014	0.014	0.014
	Lead	mg/L	0.0001	24	9	0	0.0001	0.0003	0.0002
	Mercury	mg/L	0.0001	24	0	0	<0.0001	<0.0001	<0.0001
	Manganese	mg/L	0.001	24	24	0	0.0002	0.017	0.00161
	Molybdenum	mg/L	0.0001	24	24	0	0.0002	0.0004	0.00032
	Nickel	mg/L	0.0001	24	12	0	0.0001	0.0002	0.00013
	Selenium	mg/L	0.0001	24	24	0	0.0001	0.0003	0.00022
	Silver	mg/L	0.001	24	0	0	<0.001	<0.001	<0.001
	Strontium	mg/L	0.01	24	24	0	0.16	0.29	0.195
	Thallium	mg/L	0.0001	24	0	0	<0.0001	<0.0001	<0.0001
	Tin	mg/L	0.0001	24	0	0	<0.0001	<0.0001	<0.0001
	Titanium	mg/L	0.001	24	0	0	<0.001	<0.001	<0.001
	Uranium	mg/L	0.0001	24	3	0	0.0001	0.0002	0.00013
	Vanadium	mg/L	0.0001	24	24	0	0.001	0.0026	0.00162
	Zinc	mg/L	0.001	24	17	0	0.001	0.005	0.0022
	Chloroform	µg/L	1	24	24	0	2	15	6.1
	Bromodichloro methane	µg/L	1	24	24	0	5	21	12.5
	Dibromochloro methane	µg/L	1	24	24	0	14	30	20.4
	Bromoform	µg/L	1	24	24	0	6	12	8.5
	Total THM's	µg/L	1	24	24	0	32	74	47.6
	PFOS	µg/L	0.005	8	0	0	<0.005	<0.005	<0.005

Table 4 - Reticulation *E.coli* verification monitoring

Drinking water scheme:	Year	Month	No. of samples collected	No. of samples collected in which E. coli is detected (i.e. a failure)	No. of samples collected in previous 12 month period	No. of failures for previous 12 month period	% of samples that comply	Compliance with 98% annual value
Bowen Scheme	2020	July	21	0	261	0	100	YES
		Aug	21	0	261	0	100	YES
		Sept	24	0	264	0	100	YES
		Oct	21	0	261	0	100	YES
		Nov	23	0	263	0	100	YES
		Dec	22	0	261	0	100	YES
	2021	Jan	22	0	265	0	100	YES
		Feb	21	0	265	0	100	YES
		Mar	30	0	271	0	100	YES
		Apr	21	0	271	0	100	YES
		May	19	0	269	0	100	YES
		June	26	0	271	0	100	YES
Coastal Scheme	2020	July	23	0	255	0	100	YES
		Aug	20	0	255	0	100	YES
		Sept	24	0	259	0	100	YES
		Oct	20	0	255	0	100	YES
		Nov	20	0	255	0	100	YES
		Dec	20	0	275	0	100	YES
	2021	Jan	15	0	250	0	100	YES
		Feb	20	0	249	0	100	YES
		Mar	23	0	250	0	100	YES
		Apr	20	0	247	0	100	YES
		May	18	0	244	0	100	YES
		June	25	0	248	0	100	YES
Collinsville Scheme	2020	July	18	0	220	0	100	YES
		Aug	18	0	220	0	100	YES
		Sept	20	0	218	0	100	YES
		Oct	18	0	220	0	100	YES
		Nov	18	0	220	0	100	YES
		Dec	18	0	219	0	100	YES
	2021	Jan	21	0	224	0	100	YES
		Feb	20	0	227	0	100	YES
		Mar	24	0	231	0	100	YES
		Apr	18	0	231	0	100	YES
		May	15	0	228	0	100	YES
		June	23	0	231	0	100	YES
Proserpine Scheme	2020	July	24	0	240	0	100	YES
		Aug	19	0	240	0	100	YES
		Sept	21	0	242	0	100	YES
		Oct	19	0	239	0	100	YES
		Nov	19	0	239	0	100	YES
		Dec	18	0	243	0	100	YES
	2021	Jan	19	0	237	0	100	YES
		Feb	19	0	237	0	100	YES
		Mar	22	0	237	0	100	YES
		Apr	19	0	237	0	100	YES
		May	17	0	235	0	100	YES
		June	24	0	240	0	100	YES

Appendix B – Implementation of the DWQMP Risk Management Improvement Program

The RMIP is included below as well as separately for ease of readability.

Scheme Component / Sub- component		Hazardous event	Hazard	Priority	Interim Action(s)	Short-term Action(s)	Long-term Action(s)	Original Target date/s	Revised Target Date	Cost	Responsibility	Actions Taken
Catchment - Proserpine River	1	Inadequate Water Supply	Supply loss & pump damage	Medium	Monitor flows and pump efficiencies. Replace pump impellers. Start design work on options.	Remove sand from around spears and rock gabling in 2018	-Open water intake, - major maintenance around spears (remove geo-fabric & rock repack)	- Nov 2018 - May 2019	- Aug 2019 (maintenance) - June 2022 - Jun 2023	Est $800K for intake $500K for river spear maint	Treatment Operations Manager, Planning & Assets Engineer, Capital Works Manager	Initial-Open water intake design work commenced and initial tender released 2018-Open water intake utilising a diesel pump operational. Civil construction works delayed up to 3 years as tender prices significantly higher than anticipated. Maintenance done in 2018, will be carried out again 2019. 3 stage capital process-Building; electrical; mechanical; starting Jan 2022 Assessing electric pump to replace diesel pump Maintenance of spears - ongoing
Reticulation	30	Inadequate Water Supply	Supply loss & pump damage	Medium			New bores (and pump station) to replace Bore 1, 2, 3 - lower risk water - closer proximity to WTP	2022-23			Planning & Assets Engineer	2018-Concept design completed Pump Station complete, undergoing commissioning. Planning for bores underway; funding application in process for construction of 4 bores (1 bore funded)
WTP	2	Power failure	Loss of supply	High	Electrician to attend site	Generators to be installed at sites, see actions taken	Emergency Management Plan	Dec-16	Dec 2019 June 2022	Staff time	Operator; Senior staff	Initial-Generators to be installed at Foxdale bores, Coastal WTP, Bowen WTP Generator at Proserpine booster Solar Farm at Bowen WTP to supply plant & grid 2018-Generators installed at Foxdale bores, Dodd St bores, Coastal WTP, Bowen WTP. Solar farm at Bowen WTP operational. Additional generators ordered for Proserpine WTP, Collinsville WTP, Proserpine high lift and a mobile unit. Generators installed at Proserpine WTP, Proserpine High Lift pump and 3 x mobile units. Collinsville unit utilitsed on other project until Collinsville Solar Project underway See RMIP#33
	3	Instrumentation Failure	Loss of online monitoring	Low		Coastal WTP - Install new analysers at Clear Water Tank	Coastal WTP - upgrade PLC and control telemetry at bores		Short Term July 2018 Long Term July 2019		Treatment Operations Manager	Initial-Analysers received 2018-Completed. Additional work - connecting all bores to SCADA Completed
	32	Instrumentation Failure	Loss of online monitoring	Low			Replace Turbidity Analysers with HACH units as required.					Due to unavailability of service technician (COVID lockdowns) will change to service provider with local technicians.
Collinsville WTP	4	Contamination by Fresh Water Shellfish	Taste & Odour	Low	Shellfish removed as soon as observed. Regular inspections. Chlorination.	- PAC dosing initiated as required to remove taste and odour compounds			Ongoing	Operational cost as required	Operator	Initial-Ongoing maintenance; PAC dosing can be utilised to reduce taste and odour compounds Ongoing Complete Drain and clean of clarifier 2020 (travelling bridge also adjusted) Maintenance ongoing
	5	Filtration Failure	Turbidity etc.	Low		Turbidity Analysers at each Filter	Control system to have more control over plant		Short Term July 2018 Long Term July 2019 Dec 2022		Treatment Operations Manager	Initial-Analysers received 2018-Turbidity analysers installed. SCADA control scheduled for completion September 2019. SCADA control delayed due to incorportion into Solar panel project with completion due end 2022.
	33	Electrical components failure	Loss of Supply			Collinsville Solar Project		Jun-22			Treatment Operations Manager	Solar energy project to run both Collinsville WTP and STP with electrical upgrades at both plants, incorporating SCADA control, generator will be incorporated.
Reticulation	6	Chlorine Overdose	Taste / Odour	Low	Sodium hypochlorite dosing based on flow rate in WTP. Online chlorine analysers at plant have high chlorine CCP alarm that initiates plant shutdown. Daily sampling undertaken.	Telemetry to be installed to new online instrumentation within the reticulation.	Investigate effect of closing down re-chlorination stations & installation of more online analysers at strategic locations around the region.	Jun-19	Jun-22	$10K for telemetry on new analysers.	Treatment Operations Manager	Initial-Online chlorine residual analysers have been installed within the Bowen, Proserpine & Cannonvale reticulation. Extra (Auto) sodium hypochlorite monitoring & dosing equipment installed at Bowen reservoir & Flemington rd chlorinator. 2018-Bowen reservoir completed. Flemington Rd chlorinator to be decommissioned. Railway Rd (Merinda) dosing stations upgraded. Telemetry for all analysers scheduled for 2021-22. Southern reticulation network upgrade scheduled, See #29. Ongoing
	7	Chlorination failure / Loss of Residual / Chlorinator failure	Public health	High	Sodium hypochlorite dosing based on flow rate in WTP. Online chlorine analysers at plant have low chlorine CCP alarm that initiates plant shutdown. Daily sampling undertaken.	Telemetry to be installed to new online instrumentation within the reticulation.	Investigate effect of closing down re-chlorination stations & installation of more online analysers at strategic locations around the region.	Jul-19		$10K for telemetry on new analysers.	Treatment Operations Manager	As above

Reticulation	**29**	Chlorination failure / Loss of Residual / Chlorinator failure	Public health	High	Isolate Bore 10 from direct connection to potable water network (currently high pressure potable water going to bore)	Initiate Cannonvale Bulk Water Project. Purchase land for Cannon Valley Reservoir. Cannonvale Bulk Water porject - Cannonvale network configuration to isolate bulk supply from trunk and reticulation networks, to reduce pressure spikes in network and provide equal water age.	Deliver Cannonvale Bulk Water Project, build Cannon Valley reservoir and renew pipeline from Proserpine.	Short Term 2020-21 Long Term 2021-22			Planning & Assets Engineer – Network Operations Managers COO.	2018-Design complete. Initial project implementation. Bore 10 isolated from netwrok and redirected to Proserpine WTP. Reservoirs x 2 under construction, completion due June 2022 Netwrok reconfiguration after construction completion.
	8	Main bursts / Repairs	Aesthetics / suspended solids / taste & odour	Medium	Monitor flow, reservoir levels, pressure, turbidity. Re-chlorination	Develop a mains burst / repair procedure. Training of operations staff on importance of Hygiene practices (Chlorination of lines following repair, chlorine test on reconnection)	Investigate best-practice chlorination of mains following a repair.	Dec-16	Dec-17	Staff time	Treatment Operations Manager, Network Operations Managers	2018-Completed
	9	Backflow	public health / Aesthetics	High	All RPZDs to be tested	RPZD testing schedule to be implemented with checks to ensure tests are completed in time. Faulty devices to be repaired or replaced.	Assets mapped and listed and annual preventative maintenance implemented into councils systems. Investigate if RPZ are present as part of meter assembly during meter reading.	Nov-15	Nov-19	Staff time	Treatment Operations Manager, Trade Waste Coordinator, Network Operations Managers	Initial-Incomplete lists have been developed for Northern and Southern areas. Consolidating this role into a regional one through the trade waste coordinator. 2018-This role has moved back to Water Operations. Audit completed, lists to be compiled into the new Council system. Ongoing Maintenance plan underway
	10	High flow (sediments mobilised, slimes detached)	Aesthetics / Suspended Solids / Taste, Odour & Colour	Medium	Flushing program	Pigging program	Pigging program		Ongoing	Staff time	Planning & Assets Engineer, Network Operations Managers	Initial-Pigging program underway 2018-Ongoing Includes bore mains. Ongoing
	11	Slimes detaching	Aesthetics / Suspended Solids / Taste, Odour & Colour	Medium	Flushing program	Pigging program	Pigging program		Ongoing	Staff time	Planning & Assets Engineer, Network Operations Managers	Initial-Pigging program underway 2018-Ongoing Ongoing
	12	Cross Contamination (close sewer proximity)	Bacterial, Viral, Protozoa			Develop a mains burst / repair procedure. Training of operations staff on importance of Hygiene practices (Chlorination of lines following repair, chlorine test on reconnection)	Investigate best-practice chlorination of mains following a repair.		Dec-17	Staff time	Treatment Operations Manager, Network Operations Managers	Initial-A chlorination of New mains procedure has been developed. A mains burst / repair procedure will be developed. 2018-Completed. See #8
	13	New main connections (contaminating existing system)	Aesthetics / Suspended Solids / Taste, Odour & Colour			Procedure for re-chlorination of new main prior to connection			Complete		Treatment Operations Manager, Network Operations Managers	Initial-A chlorination of New mains procedure has been developed. 2018-Completed. See #8
Recycled Water	**14**	Cross Connection to recycled water infrastructure	Bacterial, Viral, Protozoa	Low			RPZD's required and to be checked annually	Jun-17	Jun-18	Staff time	Treatment Operations Manager, Network Operations Managers, Team Leaders	Initial-Consolidating this role into a regional one through the trade waste coordinator. 2018-Completed. See #9
Bowen - Proserpine main	**15**	Main break	Water supply cut off / public health	High	Adhoc repair	Visual check of line and valves.	Full asset check of all line and valves, with asset list and mapping creation. Also preventative maintenance schedule created & implemented	June-16	Dec-17	$40K	Planning & Assets Engineer	Initial-Line has been checked; Check valve being installed south of Whitsunday Shores (2/3 along main) 2018-Completed. Included in maintenance program.
	16	Sediment scouring / slime slough	Aesthetics / suspended solids / taste & odour	Medium	Turbidity monitors; lines flushed	Pigging to be undertaken to remove sediment build up	Pigging stations to be constructed		Ongoing	$8K	Planning & Assets Engineer	Initial-All stations done, worst section of line has been pigged. 2018-As Above

Bowen - Proserpine main	**17**	Farmers over use of treated water	Water supply cut-off / Public health	High	Monitoring of usage and communication with farmers using WRWW treated water.	Future planning of use by farmers, with farmers	Farmers and state government to use alternatives to treated water.	tbc	Dec-16	Staff time	Planning & Assets Engineer	Initial-Only 1 user allocation still in effect 2018-Monitoring on other potential users.
	18	Farmers contaminating Drinking water supply	Public health	Medium	Communication with Farmers	Farmers to be asked to create SOPs for their usage of supply	Council to review farmers SOPs & processes for turning water on/off & usage. Also farmers to eventually use alternatives to treated drinking water.	tbc	Dec-16	Staff time	Planning & Assets Engineer	Initial-Only 1 user allocation still in effect 2018-Monitoring on other potential users.
Storage Reservoirs	**19**	Pay out of under grade reservoirs.	Public health - Bacterial, Viral and Protozoan contamination due to	High	At-grade reservoirs have been isolated from system	Assessment of system storage to be completed to determine if at-grade reservoirs need to be on line. Additional sample points to be installed.	If reservoirs are required for satisfactory system operation, reconfiguration of valving to be carried out to ensure water cycles through reservoirs	Dec-15	Jul-18	Staff time	Planning & Assets Engineer – Network Operations Managers COO.	Initial-Assessments complete. Bowen Res - work complete. Hydraulic modelling of Bowen Retic needs re-calibration for other reservoirs. Brisk Bay Res - scheduled for 2017-18 2018-Completed. Brisk Bay Res off line until replacement scheduled for 2023-24
Storage Reservoirs	**20**	Human access to reservoirs	Bacterial, Viral and Protozoan contamination due to animal or human entry	High	Inspection of all reservoir roof structures, security and vermin proofing	Immediate minor repairs to identified issues where possible	Full asset check of all reservoir structures, vermin proofing material and site security, with asset list and mapping creation. Also preventative maintenance schedule created	Dec-15	Ongoing	Staff time + what ever tasks are required.	Treatment Operations Manager & field staff, Network Operations Managers	Initial-Inspections complete. Roof repairs done. Monthly Reservoir inspections commenced. Repairs to vermin proofing from cyclone Debbi required - Scheduled for October - December 2017. 2018-Ongoing External audit of all reservoirs scheduled for 2019 (including safety and security). Report will feed into the database for scheduling of works required. Inspections ongoing - Operators-water quality; Networks-structural/mechanical External audit money used for maintenance and audit carried out by our own staff. Remaining findings included into maintenance schedule. Repair works to commence on Mt Devlin reservoir.
	21	Animal Access to reservoirs.	Bacterial, Viral and Protozoan contamination n due to animal or human entry	High	Inspection of all reservoir roof structures, security and vermin proofing	Immediate minor repairs to identified issues where possible	Full asset check of all reservoir structures, vermin proofing material and site security, with asset list and mapping creation. Also preventative maintenance schedule created & implemented	Dec-15	Ongoing	Staff time + what ever tasks are required.	Treatment Operations Manager & field staff, Network Operations Managers	Initial-Inspections complete. Roof repairs done. Monthly Reservoir inspections commenced. Repairs to vermin proofing from cyclone Debbi required - Scheduled for October - December 2017. 2018-Ongoing Ongoing
	22	Short circuiting of reservoirs	Bacterial, Viral, Protozoa	Medium	Reservoirs to be operated to ensure turnover (when network allows).	Possible pipework changes	Install mixers if appropriate. Installing sample taps at reservoirs to enable monthly sampling.	2017-18	Ongoing Monitoring	Staff time	Treatment Operations Manager.	Initial-Reservoirs appear to have appropriate mixing via operational level controls. Regular sampling to ensure residual maintained carried out each month. 2018-Ongoing Ongoing
Security	**23**	Terrorism, sabotage	Chemical / Biological	Medium		Review of security at treatment plant sites to ensure access of unauthorised persons is adequately controlled	Preventative maintenance Schedule implemented in councils systems	Dec-15	Dec-17	Staff time	Treatment Operations Manager; Network Operations Managers	Initial-Monthly Reservoir checks have commenced. Action plans will be developed out of these to rectify issues. Emergency Management Plan 2018-Completed
	24	Natural Disasters	Cyclone, Earthquake, Flooding etc.	High	Emergency Management Plan	Emergency Management Plan	Emergency Management Plan	Jun-16	Ongoing	Staff time	All Staff	Initial-Emergency Management Plan in effect. Developing a site based cyclone / wet-weather procedure. 2018-Completed
	25	Water quality	Water quality	High			In-depth Risk assessment and control measures to improve security at drinking water supply system sites and WTPs processes.	Jun-16	Ongoing		Treatment Operations Manager, Network Operations Managers, Team Leaders	Initial-Risk assessments contained within DWQMP. Monthly Reservoir checks improve security on site. 2018-Ongoing Ongoing

Security	**31**	Cybersecurity	Breach into SCADA - at WTP's or in Network	High		CCTV & Boom gates at plants. External Audit of all sites	Implement audit actions	Short Term - end 2019; Long Term 2020			Treatment Operations Manager; Network Operations Managers	2018-CCTV & Boomgates installation commenced. External audit scope devised. Site Safety - STP's completed. Business case to be developed for high risk water sites (eg Proserpine WTP as is a multi use depot) for electronic gates. Cybersecurity - SCADA Strategy and 16 quick wins inititated.
Operation and Maintenance Procedures	**26**			High	Draft set of procedures to be reviewed and updated.	Additional procedures required identified, drafted, reviewed and implemented	Regular review	Dec-15	Ongoing	Staff time	Treatment Operations Manager; Network Operations Managers, Field Staff, Environmental Management Coordinator	Initial-A list of procedures (included in DWQMP) will be reviewed on 2 yearly basis. Further procedures identified in risk assessments will be developed as required. 2018-Ongoing Ongoing
Staff Training and Awareness	**27**	Staff training and awareness	Staff training and awarenes ss	High			Implement training and awareness workshops once management plan approved in toolbox talks. Assess training need through internal audits and general feedback. KPI toolbox talk, updated ADWG related toolbox talks	Dec-15	Ongoing	Staff time	Treatment Operations Manager; Senior Staff, Field Staff, Environmental Management Coordinator	Initial-Gap analysis training conducted in September 2017 to certify operators under new national training package (NWP15). Refresher may be required for new staff, and new staff will also be updated under the new training package. 2018-Ongoing Ongoing
	34	Staffing	Insufficie nt staffing redundan cy	High	Quality over Quantity		Fully Trained operators for relief use at any site				Treatment Operations Manager	No redundancy staff available for periods of absence. Collinsville WTP - only available backup has experience but no qualifications.
Customer Awareness Processes	**28**	Customer awareness	Custome r awarene ss	Mediu m			Customer process definition and provide details to customer in customer service standards on levels of service they can expect.	Dec-15	Ongoing	Staff time	Treatment Operations Manager; Environmental Management Coordinator, Website client liaison.	Initial-Complete. Updated standards uploaded onto Whitsunday Regional Councils website as required. 2018-Ongoing Ongoing