Drinking Water Quality Management Plan (DWQMP) Report

1 July 2014 to 30 June 2015

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Definitions and glossary of terms

ADWG	Australian Drinking Water Guidelines (2011). Published by the National Health and Medical Research Council of Australia
CCTV	Closed-circuit television
cells/ml	cells per millilitre
C. raciborskii	*Cylindrospermopsis raciborskii*, a freshwater cyanobacteria known to produce the toxin cylindrospermopsin and therefore a potential health risk
DWQMP	Drinking Water Quality Management Plan
EC	Electrical conductivity
E. coli	*Escherichia coli*, a bacterium which is considered to indicate the presence of faecal contamination and therefore a potential health risk
FRW	Fitzroy River Water
GWTP	Glenmore Water Treatment Plant
LOR	Limit of reporting
LSC	Livingstone Shire Council
mg/L	Milligrams per litre
NTU	Nephelometric turbidity units
MPN/100ml	Most probable number per 100 millilitres
RRC	Rockhampton Regional Council
RMIP	Risk Management Improvement Program
TCU	True colour units
TDS	Total dissolved solids
THM	Trihalomethanes
µg/L	Micrograms per litre
µS/cm	Micro-Siemens per centimetre
<	Less than
>	Greater than

1. Introduction

This report documents the performance of Rockhampton Regional Council's drinking water service with respect to water quality and also its 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).

This report assists the Regulator to determine whether the approved amended 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

This report relates to the drinking water supply schemes which Rockhampton Regional Council (RRC) owned and operated from 1 July 2014 to 30 June 2015. Fitzroy River Water (FRW), a commercialised business unit of the Rockhampton Regional Council, is the drinking water service provider.

The direct physical link of localities within the newly re-formed Livingstone Shire Council (LSC) to the Rockhampton Water Supply Scheme meant that some LSC communities are partially or fully served by the water infrastructure operated by RRC. Only the performance of water supply schemes for which RRC have ownership, operating and maintenance responsibility, i.e. drinking water supplied to RRC ratepayers, during this reporting period is detailed in this report. Table 1 lists the water supply scheme, water source, water treatment process, population and average drinking water demand for the water supply schemes covered in this report.

Table 1 Water supply scheme, water supply source, treatment process, population served and average water demand

Scheme	Water Source	Treatment Process	Population	Average Demand (ML/d)
Rockhampton (includes LSC's Capricorn Coast)	Fitzroy River	Coagulation, flocculation, sedimentation, filtration, pH correction and disinfection	77,140 (99,710)	49 (60)
Mount Morgan	Dee River	Coagulation, sedimentation, filtration, pH correction and disinfection	3,130	1.0

During this reporting period, Mount Morgan Water Supply Scheme's alternate water source (Fletcher Creek) was not used thus its water quality monitoring results is not incorporated in this report.

3. Actions taken to implement the DWQMP

Generally, the DWQMP describes the operating strategies, operating limits and approaches to water quality monitoring and the overall management of risks to water quality that were in place at the time that the DWQMP was approved. Specific changes or improvements to the drinking water services provided by FRW have occurred via the implementation of the Risk Management Improvement Program (RMIP) as detailed below.

Progress in implementing the Risk Management Improvement Program

Refer to the Appendix B for a summary of progress in implementing each of the improvement program actions. The information provided describes the progress made during this reporting period towards the completion of specific tasks identified in the RMIP listed in the approved amended DWQMP.

Amendments made to the DWQMP

Amendments made for the DWQMP was approved by the Regulator on December 2014 and primarily reflect the changes made following de-amalgamation of LSC from RRC on 1 January 2014. The amendments also include changes to some of the risk assessments due to the implementation of the aspects of RMIP or receipt of new information relating to potential risks. Minor changes were also made to reflect the new data obtained through the ongoing verification monitoring program, and changes to the treatment plant operations including cessation of fluoride dosing. Draft amendments to the DWQMP are currently being prepared to capture information related to a number of Drinking Water Incidents (DWI) that occurred during this reporting period. In particular, the impacts of the Tropical Cyclone Marcia event on drinking water quality will be captured along with additions to the RMIP to achieve further mitigation of these risks to drinking water quality.

4. Compliance with water quality criteria for drinking water

Appendix A provides an overview of the results from the water quality monitoring program for the reporting period of 1 July 2014 to 30 June 2015. The water quality monitoring program was carried out as per Section 10.2 of the approved amended DWQMP. The drinking water results were compared against the water quality criteria, i.e. the health guideline values in the current Australian Drinking Water Guidelines (ADWG), as well as the standards in the *Public Health Regulation 2005*.

Appendix A Tables 1.1 and 1.2 contain a summary of the results of the water quality monitoring program for Rockhampton and Mount Morgan water supply schemes. All physico-chemical drinking water quality results from the standard monitoring program met the recommended values in the ADWG.

Appendix A Tables 2.1 and 2.2 contain a summary of the results of the reticulation *E. coli* verification monitoring program for Rockhampton and Mount Morgan water supply schemes. All but one sample taken tested negative for *E. coli*.

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

For this reporting period, there were 4 instances where the Regulator was notified under section 102 or 102A of the Act. One of these notifications involved the detection of *E. coli* – an organism which indicates the presence of recent faecal contamination and may directly represent a hazard to human health. The remaining three (3) notifications were from an event-related, non-standard sampling for chlorine (free), trihalomethanes (THM) and manganese. None of the reported non-compliances required RRC to issue a "boil water alert" or "do not drink notice" to the communities.

5.1 Non-compliances with the water quality criteria and corrective and preventative actions undertaken

Overview of non-compliance: Chlorine (free) exceeding water quality criteria in supply reservoir samples

Incident description: Free chlorine levels exceeding the health guideline value of 5.0 mg/L were measured on 8 December 2014 from the chlorine sampling point for the Athelstane Range Reservoir B. *In situ* free chlorine levels within the reservoir were measured at 5.4 and 8.8 mg/L. The short-lived spikes in free chlorine residual recorded during the event were caused by a power outage as a result of a recent thunderstorm and lightning strike which led to dosing occurring due to a faulty inlet flow meter.

Corrective and preventative actions: Chlorine dosing was ceased immediately and the supply reservoir was topped with water with low chlorine to dilute the water inside the reservoir. Damaged system components were also repaired or replaced as soon as practicable. Full service and calibration of the chlorine dosing system was also performed. In addition, further testing downstream of the reservoir and across the supply network was carried out. The free chlorine residual measured from all reticulation sample sites were less than 1.1 mg/L and within the normal levels.

To prevent the re-occurrence of this type of non-compliance, regular preventative maintenance will continue along with continued vigilance of the supply reservoir and supply zone following a system failure associated with thunderstorms or other power supply issues.

Overview of non-compliance: Manganese exceeding water quality criteria following Tropical Cyclone Marcia

Incident description: A Manganese concentration of 0.8 mg/L was measured in the drinking water from the Glenmore Water Treatment Plant (GWTP) on 11 March 2015. A follow-up sample collected from the GWTP on the same day also exceeded the health guideline value of 0.5 mg/L. Fifteen (15) of the more than 250 samples collected from Rockhampton water supply scheme from 12 to 31 March were also non-compliant for manganese. The exceedances for manganese was due to the very low dissolved oxygen levels (<2 mg/L), high organic carbon load, and greater amounts of dissolved, organically complexed manganese ions in the source water flushed out from Alligator Creek following the Tropical Cyclone Marcia event.

Corrective and preventative actions: A number of corrective actions were taken to remove the extremely poor raw water quality which then filled most of the Fitzroy River Barrage storage. These corrective actions included the controlled release of the raw water from the Fitzroy River Barrage storage, provision of a temporary aeration system at the inlet of the GWTP, pre-oxidation of manganese by chlorine dosing at the inlet of the GWTP and additional chlorine dosing post-flocculation and pre-filtration, adjustments to the powdered activated carbon dose rates, flushing of trunk and water mains, scouring of supply reservoirs, additional monitoring and testing, public notification on the nature and cause of the water quality event, and provision of bottled and tankered water.

To prevent the re-occurrence of this type of non-compliance, a number of options are currently under consideration including earlier release of poor quality river water, installation of an oxygen or hydrogen peroxide dosing system into the raw water pipeline, installation of online monitoring system upstream in the Alligator Creek, and provision of an additional chemical pre-treatment process for more effective and rapid oxidation of manganese. Funding for the installation of an additional chemical pre-treatment process has been secured for this current financial year.

Overview of non-compliance: Trihalomethanes (THM) exceeding water quality criteria following Tropical Cyclone Marcia

Incident description: THM concentrations exceeding the health guideline value of 250 µg/L were measured in two (2) reticulation sample points and a supply reservoir on 19 March 2015. All follow-up samples from these sites had THM levels less than 250 µg/L however, slight exceedances were detected on 3 other reticulation sample sites on 31 March and 8 April. These elevated levels of THMs were due to chlorine pre-dosing at the GWTP which was undertaken to treat high levels of manganese and associated organic carbon following the Tropical Cyclone Marcia event.

Corrective and preventative actions: A number of corrective actions were taken to manage the elevated THM levels in the treated water. This include adjusting powdered activated carbon dose rates to optimise the removal of dissolved organic carbon at the GWTP; strategic flushing of trunk and water mains and scouring of supply reservoirs to decrease the detention times in the system; and where practicable, lowering the storage levels in some supply reservoirs to promote higher water turn-over to reduce the overall formation of THMs. The chlorine pre-dose rates were also reduced following receipt of results of improved raw water quality. Some of the preventative strategies currently under consideration include earlier release of poor quality river water, injection of oxygen and hydrogen peroxide in the raw water rising main, and provision of an additional chemical pre-treatment process (e.g. chlorine dioxide) for more effective and rapid oxidation of manganese without the formation of additional THMs.

Overview of non-compliance: Reticulation sample tested positive for *E. coli*

Incident description: A reticulation sample collected on 22 June 2014 from the Mt Morgan water supply scheme tested positive (1 MPN/100ml) for *E. coli*. At the time of the sampling the free chlorine residual

measured from the sampling point and supply reservoir were 0.48 mg/L and 1.63 mg/L, respectively. A second split (parallel) sample collected on the 22 June for general physico-chemical testing was also analysed for *E. coli* but tested negative for the bacteria. All follow-up samples taken from the sample site, supply reservoir, and other reticulation sampling points tested negative for *E. coli*.

Corrective and preventative actions: There was an absence of any specific likely cause of the *E. coli* detection. There was no obvious entry points observed between the supply reservoir and the sampling point. At the time of the sampling and the weeks thereafter, the supply reservoir was operating well and the chlorine residual measured from the sampling point were relatively high. Nonetheless, in order to prevent the non-compliance for *E. coli*, regular inspections and maintenance of the supply reservoir will continue to ensure that animal ingress is prevented and the facility is operating effectively.

5.2 Prescribed incidents or events reported to the Regulator and corrective and preventative actions undertaken

Overview of non-compliance: Cyanobacteria bloom and cylindrospermopsin detected in the source water

Incident description: In November 2014, a gradual increase in cyanobacteria counts from the samples collected at the GWTP raw water intake structure was observed. On 26 November 2014, 265,000 cyanobacteria cells/ml were counted from the raw water sample which included 17,100 cells/ml of the potentially toxic cyanobacteria species *Cylidrospermopsis raciborskii*. Samples collected from the treated water from the GWTP had 65 cyanobacteria cells/ml and nil *C. raciborskii*. Toxicity testing for the same date showed 0.40 μg/L of cylindrospermopsin in the raw water and <0.2 μg/L of cylindrospermopsin in the treated water.

Corrective and preventative actions: Chemical dose rates were adjusted at the GWTP following receipt of the test results to ensure that the changes in the raw water quality were managed by the treatment processes. In particular, coagulant and powdered activated carbon were increased with increasing cyanobacteria counts to remove cyanobacteria and any associated toxin. The effectiveness of these changes at the GWTP was evident in nil detection of cyanobacteria or cylindrospermopsin in all of the follow-up potable water samples.

There is no guideline value (either health or aesthetics) for cyanobacteria or cylindrospermopsin in the ADWG. Cyanobacteria in the source water are not uncommon and high cyanobacteria counts are known to occur sporadically in the source water between September and December where water conditions favour the cyanobacteria bloom. To manage the presence of cyanobacteria and toxin in the source water, GWTP can vary the raw water intake depth to avoid surface scums during bloom events, effectively adjust the coagulant and powdered activated carbon dosing rates, and where necessary, pre-chlorinate raw water to destroy cyanobacteria (usually not preferred). A regular monitoring and sampling program in the Fitzroy Barrage storage is also in place to detect cyanobacteria blooms.

6. Customer complaints related to water quality

Rockhampton Regional Council is required to report on the number of drinking water quality complaints, general details of complaints and the responses undertaken.

Table 2 and Figure 1 provide a breakdown of the customer complaints relating to drinking water quality during this period.

Table 2 Number of drinking water quality complaints from 1 July 2014 to 30 June 2015

Scheme	Suspected Illness	Taste and/or Odour	Appearance and/or Discoloured Water	Total
Rockhampton	0	65	212	**277**
Mount Morgan	0	4	5	**9**
Total	**0**	**69**	**217**	**286**

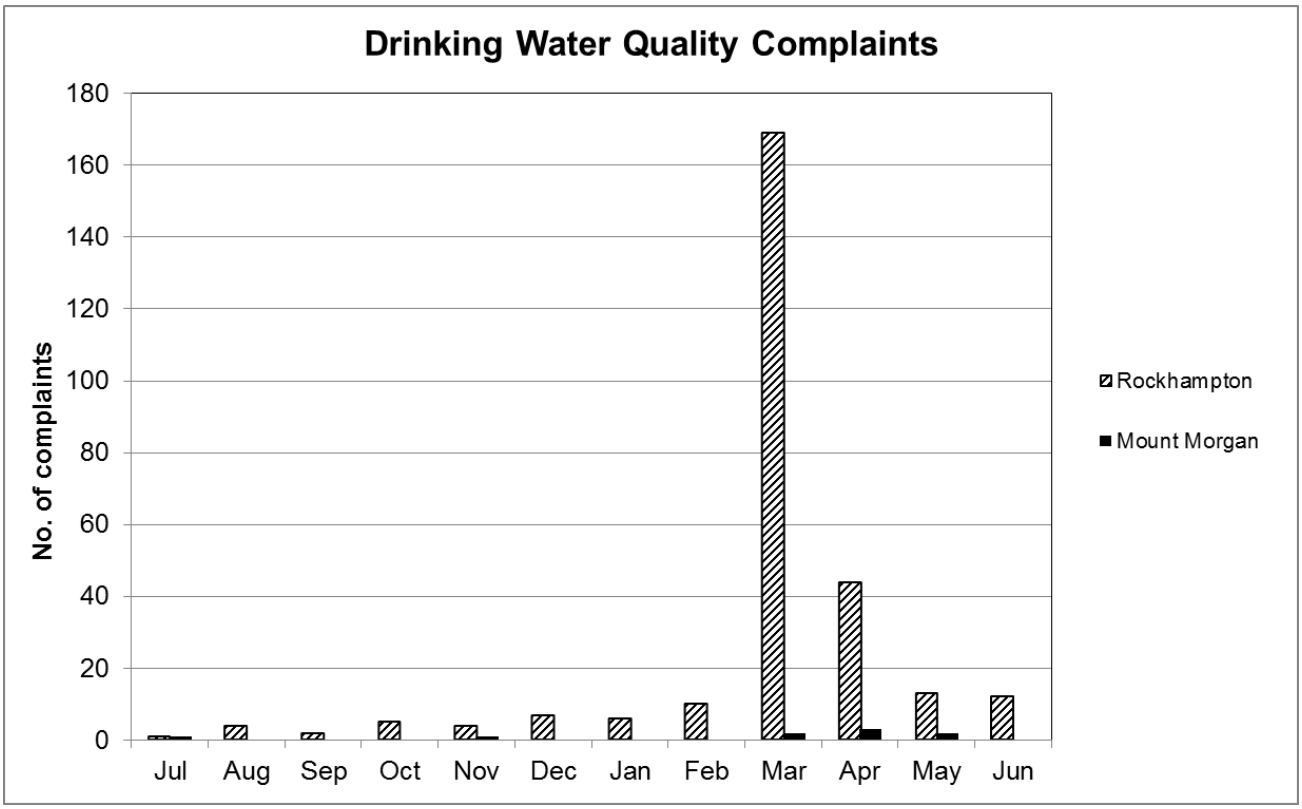

Figure 1. Drinking water quality complaints received between 1 July 2014 and 30 June 2015. The high number of complaints following the Tropical Cyclone Marcia event in late February can be seen during March and April.

Suspected illness

Complaints are sometimes received from customers who suspect their water may be associated with an illness they are experiencing. FRW investigates each complaint relating to alleged illness from the water quality, typically by testing the customers tap and closest reticulation sampling for the presence of *E. coli* as well as general physico-chemical testing.

In addition, FRW staff periodically liaises with local Queensland Health Officers in order to receive updates on any reports of suspected waterborne disease.

During this reporting period, RRC was not aware of any confirmed cases of illness arising from drinking water supplied from Rockhampton and Mount Morgan water supply schemes.

Taste and/or odour

A total number of 69 customer complaints associated with unfavourable taste and/or odour were received during this reporting period. Sixty-five (65) complaints were from Rockhampton water supply scheme and of these, four (4) were related to elevated chlorine (less than the ADWG health value) in the supply zone. On the other hand, four (4) customer complaints were received from Mount Morgan water supply scheme.

The vast majority of complaints associated with taste and/or odour were received during the period of poor water quality in the river following Tropical Cyclone Marcia on 20 February 2015. In response to reduced water quality, FRW took a range of actions including flushing of water mains, supplying bottled or tankered water, additional testing and public notification on the nature and cause of the water quality event. Investigation of each complaint found no public health risks.

Appearance and/or discoloured water

A total of 217 customer complaints associated with appearance and/or discoloured water were received during this reporting period. Two hundred ten (212) were received from Rockhampton water supply scheme and of these only 5 were due to air in the water causing a milky appearance. As with taste and/or odour complaints, the majority of complaints on appearance and/or discoloured water were received following Tropical Cyclone Marcia. In March 2015 alone, RRC recorded a total of 155 customer complaints associated with water discolouration from Rockhampton water supply scheme. In response to these large number of complaints, FRW took a range of actions including flushing of water mains, supplying of advanced laundry detergent, supplying of bottled or tankered water and public notification on the nature and cause of the water quality event. All customers who reported a complaint were responded to promptly and advised of the reasons for the discoloured water.

7. Findings and recommendations of the DWQMP auditor

During this reporting period, FRW was not required to engage an auditor to conduct an audit of the DWQMP. In accordance with legislative requirements, an audit of the DWQMP is scheduled for completion on 31 August 2016, with subsequent findings of the audit to be incorporated as appropriate in future revisions of the DWQMP.

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

A review of the DWQMP was completed in October 2014 and a number of amendments were made on the document. These changes were outlined in the Section 8 of the 2013-2014 DWQMP report. The amendments made to the DWQMP were approved by the Regulator in December 2014. The next internal review of the approved amended DWQMP is due on 31 August 2016. As indicated above, draft amendments are currently being made to capture important information associated with the various incidents and events that occurred during this reporting period.

Appendix A Summary of compliance with water quality criteria

The results from the verification program for the period of 1 July 2014 to 30 June 2015 have been compared against the levels of the water quality criteria specified by the Regulator in the *Water Quality and Reporting Guidelines for a Drinking Water Service*.

The drinking water quality monitoring program for this reporting period was carried out as per Section 10.2 of the approved amended DWQMP. The reported statistics do not include results from repeat samples undertaken in response to an elevated result or from event-related or investigative samples. Three (3) of the 4 water quality criteria non-compliances detailed in Section 5.1 of this report were event-related, non-standard sampling and thus, are not included in Table A1.1 below. Only the detection of *E. coli* on 23 June 2015 from Mount Morgan Water Supply Scheme is included in the following statistics.

Tables A1.1 and A1.2 contains a summary of water quality monitoring results from Rockhampton and Mount Morgan water supply schemes, respectively, including scheme component, parameter, limit of resolution (LOR), unit of measure, frequency of sampling, total number of samples taken, number of samples with values greater than or equal the LOR, number of drinking water samples exceeding the levels of the water quality criteria (specifically the ADWG health guideline value or other regulatory target), minimum concentration or count, maximum concentration or count, average (mean) concentration or count, and laboratory name. The fluoride data presented in Tables A1.1 and A1.2 are naturally-occurring fluoride. RRC discontinued fluoridating drinking water on 17 June 2013.

Tables A2.1 and A2.2 provide a summary of the reticulation *E. coli* verification monitoring from Rockhampton and Mount Morgan Water Supply Schemes, respectively. The percentage from each water supply scheme was calculated using a twelve (12) month rolling annual value. All samples taken from the Rockhampton water supply scheme tested negative for *E. coli* while one (1) sample from the Mount Morgan water supply scheme tested positive for *E. coli*.

Table A1.1 Rockhampton Water Supply Scheme water quality monitoring results from 1 July 2014 to 30 June 2015

Scheme Name	Scheme Component	Parameter	LOR	Unit	Sampling Frequency	Total no. of samples collected	Total no. of samples with values greater than or equal the LOR	Minimum	Maximum	Average	Laboratory Name
Rockhampton	Source Water	pH	0.01	unit	Monthly	12	12	7.14	8.46	7.80	Symbio Alliance
Rockhampton	Source Water	Colour (True)	2	TCU	Monthly	12	11	<2	90	38	Symbio Alliance
Rockhampton	Source Water	Turbidity	0.1	NTU	Monthly	12	12	2.9	363.0	53.8	Symbio Alliance
Rockhampton	Source Water	Electrical Conductivity	1	µS/cm	Monthly	12	12	190	360	273	Symbio Alliance
Rockhampton	Source Water	Solids (Dissolved)	2	mg/L	Monthly	12	12	150	310	224	Symbio Alliance
Rockhampton	Source Water	Chloride	2	mg/L	Monthly	12	12	25	67	44	Symbio Alliance
Rockhampton	Source Water	Fluoride	0.05	mg/L	Monthly	12	11	<0.05	0.27	0.13	Symbio Alliance
Rockhampton	Source Water	Nitrate (as N)	0.005	mg/L	Monthly	12	8	<0.005	0.510	0.186	Symbio Alliance
Rockhampton	Source Water	Nitrite (as N)	0.005	mg/L	Monthly	11	2	<0.005	0.018	<0.005	Symbio Alliance
Rockhampton	Source Water	Sulphate	5	mg/L	Monthly	12	9	<5	18	9	Symbio Alliance
Rockhampton	Source Water	Aluminium (Acid Soluble)	0.01	mg/L	Monthly	11	10	<0.01	0.69	0.23	Symbio Alliance
Rockhampton	Source Water	Iron (Total)	0.01	mg/L	Monthly	12	12	0.05	2.40	0.75	Symbio Alliance
Rockhampton	Source Water	Manganese (Total)	0.0005	mg/L	Monthly	12	12	0.0089	0.5900	0.0911	Symbio Alliance
Rockhampton	Source Water	Copper (Total)	0.0005	mg/L	Monthly	12	6	<0.0005	0.0050	0.0025	Symbio Alliance
Rockhampton	Source Water	Lead (Total)	0.0001	mg/L	Monthly	12	5	<0.0001	0.0009	0.0005	Symbio Alliance
Rockhampton	Source Water	Zinc (Total)	0.0005	mg/L	Monthly	12	6	<0.0005	0.0350	0.0107	Symbio Alliance
Rockhampton	Source Water	Calcium (Total)	0.1	mg/L	Monthly	12	12	8.9	16.0	12.8	Symbio Alliance
Rockhampton	Source Water	Sodium (Total)	1	mg/L	Monthly	12	12	17	32	24	Symbio Alliance
Rockhampton	Source Water	Potassium (Total)	0.2	mg/L	Monthly	12	12	2.0	5.6	3.3	Symbio Alliance
Rockhampton	Source Water	Magnesium (Total)	0.05	mg/L	Monthly	12	12	6.50	15.00	9.99	Symbio Alliance
Rockhampton	Source Water	Hardness (Total)	1	mg/L	Monthly	12	12	49	102	72	Symbio Alliance
Rockhampton	Source Water	Alkalinity (Total) as CaCO3	1	mg/L	Monthly	12	12	46	88	70	Symbio Alliance
Rockhampton	Source Water	Total Organic Carbon	1	mg/L	Quarterly	4	4	6	14	9	Symbio Alliance
Rockhampton	Source Water	Arsenic	0.0005	mg/L	Annually	1	1	0.0012	0.0012	0.0012	Symbio Alliance
Rockhampton	Source Water	Cadmium	0.0001	mg/L	Annually	1	0	<0.0001	<0.0001	<0.0001	Symbio Alliance
Rockhampton	Source Water	Chromium	0.0005	mg/L	Annually	1	0	<0.0005	<0.0005	<0.0005	Symbio Alliance
Rockhampton	Source Water	Mercury	0.0001	mg/L	Annually	1	0	<0.0001	<0.0001	<0.0001	Symbio Alliance
Rockhampton	Source Water	Nickel	0.0001	mg/L	Annually	1	0	<0.0001	<0.0001	<0.0001	Symbio Alliance
Rockhampton	Source Water	Selenium	0.0005	mg/L	Annually	1	0	<0.0005	<0.0005	<0.0005	Symbio Alliance
Rockhampton	Source Water	Perfluorooctanoic Acid	0.02	µg/L	Annually	1	0	<0.02	<0.02	<0.02	Symbio Alliance
Rockhampton	Source Water	Perfluorooctane Sulphate	0.02	µg/L	Annually	1	0	<0.02	<0.02	<0.02	Symbio Alliance
Rockhampton	Source Water	Pesticides (various)	0.2	µg/L	Annually	1	0	<0.2	<0.2	<0.2	Symbio Alliance
Rockhampton	Source Water	pH	0.01	unit	Continuous			6.87	8.96	7.72	FRW - Telemetry
Rockhampton	Source Water	Turbidity	0.01	NTU	Continuous			8.30	590.09	80.55	FRW - Telemetry
Rockhampton	Source Water	pH	0.01	unit	Daily	363	363	6.60	9.30	7.82	FRW - Inhouse
Rockhampton	Source Water	Turbidity	0.01	NTU	Daily	363	363	1.90	893.00	78.60	FRW - Inhouse

Table A1.1 Rockhampton Water Supply Scheme water quality monitoring results from 1 July 2014 to 30 June 2015 (*continued*)

Scheme Name	Scheme Component	Parameter	LOR	Unit	Sampling Frequency	Total no. of samples collected	Total no. of samples with values greater than or equal the LOR	Total no. of samples exceeding water quality criteria	Minimum	Maximum	Average	Laboratory Name
Rockhampton	WTP	pH	0.01	unit	Monthly	12	12	No value	7.19	7.92	7.61	Symbio Alliance
Rockhampton	WTP	Colour (True)	2	TCU	Monthly	12	2	No value	3	10	7	Symbio Alliance
Rockhampton	WTP	Turbidity	0.1	NTU	Monthly	12	10	No value	<0.1	0.5	0.2	Symbio Alliance
Rockhampton	WTP	Electrical Conductivity	1	µS/cm	Monthly	12	12	No value	210	380	292	Symbio Alliance
Rockhampton	WTP	Solids (Dissolved)	2	mg/L	Monthly	12	12	No value	120	320	199	Symbio Alliance
Rockhampton	WTP	Chloride	2	mg/L	Monthly	12	12	No value	22	69	48	Symbio Alliance
Rockhampton	WTP	Fluoride	0.05	mg/L	Monthly	12	10	0	<0.05	0.32	0.15	Symbio Alliance
Rockhampton	WTP	Nitrate (as N)	0.005	mg/L	Monthly	12	12	0	0.005	1.300	0.290	Symbio Alliance
Rockhampton	WTP	Nitrite (as N)	0.005	mg/L	Monthly	11	2	0	<0.005	0.010	0.009	Symbio Alliance
Rockhampton	WTP	Sulphate	5	mg/L	Monthly	12	9	0	<5	39	11	Symbio Alliance
Rockhampton	WTP	Aluminium (Acid Soluble)	0.01	mg/L	Monthly	11	4	No value	<0.01	0.02	0.01	Symbio Alliance
Rockhampton	WTP	Iron (Total)	0.01	mg/L	Monthly	12	2	No value	<0.01	0.01	<0.01	Symbio Alliance
Rockhampton	WTP	Manganese (Total)	0.0005	mg/L	Monthly	12	5	0	<0.0005	0.4100	0.0834	Symbio Alliance
Rockhampton	WTP	Copper (Total)	0.0005	mg/L	Monthly	12	6	0	<0.0005	0.0170	0.0077	Symbio Alliance
Rockhampton	WTP	Lead (Total)	0.0001	mg/L	Monthly	12	6	0	<0.0001	0.0020	0.0011	Symbio Alliance
Rockhampton	WTP	Zinc (Total)	0.0005	mg/L	Monthly	12	7	No value	<0.0005	0.0300	0.0097	Symbio Alliance
Rockhampton	WTP	Calcium (Total)	0.1	mg/L	Monthly	12	12	No value	11	18	14.3	Symbio Alliance
Rockhampton	WTP	Sodium (Total)	1	mg/L	Monthly	12	12	No value	17	31	24	Symbio Alliance
Rockhampton	WTP	Potassium (Total)	0.2	mg/L	Monthly	12	12	No value	1.9	5.2	3.2	Symbio Alliance
Rockhampton	WTP	Magnesium (Total)	0.05	mg/L	Monthly	12	12	No value	5.50	14.00	9.63	Symbio Alliance
Rockhampton	WTP	Hardness (Total)	1	mg/L	Monthly	12	12	No value	55	95	75	Symbio Alliance
Rockhampton	WTP	Alkalinity (Total) as CaCO3	1	mg/L	Monthly	12	12	No value	48	82	67	Symbio Alliance
Rockhampton	WTP	Total Organic Carbon	1	mg/L	Quarterly	4	4	No value	2.8	9.9	5	Symbio Alliance
Rockhampton	WTP	Trihalomethanes	4	µg/L	Quarterly	4	4	0	20	95	47	Symbio Alliance
Rockhampton	WTP	Arsenic	0.0005	mg/L	Annually	1	1	0	0.00063	0.00063	0.00063	Symbio Alliance
Rockhampton	WTP	Cadmium	0.0001	mg/L	Annually	1	0	0	<0.0001	<0.0001	<0.0001	Symbio Alliance
Rockhampton	WTP	Chromium	0.0005	mg/L	Annually	1	0	0	<0.0005	<0.0005	<0.0005	Symbio Alliance
Rockhampton	WTP	Mercury	0.0001	mg/L	Annually	1	0	0	<0.0001	<0.0001	<0.0001	Symbio Alliance
Rockhampton	WTP	Nickel	0.0001	mg/L	Annually	1	0	0	<0.0001	<0.0001	<0.0001	Symbio Alliance
Rockhampton	WTP	Selenium	0.0005	mg/L	Annually	1	0	0	<0.0005	<0.0005	<0.0005	Symbio Alliance
Rockhampton	WTP	Perfluorooctanoic Acid	0.02	µg/L	Annually	1	0	No value	<0.02	<0.02	<0.02	Symbio Alliance
Rockhampton	WTP	Perfluorooctane Sulphate	0.02	µg/L	Annually	1	0	No value	<0.02	<0.02	<0.02	Symbio Alliance
Rockhampton	WTP	pH	0.01	unit	Continuous			No value	7.4	7.94	7.68	FRW - Telemetry
Rockhampton	WTP	Turbidity	0.01	NTU	Continuous			No value	0.03	2.95	0.19	FRW - Telemetry
Rockhampton	WTP	Electrical Conductivity	0.01	µS/cm	Continuous			No value	142.13	496.63	298.32	FRW - Telemetry
Rockhampton	WTP	Chlorine (Free)	0.01	mg/L	Continuous			0	0.62	1.34	1.00	FRW - Telemetry
Rockhampton	WTP	pH	0.01	unit	Daily	363	363	No value	7.22	8.57	7.60	FRW - Inhouse
Rockhampton	WTP	Turbidity	0.01	NTU	Daily	363	363	No value	0.01	0.80	0.15	FRW - Inhouse
Rockhampton	WTP	Electrical Conductivity	0.01	µS/cm	Daily	363	363	No value	160.00	467.40	303.06	FRW - Inhouse
Rockhampton	WTP	Chlorine (Free)	0.01	mg/L	Daily	363	363	0	0.58	1.53	1.03	FRW - Inhouse
Rockhampton	Reticulation	Trihalomethanes - Johnson Rd	4	µg/L	Quarterly	4	4	0	62	170	99	Symbio Alliance
Rockhampton	Reticulation	*Escherichia coli (E. coli)*	1	MPN/100ml	Weekly	460	0	0	<1	<1	<1	Ecoscope Environmental
Rockhampton	Reticulation	Chlorine (Free)	0	mg/L	Weekly	537	537	0	0	1.63	0.70	FRW - *in situ*

Table A1.2 Mount Morgan Water Supply Scheme water quality monitoring results from 1 July 2014 to 30 June 2015

Scheme Name	Scheme Component	Parameter	LOR	Unit	Sampling Frequency	Total no. of samples collected	Total no. of samples with values greater than or equal the LOR	Minimum	Maximum	Average	Laboratory Name
Mount Morgan	Source Water	pH	0.01	unit	Monthly	12	12	7.27	9.04	7.98	Symbio Alliance
Mount Morgan	Source Water	Colour (True)	2	TCU	Monthly	12	11	<2	75	29	Symbio Alliance
Mount Morgan	Source Water	Turbidity	0.1	NTU	Monthly	12	12	1.2	12.8	4.1	Symbio Alliance
Mount Morgan	Source Water	Electrical Conductivity	1	µS/cm	Monthly	12	12	130	520	294	Symbio Alliance
Mount Morgan	Source Water	Solids (Dissolved)	2	mg/L	Monthly	12	12	98	250	168	Symbio Alliance
Mount Morgan	Source Water	Chloride	2	mg/L	Monthly	12	12	16	54	37	Symbio Alliance
Mount Morgan	Source Water	Fluoride	0.05	mg/L	Monthly	12	11	<0.05	0.26	0.12	Symbio Alliance
Mount Morgan	Source Water	Nitrate (as N)	0.005	mg/L	Monthly	12	6	<0.005	0.250	0.097	Symbio Alliance
Mount Morgan	Source Water	Nitrite (as N)	0.005	mg/L	Monthly	11	3	<0.005	0.015	0.012	Symbio Alliance
Mount Morgan	Source Water	Sulphate	5	mg/L	Monthly	12	9	<5	37	11	Symbio Alliance
Mount Morgan	Source Water	Aluminium (Acid Soluble)	0.01	mg/L	Monthly	11	10	<0.01	0.31	0.08	Symbio Alliance
Mount Morgan	Source Water	Iron (Total)	0.01	mg/L	Monthly	12	12	0.02	0.64	0.24	Symbio Alliance
Mount Morgan	Source Water	Manganese (Total)	0.0005	mg/L	Monthly	12	12	0.0310	0.1800	0.0778	Symbio Alliance
Mount Morgan	Source Water	Copper (Total)	0.0005	mg/L	Monthly	12	6	<0.0005	0.0023	0.0016	Symbio Alliance
Mount Morgan	Source Water	Lead (Total)	0.0001	mg/L	Monthly	12	4	<0.0001	0.0003	0.0002	Symbio Alliance
Mount Morgan	Source Water	Zinc (Total)	0.0005	mg/L	Monthly	12	6	<0.0005	0.0200	0.0084	Symbio Alliance
Mount Morgan	Source Water	Calcium (Total)	0.1	mg/L	Monthly	12	12	7.3	26.0	16.1	Symbio Alliance
Mount Morgan	Source Water	Sodium (Total)	1	mg/L	Monthly	12	12	11	41	24	Symbio Alliance
Mount Morgan	Source Water	Potassium (Total)	0.2	mg/L	Monthly	12	12	1.1	1.7	1.5	Symbio Alliance
Mount Morgan	Source Water	Magnesium (Total)	0.05	mg/L	Monthly	12	12	5.40	14.00	9.90	Symbio Alliance
Mount Morgan	Source Water	Hardness (Total)	1	mg/L	Monthly	12	12	40	105	77	Symbio Alliance
Mount Morgan	Source Water	Alkalinity (Total) as CaCO3	1	mg/L	Monthly	12	12	52	103	77	Symbio Alliance
Mount Morgan	Source Water	Total Organic Carbon	1	mg/L	Quarterly	4	4	8	12	10	Symbio Alliance
Mount Morgan	Source Water	Arsenic	0.0005	mg/L	Annually	1	1	0.00054	0.00054	0.00054	Symbio Alliance
Mount Morgan	Source Water	Cadmium	0.0001	mg/L	Annually	1	0	<0.0001	<0.0001	<0.0001	Symbio Alliance
Mount Morgan	Source Water	Chromium	0.0005	mg/L	Annually	1	0	<0.0005	<0.0005	<0.0005	Symbio Alliance
Mount Morgan	Source Water	Mercury	0.0001	mg/L	Annually	1	0	<0.0001	<0.0001	<0.0001	Symbio Alliance
Mount Morgan	Source Water	Nickel	0.0001	mg/L	Annually	1	0	<0.0001	<0.0001	<0.0001	Symbio Alliance
Mount Morgan	Source Water	Selenium	0.0005	mg/L	Annually	1	0	<0.0005	<0.0005	<0.0005	Symbio Alliance
Mount Morgan	Source Water	Pesticides (various)	0.2	µg/L	Annually	1	0	<0.2	<0.2	<0.2	Symbio Alliance
Mount Morgan	Source Water	pH	0.01	unit	Continuous			6.28	9.06	7.62	FRW - Telemetry
Mount Morgan	Source Water	Turbidity	0.01	NTU	Continuous			0.23	66.72	4.80	FRW - Telemetry
Mount Morgan	Source Water	Electrical Conductivity	0.01	µS/cm	Continuous			2.29	605.44	250.17	FRW - Telemetry
Mount Morgan	Source Water	pH	0.01	unit	Daily	357	357	6.33	8.94	7.49	FRW - Inhouse
Mount Morgan	Source Water	Turbidity	0.01	NTU	Daily	356	356	0.20	51.40	4.35	FRW - Inhouse

Table A1.2 Mount Morgan Water Supply Scheme water quality monitoring results from 1 July 2014 to 30 June 2015 (*continued*)

Scheme Name	Scheme Component	Parameter	LOR	Unit	Sampling Frequency	Total no. of samples collected	Total no. of samples with values greater than or equal the LOR	Total no. of samples exceeding water quality criteria	Minimum	Maximum	Average	Laboratory Name
Mount Morgan	WTP	pH	0.01	unit	Monthly	12	12	No value	7.09	7.94	7.58	Symbio Alliance
Mount Morgan	WTP	Colour (True)	2	TCU	Monthly	12	1	No value	<2	2	<2	Symbio Alliance
Mount Morgan	WTP	Turbidity	0.1	NTU	Monthly	12	12	No value	0.2	3.1	0.9	Symbio Alliance
Mount Morgan	WTP	Electrical Conductivity	1	µS/cm	Monthly	12	12	No value	220	460	353	Symbio Alliance
Mount Morgan	WTP	Solids (Dissolved)	2	mg/L	Monthly	12	12	No value	140	280	203	Symbio Alliance
Mount Morgan	WTP	Chloride	2	mg/L	Monthly	12	12	No value	18	58	40	Symbio Alliance
Mount Morgan	WTP	Fluoride	0.05	mg/L	Monthly	12	6	0	<0.05	0.22	0.11	Symbio Alliance
Mount Morgan	WTP	Nitrate (as N)	0.005	mg/L	Monthly	12	12	0	0.023	1.800	0.257	Symbio Alliance
Mount Morgan	WTP	Nitrite (as N)	0.005	mg/L	Monthly	11	0	0	<0.005	<0.005	<0.005	Symbio Alliance
Mount Morgan	WTP	Sulphate	5	mg/L	Monthly	12	11	0	<5	49	36	Symbio Alliance
Mount Morgan	WTP	Aluminium (Acid Soluble)	0.01	mg/L	Monthly	11	11	No value	0.27	0.60	0.46	Symbio Alliance
Mount Morgan	WTP	Iron (Total)	0.01	mg/L	Monthly	12	6	No value	<0.01	0.23	0.05	Symbio Alliance
Mount Morgan	WTP	Manganese (Total)	0.0005	mg/L	Monthly	12	12	0	0.0041	0.0240	0.0100	Symbio Alliance
Mount Morgan	WTP	Copper (Total)	0.0005	mg/L	Monthly	12	6	0	<0.0005	0.0042	0.0023	Symbio Alliance
Mount Morgan	WTP	Lead (Total)	0.0001	mg/L	Monthly	12	1	0	<0.0001	0.0001	<0.0001	Symbio Alliance
Mount Morgan	WTP	Zinc (Total)	0.0005	mg/L	Monthly	12	7	No value	<0.0005	0.033	0.0125	Symbio Alliance
Mount Morgan	WTP	Calcium (Total)	0.1	mg/L	Monthly	12	12	No value	7.8	18.0	14.3	Symbio Alliance
Mount Morgan	WTP	Sodium (Total)	1	mg/L	Monthly	12	12	No value	26	50	38	Symbio Alliance
Mount Morgan	WTP	Potassium (Total)	0.2	mg/L	Monthly	12	12	No value	1.2	1.6	1.4	Symbio Alliance
Mount Morgan	WTP	Magnesium (Total)	0.05	mg/L	Monthly	12	12	No value	5.20	13.00	9.68	Symbio Alliance
Mount Morgan	WTP	Hardness (Total)	1	mg/L	Monthly	12	12	No value	41	98	75	Symbio Alliance
Mount Morgan	WTP	Alkalinity (Total) as CaCO3	1	mg/L	Monthly	12	12	No value	40	108	79	Symbio Alliance
Mount Morgan	WTP	Total Organic Carbon	1	mg/L	Quarterly	4	4	No value	5	8	6	Symbio Alliance
Mount Morgan	WTP	Trihalomethanes	4	µg/L	Quarterly	4	4	0	63	110	88	Symbio Alliance
Mount Morgan	WTP	Arsenic	0.0005	mg/L	Annually	1	0	0	<0.0005	<0.0005	<0.0005	Symbio Alliance
Mount Morgan	WTP	Cadmium	0.0001	mg/L	Annually	1	0	0	<0.0001	<0.0001	<0.0001	Symbio Alliance
Mount Morgan	WTP	Chromium	0.0005	mg/L	Annually	1	0	0	<0.0005	<0.0005	<0.0005	Symbio Alliance
Mount Morgan	WTP	Mercury	0.0001	mg/L	Annually	1	0	0	<0.0001	<0.0001	<0.0001	Symbio Alliance
Mount Morgan	WTP	Nickel	0.0001	mg/L	Annually	1	0	0	<0.0001	<0.0001	<0.0001	Symbio Alliance
Mount Morgan	WTP	Selenium	0.0005	mg/L	Annually	1	0	0	<0.0005	<0.0005	<0.0005	Symbio Alliance
Mount Morgan	WTP	pH	0.01	unit	Continuous			No value	6.10	9.99	6.99	FRW - Telemetry
Mount Morgan	WTP	Turbidity	0.01	NTU	Continuous			No value	0.20	4.67	1.63	FRW - Telemetry
Mount Morgan	WTP	Chlorine (Free)	0.01	mg/L	Continuous			0	0.45	1.62	1.34	FRW - Telemetry
Mount Morgan	WTP	pH	0.01	unit	Daily	359	359	No value	6.24	7.82	7.21	FRW - Inhouse
Mount Morgan	WTP	Turbidity	0.01	NTU	Daily	360	360	No value	0.2	3.08	0.63	FRW - Inhouse
Mount Morgan	WTP	Electrical Conductivity	0.01	µS/cm	Daily	357	357	No value	143	683.00	365.69	FRW - Inhouse
Mount Morgan	WTP	Chlorine (Free)	0.01	mg/L	Daily	359	359	0	0.51	1.85	1.23	FRW - Inhouse
Mount Morgan	Reticulation	Trihalomethanes - Smalls Road	4	µg/L	Quarterly	4	4	0	84	100	93	Symbio Alliance
Mount Morgan	Reticulation	*Escherichia coli (E. coli)*	1	MPN/100ml	Weekly	104	1	1	<1	1	<1	Ecoscope Environmental
Mount Morgan	Reticulation	Chlorine (Free)	0	mg/L	Weekly	104	104	0	0	2.20	0.97	FRW - *in situ*

Table A2.1 Rockhampton Water Supply Scheme reticulation *E. coli* verification monitoring from 1 July 2014 to 30 June 2015

Drinking water scheme: **Rockhampton Drinking Water Scheme**

Year	*July 2014 to June 2015*											
Month	***Jul***	***Aug***	***Sept***	***Oct***	***Nov***	***Dec***	***Jan***	***Feb***	***Mar***	***Apr***	***May***	***Jun***
No. of samples collected	32	33	45	36	36	44	36	36	45	36	36	45
No. of samples collected in which *E. coli* is detected (i.e. a failure)	0	0	0	0	0	0	0	0	0	0	0	0
No. of samples collected in previous 12 month period	416	417	422	426	430	442	438	442	447	451	455	460
No. of failures for previous 12 month period	0	0	0	0	0	0	0	0	0	0	0	0
% of samples that comply	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Compliance with 98% annual value	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

CALCULATE PERCENTAGE USING A TWELVE (12) MONTH 'ROLLING' ANNUAL VALUE

The *Public Health Regulation 2005* (the regulation) requires that 98 per cent of samples taken in a 12 month period should contain no *E. Coli*. This requirement is refered to as the 'annual value' in Schedule 3A of the regulation.

This requirement comes into effect once you have 12 months data and should be assessed every month based on the previous 12 months data (so that it is a 'rolling' assessment).

Table A2.2 Mount Morgan Water Supply Scheme reticulation *E. coli* verification monitoring from 1 July 2014 to 30 June 2015

Drinking water scheme: **Mount Morgan Drinking Water Scheme**

Year	*July 2014 to June 2015*											
Month	***Jul***	***Aug***	***Sept***	***Oct***	***Nov***	***Dec***	***Jan***	***Feb***	***Mar***	***Apr***	***May***	***Jun***
No. of samples collected	8	8	10	8	8	10	8	8	10	8	8	10
No. of samples collected in which *E. coli* is detected (i.e. a failure)	0	0	0	0	0	0	0	0	0	0	0	1
No. of samples collected in previous 12 month period	104	104	104	104	104	106	104	104	104	104	104	104
No. of failures for previous 12 month period	0	0	0	0	0	0	0	0	0	0	0	1
% of samples that comply	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.0%
Compliance with 98% annual value	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

CALCULATE PERCENTAGE USING A TWELVE (12) MONTH 'ROLLING' ANNUAL VALUE

The *Public Health Regulation 2005* (the regulation) requires that 98 per cent of samples taken in a 12 month period should contain no *E. Coli*. This requirement is refered to as the 'annual value' in Schedule 3A of the regulation.

This requirement comes into effect once you have 12 months data and should be assessed every month based on the previous 12 months data (so that it is a 'rolling' assessment).

Appendix B Implementation of the DWQMP Risk Management Improvement Program

Tables B1.1 and B1.2 below describes the significant progress that has been made during this reporting period towards the completion of specific actions identified in the Risk Management Improvement Program in the approved amended DWQMP.

Table B1.1 Progress against the risk management improvement program in the Rockhampton Water Supply Scheme

Risk No.	Scheme Component / Sub-Component	Action(s)	Target Date(s)	Status as at 29 September 2015	(If implementing these actions will take longer than anticipated, please provided detail, as it may affect the approved amended DWQMP)
R08	Source - Contamination of raw water with EC or TDS	Continue to lobby regulator for tighter water quality limits on mine water discharges	Ongoing (as required)	Continuing as required	As this is an ongoing matter, it is anticipated that the action will continue to form part of the RMIP
R13	Treatment – Lack of effective treatment for viral pathogens	Perform testing for viruses for further confirmation of process effectiveness	30 Sept 2012 (Planning)	Deferred	Action has been deferred based on the current ADWG and the absence of health based target for water quality monitoring.
R30	Reservoirs – Inadequate security against deliberate act of sabotage or terrorism	Identify high risk sites and install CCTV at these sites	June 2017	Budget allocation secured for 2015-16 and 2016-17 for project commencement.	Physical and electronic security upgrades at various reservoirs are budgeted over 2 financial years. Progress delayed due to the Tropical Cyclone Marcia event.
R33	Customer tap – Contamination of treated water with microbial pathogens	Create a website Fact Sheet warning of contamination at customers tap	October 2015	Draft phase	Completion expected in 2015-16 reporting period. FRW website currently being completed revised and new content being added accordingly.

Table B1.2 Progress against the risk management improvement program in the Mount Morgan water supply scheme

Risk No.	Scheme Component / Sub-Component	Action(s)	Target Date(s)	Status as at 29 September 2015	(If implementing these actions will take longer than anticipated, please provided detail, as it may affect the approved amended DWQMP)
MM12	Treatment – Lack of effective treatment for protozoan pathogens	Further optimise filter performance or looking at installing UV disinfection if required	June 2016	Budget allocation secured for 2015-16 year for UV disinfection installation.	Completion expected in 2015-16 reporting period.
MM13	Treatment – Process control failure for the removal of cyanobacteria	Conduct more analysis to determine effectiveness of each treatment barrier for removal of cyanobacteria	June 2016	Continuing	Completion expected in 2015-16 reporting period. Limited opportunity for full analysis to be completed due to relatively low levels of cyanobacteria.
MM14	Treatment – Lack of effective treatment for viral pathogens	Perform testing for viruses for further confirmation of process effectiveness	30 Sept 2012 (Planning)	Deferred	Action has been deferred based on the current ADWG and the absence of health based target for water quality monitoring. This testing will be considered in associated with the installation of the UV treatment barrier later this financial year.
MM18	Treatment – Process control failure leading to excessive turbidity	Continue to use newly installed on-line analyser to drive further process optimisation	June 2016	Continuing	Review of the process performance is expected to be completed in 2015-16 reporting period. Further upgrading of process control continuing although progress delayed slightly due to Tropical Cyclone Marcia event.
MM20	Treatment – Process control failure leading to coagulant underdose	Convert coagulant dosing to liquid alum for on-line flow metering and better measurement of chemical usage	November 2015	Near completion (90%) pending electrical and plumbing works.	Completion expected in 2015-16 reporting period. Progress delayed due to Tropical Cyclone Marcia.
MM32	Treatment – Inadequate security against deliberate act of sabotage or terrorism	Identify high risk sites and install CCTV at these sites	June 2016	Budget allocation secured for 2015-16 year for project commencement.	Completion expected in 2015-16 reporting period. Progress delayed due to Tropical Cyclone Marcia event.

Risk No.	Scheme Component / Sub-Component	Action(s)	Target Date(s)	Status as at 29 September 2015	(If implementing these actions will take longer than anticipated, please provided detail, as it may affect the approved amended DWQMP)
MM36	Customer tap – contamination treated water with microbial pathogens	Create a website Fact Sheet warning of contamination at customers tap	October 2015	Draft phase	Completion expected in 2015-16 reporting period. FRW website currently being completed revised and new content being added accordingly.