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Service Provider ID: 9

Drinking Water Quality Management Plan (DWQMP)

ANNUAL REPORT

2016/2017

Glossary of terms

ADWG 2004	Australian Drinking Water Guidelines (2004). Published by the National Health and Medical Research Council of Australia
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

1. Introduction

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

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

This template has been prepared in accordance with the *Water Industry Regulatory Reform – drinking water quality management plan report factsheet* published by the Department of Energy and Water Supply, Queensland, accessible at www.dews.qld.gov.au.

2. Overview of Operations

Barcoo Shire incorporates the towns of Jundah, Stonehenge and Windorah, and covers an expanse of 61,974 sq km. The population of the shire is approximately 365. The administration centre of Barcoo Shire is 220 km south of Longreach in the township of Jundah.

Barcoo Shire Council is a small drinking water service provider as defined under the Act and provides drinking water to a population of approximately 210 people. Each town is serviced by dual water reticulation, a treated, potable water supply as well as an untreated non-potable supply.

Barcoo Shire Council is responsible for the following water supply schemes:

- **Jundah**

  Raw water is sourced from a nearby waterhole on the Thomson River. This river water is coagulated and treated by conventional sedimentation and rapid sand filtration in a package module. After chlorination, it transfers to a ground level reservoir and from there it is pumped into a high-level reservoir which supplies the town.

  Bore water is stored in a small ground level reservoir prior to treatment in the reverse osmosis plant and transfers to the same ground level reservoir as the treated river water. The reverse osmosis plant hasn't been in operation since November 2014.

- **Windorah**

  Raw water is sourced from two nearby waterholes on the Cooper Creek. This river water is coagulated and treated by conventional sedimentation and dual media rapid gravity filtration in a package plant. After chlorination, it transfers to a ground level reservoir and from there it is pumped into a high-level reservoir which supplies the town.

- **Stonehenge**

  Raw water is sourced from a nearby waterhole on the Thomson River and is pumped to an off-stream storage during river flows. Water from the off-stream storage is pumped, with addition of coagulant, to a small floc-sed unit and then into a flow balance tank. The water then passes through a pressure filter and is chlorinated before being transferred to a ground level reservoir from which it is pumped into a high-level reservoir which supplies the town.
  .

3. Actions taken to implement the DWQMP

Progress in implementing the risk management improvement program

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

The main progress Council has made in implementing the DWQMP is in the following areas:

- ability to test for turbidity by procuring portable meters for all three water treatment plants
- development of key procedures for works undertaken on the potable water system
- changes in chlorination at the Stonehenge water treatment plant to be post filtration
- development of Operating Plans for each water treatment plant. These Operating Plans are more relevant and fit for purpose documents for operational staff use. They identify operational monitoring and targets for key control points within the system, as well as corrective actions.
- Expanding the operational monitoring program to include monitoring of turbidity and free chlorine at important control points within the system.
- Joint procurement through the Outback Regional Water Alliance (ORWA) for the following:
    - Reservoir cleaning
    - Air scouring of potable water mains for all three schemes
    - Review of full monitoring program by Peter Mosse
- Procuring in-line analysers for chlorine and turbidity at each treatment plant

Further implementation steps that are either in progress or are to commence in the near future, through Council's participation in the ORWA are:

- Review of disinfection products and processes. This is in progress and its implementation is subject to the availability of funding.
- Continuing use of specialist external resources/consultants e.g. Peter Mosse
- All Treatment Plant Operators are undertaking the Certificate III in Water Industry Treatment with expected completion in late 2017.

Revisions made to the operational monitoring program to assist in maintaining the compliance with water quality criteria[1] in verification monitoring.

The operational monitoring program was expanded to include additional control points within the system. These revisions were documented in the first amendment to the DWQMP and have also been included in the Operating Plans for each Water Treatment Plant.

Amendments made to the DWQMP

The following major amendments were made to the DWQMP as a result of the first review in 2015/16:

- Expanded operational monitoring program for all three schemes;
- Updated monitoring results for all three schemes;
- Updated reticulation plans included; and
- Update of the Information Management section.

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

4. Compliance with water quality criteria for drinking water

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. Refer to Appendix A for the monitoring results.

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

This financial year there were no instances where the Regulator was notified under sections 102 or 102A of the Act. Council is however in discussions with the Regulator to identify the ongoing reporting of chlorate.

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

Nil

Prescribed incidents or Events reported to the Regulator and corrective and preventive actions undertaken.

Nil

6. Customer complaints related to water quality

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

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

Table 1 - complaints about water quality, (including per 1000 customers)

	Suspected Illness	Discoloured water	Taste and odour	Total
Jundah	0	4 (47.1 per 1000 connections)	0	4
Windorah	0	6 (75.9 per 1000 connections)	0	6
Stonehenge	0	4 (133.3 per 1000 connections)	0	4
Total	0	14 (72.2 per 1000 connections)	0	14

Suspected Illness

Nil

Discoloured water

All dirty water complaints were received at the time of air scouring works being undertaken on the water mains for each scheme in late 2016.

Taste and odour

Nil

7. Findings and recommendations of the DWQMP auditor

No audit of the DWQMP has been undertaken to date. The first audit of the DWQMP is due by 30 June 2018.

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

No review of the DWQMP was conducted during the reporting period.

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*.

The reported statistics do not include results derived from repeat samples, or from emergency or investigative samples undertaken in response to an elevated result.

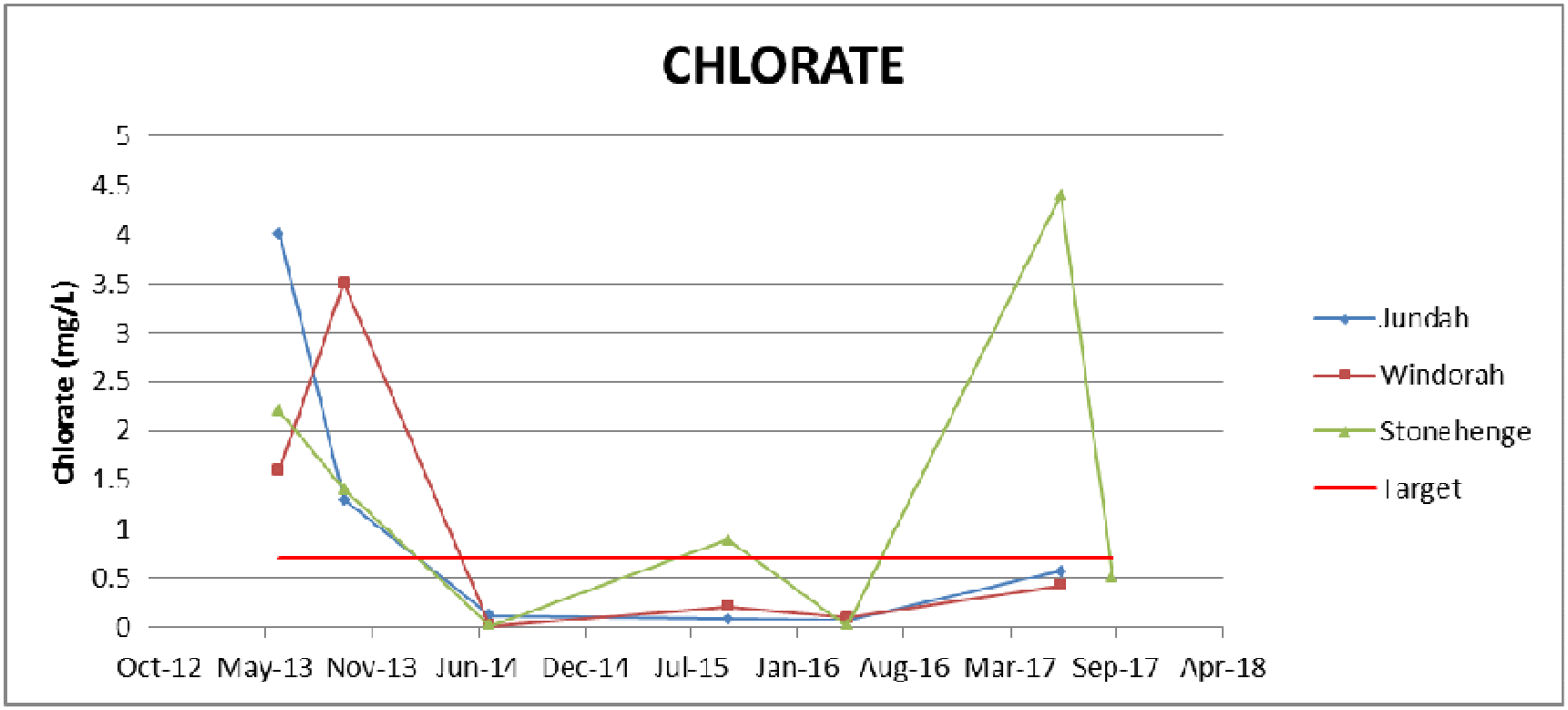
The verification monitoring was varied from that stated in the DWQMP as follows:

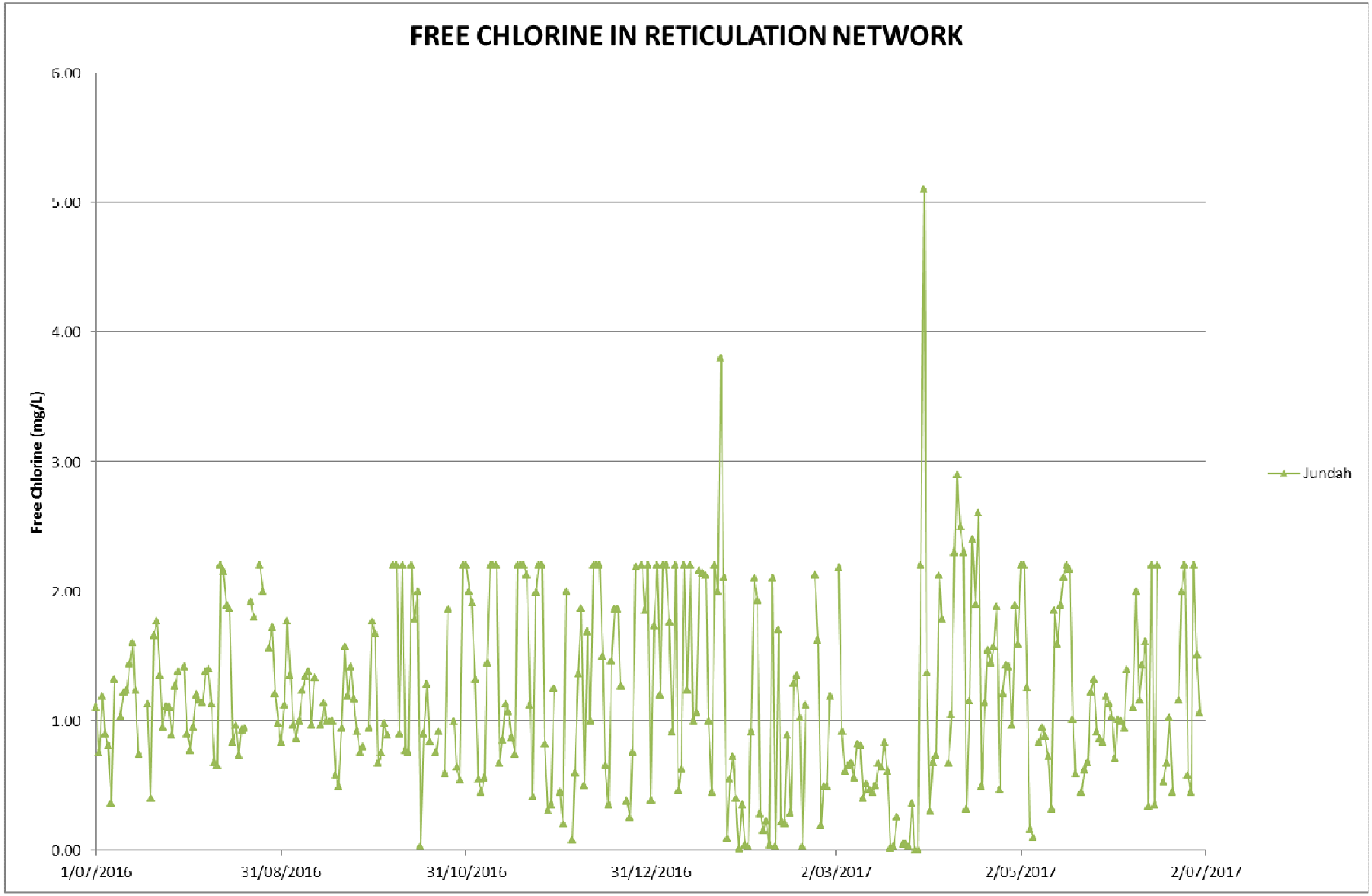
1. Monitoring of free chlorine residual in the reticulation system was increased in frequency to be on a daily basis in early 2015. The daily monitoring has been undertaken at just one site in the reticulation system for each scheme rather than monthly at three separate sites.
2. The duplicate testing of E.coli and coliform by an external laboratory was only undertaken once in 2017. Frequency of this testing will be increased in 2017/18 to reflect the new verification monitoring in the amended DWQMP.

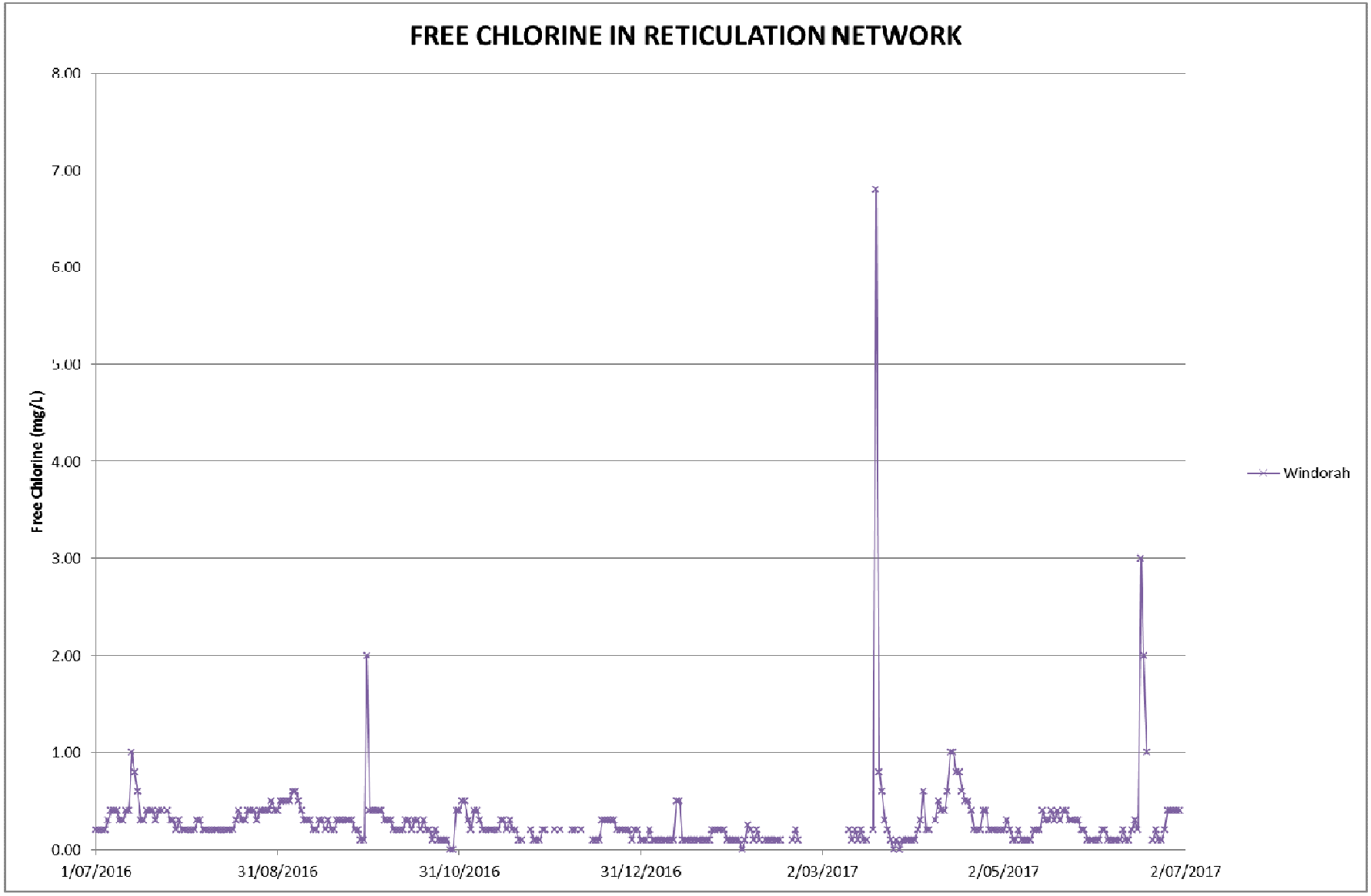
Table 2 - Verification monitoring results

Scheme name	Scheme component	Parameter	Units	Frequency of sampling	Total No. samples collected	No. of samples in which parameter was detected	No. of samples exceeding water quality criteria	Min	Max	Average (Mean)	Limit of reporting	Laboratory name
Jundah	Source Water	Antimony	mg/L	Annually	1	0	0				0.001	SAS - Darra
	Source Water	Arsenic	mg/L	Annually	1	1	0	0.0011	0.0011	0.0011		SAS - Darra
	Source Water	Barium	mg/L	Annually	1	1	0	0.28	0.28	0.28		SAS - Darra
	Source Water	Beryllium	mg/L	Annually	1	0	0				0.001	SAS - Darra
	Source Water	Boron	mg/L	Annually	1	0	0				0.20	SAS - Darra
	Source Water	Cadmium	mg/L	Annually	1	0	0				0.0002	SAS - Darra
	Source Water	Chromium	mg/L	Annually	1	1	0	0.0093	0.0093	0.0093		SAS - Darra
	Source Water	Copper	mg/L	Annually	1	1	0	0.012	0.012	0.012		SAS - Darra
	Source Water	Lead	mg/L	Annually	1	1	0	0.0041	0.0041	0.0041		SAS - Darra
	Source Water	Manganese	mg/L	Annually	1	1	0	0.12	0.12	0.12		SAS - Darra
	Source Water	Molybdenum	mg/L	Annually	1	0	0				0.001	SAS - Darra
	Source Water	Nickel	mg/L	Annually	1	1	0	0.0087	0.0087	0.0087		SAS - Darra
	Source Water	Selenium	mg/L	Annually	1	0	0				0.001	SAS - Darra
Windorah	Source Water	Antimony	mg/L	Annually	1	0	0				0.001	SAS - Darra
	Source Water	Arsenic	mg/L	Annually	1	1	0	0.0017	0.0017	0.0017		SAS - Darra
	Source Water	Barium	mg/L	Annually	1	1	0	0.27	0.27	0.27		SAS - Darra
	Source Water	Beryllium	mg/L	Annually	1	1	0	0.001	0.001	0.001		SAS - Darra
	Source Water	Boron	mg/L	Annually	1	0	0				0.20	SAS - Darra
	Source Water	Cadmium	mg/L	Annually	1	0	0				0.0002	SAS - Darra
	Source Water	Chromium	mg/L	Annually	1	1	0	0.012	0.012	0.012		SAS - Darra
	Source Water	Copper	mg/L	Annually	1	1	0	0.014	0.014	0.014		SAS - Darra
	Source Water	Lead	mg/L	Annually	1	1	0	0.0058	0.0058	0.0058		SAS - Darra
	Source Water	Manganese	mg/L	Annually	1	1	0	0.13	0.13	0.13		SAS - Darra
	Source Water	Molybdenum	mg/L	Annually	1	0	0				0.001	SAS - Darra
	Source Water	Nickel	mg/L	Annually	1	1	0	0.01	0.01	0.01		SAS - Darra
	Source Water	Selenium	mg/L	Annually	1	0	0				0.001	SAS - Darra
Stonehenge	Source Water	Antimony	mg/L	Annually	1	0	0				0.001	SAS - Darra
	Source Water	Arsenic	mg/L	Annually	1	1	0	0.0016	0.0016	0.0016		SAS - Darra
	Source Water	Barium	mg/L	Annually	1	1	0	0.26	0.26	0.26		SAS - Darra
	Source Water	Beryllium	mg/L	Annually	1	0	0				0.001	SAS - Darra
	Source Water	Boron	mg/L	Annually	1	0	0				0.20	SAS - Darra
	Source Water	Cadmium	mg/L	Annually	1	0	0				0.0002	SAS - Darra

Scheme name	Scheme component	Parameter	Units	Frequency of sampling	Total No. samples collected	No. of samples in which parameter was detected	No. of samples exceeding water quality criteria	Min	Max	Average (Mean)	Limit of reporting	Laboratory name
	Source Water	Chromium	mg/L	Annually	1	1	0	0.0079	0.0079	0.0079		SAS - Darra
	Source Water	Copper	mg/L	Annually	1	1	0	0.0079	0.0079	0.0079		SAS - Darra
	Source Water	Lead	mg/L	Annually	1	1	0	0.0027	0.0027	0.0027		SAS - Darra
	Source Water	Manganese	mg/L	Annually	1	1	0	0.064	0.064	0.064		SAS - Darra
	Source Water	Molybdenum	mg/L	Annually	1	0	0				0.001	SAS - Darra
	Source Water	Nickel	mg/L	Annually	1	1	0	0.0068	0.0068	0.0068		SAS - Darra
	Source Water	Selenium	mg/L	Annually	1	0	0				0.001	SAS - Darra




FREE CHLORINE IN RETICULATION NETWORK
Free Chlorine (mg/L)
6.00
5.00
4.00
3.00
2.00
1.00
0.00
1/07/2016
31/08/2016
31/10/2016
31/12/2016
2/03/2017
2/05/2017
2/07/2017
Jundah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Free Chlorine (mg/L)
8.00
7.00
6.00
5.00
4.00
3.00
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1/07/2016
31/08/2016
31/10/2016
31/12/2016
2/03/2017
2/05/2017
2/07/2017
Windorah

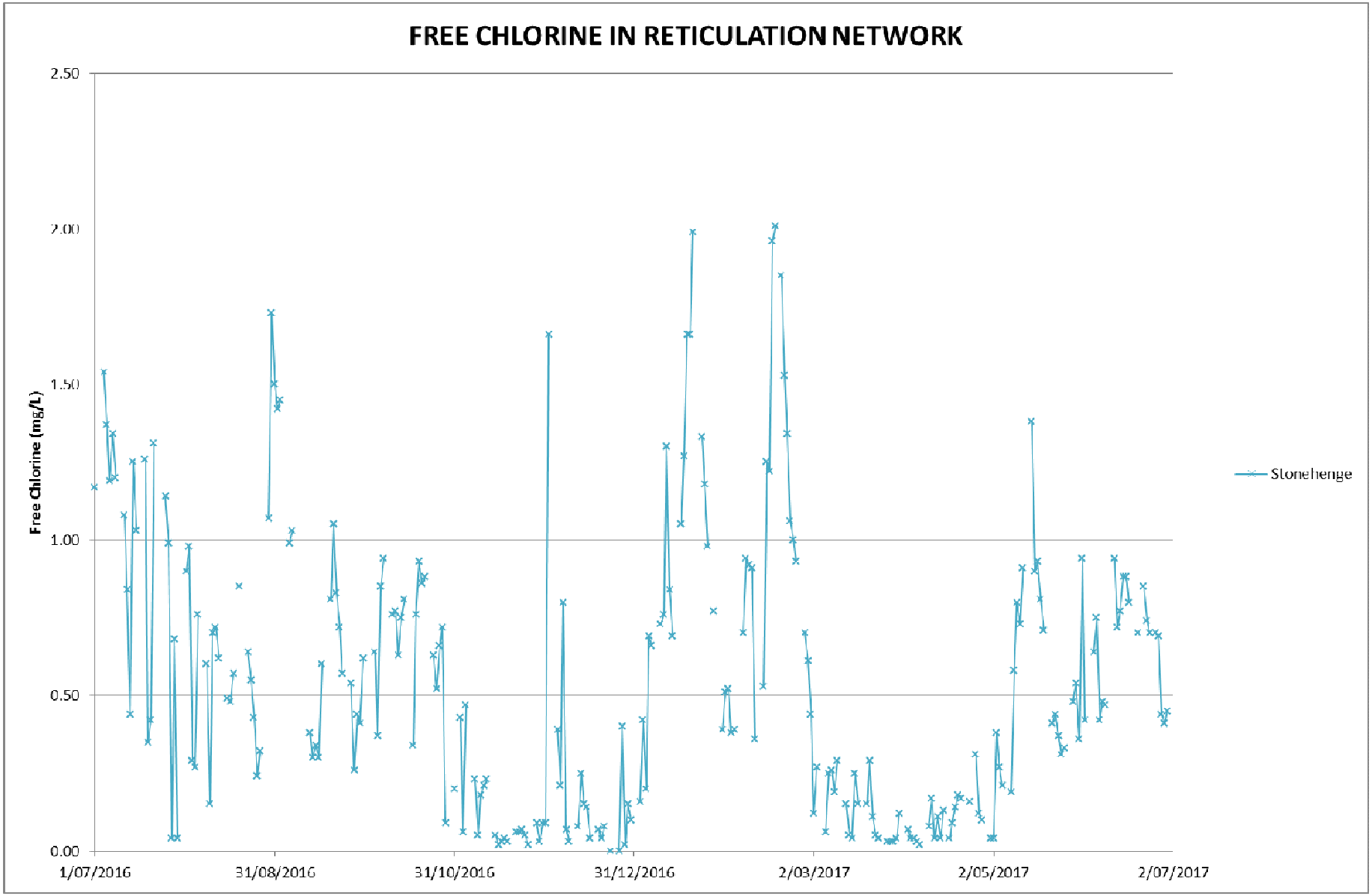
FREE CHLORINE IN RETICULATION NETWORK
Free Chlorine (mg/L)
2.50
2.00
1.50
1.00
0.50
0.00
1/07/2016
31/08/2016
31/10/2016
31/12/2016
2/03/2017
2/05/2017
2/07/2017
Stonehenge

Table 3 - Reticulation *E. coli* verification monitoring

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).

Drinking water scheme: Jundah

Year	***2016***											
Month	***Jan***	***Feb***	***Mar***	***Apr***	***May***	***June***	***July***	***Aug***	***Sept***	***Oct***	***Nov***	***Dec***
No. of samples collected	8	8	4	8	12	4	12	0	7	11	12	8
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	56	61	62	67	76	77	86	83	87	94	98	94
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

Year	*2017*											
Month	***Jan***	***Feb***	***Mar***	***Apr***	***May***	***June***	***July***	***Aug***	***Sept***	***Oct***	***Nov***	***Dec***
No. of samples collected	8	12	8	15	4	12	8	8	4	4	12	0
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	94	98	102	109	101	109	105	113	110	103	103	95
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

Drinking water scheme: Windorah

Year	*2016*											
Month	***Jan***	***Feb***	***Mar***	***Apr***	***May***	***June***	***July***	***Aug***	***Sept***	***Oct***	***Nov***	***Dec***
No. of samples collected	12	8	8	4	8	8	8	4	8	8	8	12
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	51	56	61	62	67	72	77	78	83	88	88	96
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

Year	*2017*											
Month	***Jan***	***Feb***	***Mar***	***Apr***	***May***	***June***	***July***	***Aug***	***Sept***	***Oct***	***Nov***	***Dec***
No. of samples collected	8	8	4	12	4	8	12	8	4	4	12	0
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	92	92	88	96	92	92	96	100	96	92	96	84
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

Drinking water scheme: Stonehenge

Year	*2016*											
Month	***Jan***	***Feb***	***Mar***	***Apr***	***May***	***June***	***July***	***Aug***	***Sept***	***Oct***	***Nov***	***Dec***
No. of samples collected	8	8	13	4	12	4	12	0	8	8	12	8
No. of samples collected in which *E. coli* is detected (i.e. a failure)	0	0	1	0	0	0	0	0	0	0	0	0
No. of samples collected in previous 12 month period	51	56	66	67	76	78	87	84	89	93	97	97
No. of failures for previous 12 month period	0	0	1	1	1	1	1	1	1	1	1	1
% of samples that comply	100.0%	100.0%	98.5%	98.5%	98.7%	98.7%	98.9%	98.8%	98.9%	98.9%	99.0%	99.0%
Compliance with 98% annual value	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Year	*2017*											
Month	***Jan***	***Feb***	***Mar***	***Apr***	***May***	***June***	***July***	***Aug***	***Sept***	***Oct***	***Nov***	***Dec***
No. of samples collected	8	4	8	12	8	11	8	8	4	8	12	0
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	97	93	88	96	92	99	95	103	99	99	99	91
No. of failures for previous 12 month period	1	1	0	0	0	0	0	0	0	0	0	0
% of samples that comply	99.0%	98.9%	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

External laboratory check of E.coli and coliforms

Sample Site	Units	Coliforms	E. coli	Date Sampled
Jundah WTP	MPN/100mL	<1	<1	5/12/2017
Jundah Clinic	MPN/100mL	<1	<1	5/12/2017
Jundah School	MPN/100mL	<1	<1	5/12/2017
Jundah Washdown Bay	MPN/100mL	<1	<1	5/12/2017
Windorah WTP	MPN/100mL	<1	<1	5/12/2017
Windorah Caravan Park	MPN/100mL	<1	<1	5/12/2017
Windorah Clinic	MPN/100mL	<1	<1	5/12/2017
Windorah Airport	MPN/100mL	<1	<1	5/12/2017
Stonehenge WTP	MPN/100mL	<1	<1	5/12/2017
Stonehenge Caravan Park	MPN/100mL	<1	<1	5/12/2017
Stonehenge Info Centre	MPN/100mL	<1	<1	5/12/2017
Stonehenge School	MPN/100mL	<1	<1	5/12/2017

Appendix B – Implementation of the DWQMP Risk Management Improvement Program

Table 4 – Progress against the risk management improvement program in the approved DWQMP

Ref	Hazard/ Hazardous Event	Actions	Priority	Target Date	Status as at 30/6/2017	Status Comment
Catchment						
C1	Need to monitor effectiveness of treatment as a barrier to pathogens generally	Investigate purchasing turbidity meters with resolution of at least one decimal place for each plant for operational monitoring	high	31-Dec-14	Completed	Secondhand portable meters obtained for all three water treatment plants by December 2014.
C2	Inability of treatment to reliably remove protozoa	Develop strategy to minimise use of first run of the river water, consider alternative sources (eg off-stream storage) during storm events. Optimise the plant's operation during storm events to keep turbidity down.	medium	31-Dec-14	In progress	Current strategy is to not take raw water for the first few days of any 'first flush' of the river. Sufficient treated water storage is available to allow this. For Jundah, investigating the use of an existing ground level tank to store raw water prior to the 'first flush' of the river arriving.
C3	Pathogenic quality of raw water unknown	Investigate test program for E.coli in raw water supply	high	31-Dec-14	In progress	Some E.coli checks have been done on the raw water supply in 2016. Need for this monitoring to be covered in the ORWA monitoring program review by Peter Mosse.
C4	Dead animals in waterholes	Investigate routine inspections and removal	high	31-Dec-14	On going	Plant operators undertake daily inspections of the raw water source as part of their operational monitoring.
C5	Preparedness to deal with algal blooms if they should arise	Consider testing of dam water for algae species when raw water turbidity is low and pH rises above 9 and obtaining a stock of powdered activated carbon for use if required	medium	1-Jul-15	On going	No testing undertaken to date as conditions haven't reached the levels conducive for algal blooms.
C6	Significant levels of some metals were detected in raw river water in snapshot monitoring (but still <40% of health limits)	Investigate testing for metals in March each year until results indicate that metal levels are not an issue, eg <10% of health guideline values	medium	31-Dec-14	Completed/ On going	Most recent test results included in DWQMP amendment submitted on 2 August 2016. Update monitoring program for metals will be covered in the ORWA review by Peter Mosse.
C7	Variable raw water quality may warrant additional jar test equipment and operator training	Investigate cost/benefit of additional jar test equipment and training when sufficient treated turbidity history available	medium	31-Dec-15	On going	Training undertaken. Equipment still to be investigated.

Ref	Hazard/ Hazardous Event	Actions	Priority	Target Date	Status as at 30/6/2017	Status Comment
Jundah						
J1	Incapable equipment or unit processes - salinity	Investigate external maintenance contract for RO plant	high	30-Jun-14	Completed	External maintenance contract in place with Veolia however the RO plant hasn't been in operation since November 2014.
J2	Inadequate backup	Check that spare dosing pumps are on hand	medium	31-Dec-14	Completed	Spare dosing pumps are available.
J3	Chemical dosing failures - turbidity	Investigate purchase of turbidity meter	high	31-Dec-14	Completed	Included in Item C1. Secondhand portable meters obtained for all three water treatment plants by December 2014.
J4	Ineffective disinfection - bacteria, viruses	Investigate upgrade to chlorine dosing / monitoring systems	high	31-Dec-14	In progress	A joint project under the ORWA is in progress for the upgrade to chlorine dosing. Implementation of this will be subject to available funding. Inline analysers for chlorine have been installed.
J5	Power failures - loss of supply	Investigate requirement to be able to connect generator to operate pumps and/or WTP in the extent of long power failure	medium	1-Jul-15	Completed	Work completed to allow connection of a generator to the WTP.
J6	Disinfection byproducts - THMs	Test for THMs - if problem is indicated establish on-going testing program and/or reduction strategy	medium	31-Dec-14	Completed/ On going	Testing has been undertaken. Levels at all three plants are below max. ADWG values. Council will continue to do some spot checks on this parameter.
J7	Disinfection byproducts - chlorate	Test for chlorate - establish on-going testing program if indicated. Investigate alternative chlorine chemicals. Minimise hypo holding time, UV exposure, temperature.	medium	30-Jun-14	Completed/ On going	Testing for chlorate is ongoing with the amended DWQMP identifying corrective actions for exceedance of targets.

Ref	Hazard/ Hazardous Event	Actions	Priority	Target Date	Status as at 30/6/2017	Status Comment
Windorah						
W1	Inadequate backup	Investigate backup dosing equipment	medium	31-Dec-14	Completed	Spare dosing pumps are available.
W2	Chemical dosing failures	Investigate purchase or turbidity meter for the operator	high	31-Dec-14	Completed	Included in Item C1. Secondhand portable meters obtained for all three water treatment plants by December 2014.
W3	Power failures - loss of supply	Investigate requirement to be able to connect generator to operate pumps and/or WTP in the extent of long power failure	medium	1-Jul-15	Completed	Work completed to allow connection of a generator to the WTP.
W4	Disinfection byproducts - THMs	Test for THMs - establish on-going testing program and/or reduction strategy if warranted	low	30-Jun-14	Completed/ On going	Testing has been undertaken. Levels at all three plants are below max. ADWG values. Council will continue to do some spot checks on this parameter.
W5	Disinfection byproducts - chlorate	Test for chlorate - establish on-going testing program if indicated. Investigate alternative chlorine chemical if warranted	medium	30-Jun-14	Completed/ On going	Testing for chlorate is ongoing with the amended DWQMP identifying corrective actions for exceedance of targets.

Ref	Hazard/ Hazardous Event	Actions	Priority	Target Date	Status as at 30/6/2017	Status Comment
Stonehenge						
S1	Inadequate backup	Confirm availability/suitability of spare pumps	medium	31-Dec-14	Completed	Spare dosing pumps are available.
S2	Chemical dosing failures	Investigate purchase of turbidity meter	high	31-Dec-14	Completed	Included in Item C1. Secondhand portable meters obtained for all three water treatment plants by December 2014.
S3	Ineffective disinfection - bacteria, viruses	Chlorination is at inlet to plant. Investigate moving chlorination to post filtration.	medium	30-Jun-14	Completed	Chlorination is now undertaken post filtration.
S4	Disinfection byproducts - THMs	Test for THMs - establish on-going testing program and/or reduction strategy if indicated (see also S3)	high	30-Jun-14	Completed/ On going	Testing has been undertaken. Levels at all three plants are below max. ADWG values. Council will continue to do some spot checks on this parameter.
S5	Disinfection byproducts - chlorate	Test for chlorate - establish on-going testing program if indicated. Investigate alternative chlorine chemical if warranted	high	30-Jun-14	Completed/ On going	Testing for chlorate is ongoing with the amended DWQMP identifying corrective actions for exceedance of targets.

Ref	Hazard/ Hazardous Event	Actions	Priority	Target Date	Status as at 30/6/2017	Status Comment
Network/Systems						
N1	Repairs to reticulation water mains - contamination at work site	Develop work method statement, including hygiene measures and procedure for chlorination and flushing of affected area when required	medium	31-Dec-14	Completed	Various procedures developed by June 2015
N2	Ingress of contamination from cross-connection to untreated river water	Investigate purchase of turbidity meter for testing in conjunction with bacto sampling	high	31-Dec-14	Completed	Included in Item C1. Secondhand portable meters obtained for all three water treatment plants by December 2014.
N3	Water network drawings are still draft	Finalise drawings clearly identifying potable vs raw water supplies and make available to operational staff	medium	31-Dec-14	In Progress/On going	Drawings have been updated to include all new works during the past 5 years. Updated drawings Included in the DWQMP amendment submitted on 2 August 2016. Locations of older valves, hydrants etc. still being confirmed through site inspections.
N4	Comprehensive data records are not readily available	Investigate adoption of recommendations in section 12 or similar	medium	31-Dec-14	Completed	An improved system has been implemented, with data recorded in a spreadsheet and stored in Council's centralised document management system.
N5	Operation and maintenance procedures not documented	Prioritise and document key O&M functions required to minimise risk to drinking water quality	medium	1-Jul-15	Completed	Various procedures developed by June 2015
N6	Minimal operational monitoring currently undertaken	Review and upgrade operational monitoring and logging including identifying alert levels and corrective actions	medium	31-Dec-14	Completed/ On going	An upgraded monitoring program was introduced in early 2015. Further refinements made as part of the first DWQMP review and submitted in an amendment to the DWQMP on 2 August 2016.
N7	Chlorine residual not routinely tested in the reticulation systems	Investigate testing for free chlorine residual whenever bacto samples are taken in the reticulation	medium	31-Dec-14	Completed/ On going	Monitoring of free chlorine residual in the reticulation system has been included in the monitoring program with certain sites being tested on a daily basis.
N8	DEWS has requested a revised set of risk category descriptors and more detailed preventative measure descriptors	Revise the risk category descriptors, revisit the risk assessment and include more detailed preventative measure descriptors	medium	31-Dec-14	Completed	Done as part of the first DWQMP review and submitted in an amendment to the DWQMP on 2 August 2016.